Surveillance

MINISTRY FOR PRIMARY INDUSTRIES REPORTING ON NEW ZEALAND'S BIOSECURITY HEALTH STATUS
VOLUME 42, NO 3, SEPTEMBER 2015

ANNUAL REPORT

INSIDE:

Ministry for Primary Industries
Manatū Ahu Matua



Surveillance
ISSN 1176-5305

Surveillance is published on behalf of the Director IDC and Response (Veronica Herrera). The articles in this quarterly report do not necessarily reflect government policy.

Editor: Michael Bradstock
Technical Editors: Jonathan Watts, Lora Peacock

Correspondence and requests to receive *Surveillance* should be addressed to:
Editor
Surveillance
Ministry for Primary Industries
PO Box 2526
Wellington, New Zealand
email: surveillance@mpi.govt.nz

Reproduction: Articles in *Surveillance* may be reproduced (except for commercial use or on advertising or promotional material), provided proper acknowledgement is made to the author and Surveillance as source.

Publication: *Surveillance* is published quarterly in March, June, September and December. Distribution via email is free of charge for subscribers in New Zealand and overseas.

Editorial services: Words & Pictures, Wellington
www.wordpict.co.nz

Surveillance is available on the Ministry for Primary Industries website at www.mpi.govt.nz/publications/surveillance/index.htm

Articles from previous issues are also available to subscribers to SciQuest®, a fully indexed and searchable e-library of New Zealand and Australian veterinary and animal science and veterinary continuing education publications, at www.sciquest.org.nz

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

Contents

Editorial

Building our biosecurity capability

MPI has biosecurity laboratories at Wallaceville (for animal pests and diseases), Auckland and Christchurch (plant pests and diseases). These labs are vital parts of the biosecurity system, providing fast and accurate identification and diagnostic information on suspected and confirmed incursions. This work is essential for surveillance and emergency response, and underpins assurances to our trading partners of our enviable pest and disease status.

The MPI labs also screen samples for surveillance programmes, as regularly reported on in *Surveillance*. Samples from these programmes, such as those required for ongoing assurance of freedom from transmissible spongiform encephalopathies, arbovirus diseases and avian influenza in migratory birds and waterfowl, are all processed in these laboratories.

The labs also maintain a capacity to use test methods that are crucial to ongoing passive surveillance. Although each test may only be used infrequently, numerous methods and associated reagents need to be maintained by the staff. Each day, samples are received (often referred from other laboratories) from unusual cases, import and export health testing for plants and animals, and unusual cases of disease reported through MPI's exotic pest and disease hotline (0800 80 99 66).

Because of the importance of laboratories to the biosecurity system, MPI is making a major investment in infrastructure for diagnosing diseases. Work has begun on building the new National Biocontainment Laboratory at Wallaceville. This $87M project will ensure laboratory surveillance and emergency response capability remains strong well into the future.

There are many similarities between the diagnosis of veterinary and human diseases, and MPI also works with the Ministry of Health and the Institute of Environmental Science & Research to use the facility for testing samples from suspect cases of high-risk human diseases. Sharing resources and results from investigations of suspect cases of diseases such as avian influenza, West Nile virus and brucella improves responses and capability and provides better information for decision making.

MPI currently has both high- and medium-level containment laboratories on the Wallaceville site to support veterinary biosecurity operations. The existing high-level laboratory has an excellent safety record, but it is small and nearing the end of its 15–20-year design life. When it was built in 1998, the design did not anticipate the advent of today's fast and accurate molecular diagnostic techniques.

Accordingly, in 2012 MPI decided to improve on this critical capability. The new facility will not change the type of work done at Wallaceville, or the organisms held there, but will ensure the work can continue to be done safely for the foreseeable future.

Over the last three years, detailed investigations have influenced the design of the new lab. A thorough identification of business and user requirements has determined the key components of the design. Careful assessment of biological risks, with benchmarking against international best practice, worldwide containment standards and comparison with similar facilities in Australia, North America and Europe, has been used to understand and develop a design response to operational risks.

The existing Wallaceville high-level laboratory provides the highest level of biocontainment at present available in New Zealand. Working with samples suspected of containing high-risk pathogens requires complex containment and safety procedures. These include working at negative air pressure, filtering all exhaust air, sterilising all solid materials that leave the lab, treating effluent, and mandatory showering for all staff and visitors when leaving.

Architectural design sketch of the new National Biocontainment Laboratory to be built at Wallaceville

Modelling of potential exotic disease outbreaks has been used to determine the sample testing capacity required.

At times this has been a challenging process as potential features are assessed against their likely costs, contribution to safety, and business benefits. This will ensure MPI has the best risk-management features available for the biosecurity work that we need to perform.

Many New Zealand and international experts have been involved in this project. We have assembled a highly experienced team with skills in project management, biocontainment, engineering and architecture. Our design team is led by one of the best biocontainment companies in the world, Merrick & Co., from Ottawa, and is supported by local experts CCM, Dunning Thornton and Beca. Merrick & Co. have designed 125 similar laboratories in 25 countries worldwide. The assignment of 45 engineers and architects to the design work illustrates the complex nature of the project. In addition, a panel of independent experts provide input to and review of the design. The building contractor, Fletcher Construction, has assigned staff with experience building laboratories of this type both in NZ and overseas.

The new National Biocontainment Laboratory will have a floor area of over 3 400 square metres on three levels. It will provide high and medium containment levels, similar to the current laboratories at Wallaceville. The high-level containment area will be positioned above the medium-level area, for close integration between the two labs. Key features will include high security, extensive automation, elaborate air management, seismic protection and expansion capability for high workloads during biosecurity emergencies.

High-level containment labs of this type use complex integrated automatic systems. For example, there will be more than 1 100 control points throughout the building, with 83 km of electrical and data cables.

Containment standards require the internal environment to maintain an air pressure differential from outside to inside. Air cannot be recirculated, and pressures are affected by many factors such as heat load from equipment and staff opening and closing doors. This will result in one of the most complex heating, ventilation and air conditioning systems in the country, using almost 4.5 km of ducting with nearly 3 500 bends.

The building will have a much-improved capacity for emergency animal disease response work. A unique feature will be the ability of the medium-level containment lab to operate at a higher level of containment during a major biosecurity response such as an outbreak of foot-and-mouth disease. Special features have been included to provide for this contingency, such as exhaust air filtration, negative pressure and treatment of liquid effluent, and will result in a major expansion of capacity during an emergency.

Advanced seismic protection has been included so the new laboratory will meet Important Level 4 building standards (the same as for buildings with critical national functions such as tertiary hospitals). It will be base isolated, with a tolerance of 900 mm sideways movement, and be able to withstand a one-in-2 500-year earthquake.

Security has also been a key design issue, with a security consultant advising on the design. Advanced security features have been incorporated across multiple layers, including video surveillance and biometric access control.

Together, these and other features will result in a very safe laboratory for this important work. Multiple layers of risk mitigation have been designed into the building, based on international regulation, the best knowledge available worldwide and a recognition of the value of our biological resources. The design takes account of the fact that in any system where people are operating, mistakes can happen. Having several layers of containment means that all work remains safely contained.

The international biosecurity risks that New Zealand faces are changing as new diseases emerge, old ones spread into new places and our trade and tourism patterns change over time. New diagnostic tools such as whole-genome sequencing also emphasise adaptability as a design feature. Other features such as reconfigurable laboratory fitout, a range of large and small rooms and the segmentation of each floor into different laboratory suites, make the new laboratory adaptable in the future.

Site preparation is well advanced and the main construction will start by November this year. Completion is expected in 2018 and extensive testing will take place before commissioning in the same year. MPI expects to have the laboratory fully operational by early 2019.

The construction and equipment cost of $87M is significant but the benefits in terms of trade assurance, biosecurity and maintaining quality of life for New Zealanders far exceed the price. The new National Biocontainment Laboratory will be a major step forward in building our future biosecurity capability.

Joseph O'Keefe
Project Director
National Biocontainment Laboratory Project
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Joseph.O'Keefe@mpi.govt.nz

International animal trade

Risk analysis

The Animals and Aquatic Risk Analysis Team produces science-based risk analyses for border and post-border activities. The team analyses biological risks posed by imported goods, provides scientific advice to MPI and leads a number of operational research projects. The team also reviews assessments done by other teams and by external consultants. Activities during 2014 included:

Bovine and porcine sausage casings

This import risk analysis examined the biosecurity risks associated with international trade in natural sausage casings of bovine and porcine origin that have been prepared by operating procedures that are standard in much of the casing industry. Natural sausage casings are made from the intestines of cattle and pigs that have passed ante- and post-mortem inspection. The intestines are subject to a number of processing steps that remove gut contents and different tissue layers, and the casings are subsequently stored at room temperature for at least 30 days in dry salt or saturated brine. Disease-causing organisms associated with bovine and porcine intestines were identified from previously peer-reviewed MPI risk analyses. Only classical swine fever virus was assessed to be a risk (in pig casings) and risk management options were presented.

Bovine viral diarrhoea virus (BVDV) in cattle germplasm

Imports of bovine germplasm are associated with a risk of introducing exotic BVDV species. The risk is managed by testing requirements specified in each exporting country's veterinary certification for germplasm. As part of a current review of this certification, a review of more recent literature concerning the qualitative risk of BVDV transmission through bovine germplasm was requested, and where appropriate it also described import risk management options. There are two BVDV species, BVDV-1 and BVDV-2. Infection with BVDV-1 is common in New Zealand cattle. BVDV-2 is not known in New Zealand although overseas it has been associated with severe disease. BVDV-2 has been assessed as a risk associated with the importation of bovine semen and embryos.

Red meat

Drafting of the red meat risk analysis began in July 2011. This analysis was limited to the description of biosecurity risks from disease-causing organisms associated with imported meat and meat products derived from ruminants and swine. The scope with regard to ruminants was restricted to sheep, goats, cattle, buffaloes and deer. The definition of swine includes 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). This risk analysis was completed in 2014 and has been used to update several IHSs, including imported pet foods and other products containing animal tissues.

Zoo animals

Several risk analyses completed during 2014 examined the biosecurity risks associated with the importation of species into zoological collections. These included marsupials and monotremes from Australia, New Zealand lizard species recovered from smuggling activities in Europe, and an examination of the risk of foot-and-mouth disease associated with elephants from Sri Lanka.

Biosecurity in aquaculture

This collaborative project between MPI and Aquaculture New Zealand aims to strengthen on-farm biosecurity management. Pathways and vectors of biosecurity risk organisms have been identified, a biosecurity objective for each of these has been set, and potential preventive and management options have been identified. This draft document is now undergoing MPI internal peer review.

Craft risk management standard (CRMS) for vessel biofouling

The vessel biofouling CRMS was issued in May 2014, with a four-year voluntary lead-in before requirements become mandatory. Various vessel biofouling risk factors and indicators have been identified, and the information will be used by MPI to support preparation and planning for the CRMS implementation phase.

Biofouling management

This operational research project will identify effective hull maintenance practices that could constitute best practice though the establishment of international collaborative network. The network will provide detailed observations on the condition and attributes of ship hull management systems on arrival in dry dock. These observations will be assessed against preventative management practices and vessel operational profiles.

Vessel biofouling risk profiling

The objective of this operational research project is to test and validate vessel biofouling risk factors in an operational context. Field surveys of international commercial vessels arriving in New Zealand are expected to begin in late 2015, with project completion by late 2017.

Testing in-water cleaning technology for fouled vessels

There is now a growing acceptance that regular hull maintenance, including in-water cleaning to prevent the development of mature biofouling, may create a smaller biosecurity risk than no management of biofouling on vessels between dry-dockings. This project aims to develop standard testing requirements for in-water cleaning systems. These standards are needed to ensure that the cleaning method effectively removes the biofouling while preventing further biosecurity risks caused by releasing non-native organisms into the marine environment.

Efficacy of settlement arrays for marine pest surveillance

The Marine High Risk Site Surveillance programme uses a range of methods to detect non-native species at designated locations around New Zealand. Settlement arrays (surfaces optimised for non-native marine species) will enhance our marine biosecurity surveillance system. This research is seeking to identify systems that are simple, effective, timely and cost-effective.

Animal imports

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

Some IHSs require that the animal or animal product is accompanied by a current import permit, to assist with clearance at the border. AIT is also responsible for issuing these permits, and 2 860 of them were issued in 2014 (**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 2014 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 2014:

Beef

Following the acceptance of Japan and USA's freedom from bovine spongiform encephalopathy by the World Organisation for Animal Health (OIE) Terrestrial Animal Health Code, IHSs relating to bovine meat and meat products were amended. The USA and Japan no longer have to certify the absence of specific risk materials (SRMs) in bovine products. The Japan bovine meat and meat products IHS was amended along with five USA IHSs containing beef or beef by-products.

Bee products

On 30 January MPI suspended imports of products containing more than 50 percent liquid honey. On 20 February MPI clarified that honey to be used for medical purposes (e.g., on bandages) would be allowed with a manufacturer's declaration of irradiation at 15 kGy.

During 2014 MPI made a number of decisions relating to bee-product IHSs, including the incorporation of all equivalence decisions and border feedback since 2006. This allows importation of low-risk bee products with manufacturer's declarations, instead of requiring permits. It also clarifies the requirement that untreated bee products need permits stating which Transitional Facility they will be sent to.

A separate decision resulted in the IHS for bee products from Australia being revoked on 4 November 2014. On 18 December personal consignments of bee products were moved into the IHS for specified foods for human consumption containing animal products (known by its code name ediproic.all). Bee product imports were discontinued from Tonga, Tuvalu and the Solomon Islands.

Biological products

Imported high-risk biological products need to go into an MPI-approved Transitional or Containment Facility. These products and samples can only be opened in a facility that meets the Standard for Transitional Facilities for Biological Products. On 21 February an urgent amendment was made to the standard to align the definition of "biological products" with the associated IHS and with the Standard for Facilities for Microorganisms and Cell Cultures: 2007a.

Low-risk farm animals

Imported low-risk farm animals, including horses from certain countries, need to complete post-arrival quarantine in a facility that meets the Standard for Low Security Farm Animal Transitional Facilities. On 17 April a minor amendment was made to the facility standard to include dispensations that had previously been given, to reflect current practice at the facilities and to update the wording of some sections to

Table 1: Number of import permits issued by Animal Imports Team, 2014

Category	Product type	Number
Animal product	Animal feed	16
	Animal product	120
	Bee	37
	Dairy	5
	Dairy/meat samples	1
	Egg	27
	Equine	1
	Fibre	16
	Fish	8
	Hides/skins	8
	Meat	11
	Meat/dairy/poultry/fish	1
	Porcine	17
	Poultry	1
	Semen extender	4
	Wool	4
	Total	**277**
Biologicals	Biologicals – general	426
	Biologicals – restricted	221
	Organisms	3
	Total	**650**
Embryos	Bovidae	20
	Laboratory animals	1
	Ovine	1
	Total	**22**
Live animals	Butterfly	3
	Camelid	12
	Caprine	3
	Dog/cat	101
	Dog/cat – quarantine	1 354
	Equine	32
	Fish	15
	Hatching eggs	11
	Insect	5
	Invertebrate	58
	Laboratory animals	39
	Marine invertebrates	11
	Ovine	11
	Rabbit	5
	Spider	2
	Zoological	38
	Total	**1 700**
Semen	Bovine	103
	Canine	2
	Caprine	1
	Equine	11
	Ovine	13
	Porcine	2
	Zoological	6
	Total	**138**
Transit	All	73
	Total permits issued	**2 860**

Table 2: Live animal and germplasm imports by species in 2014

Species	Adult/juvenile	Egg	Embryo	Larvae	Pupae	Semen
Alpaca	97					
Aquatic	678	15				
Avian		51 532				
Bovine			650			361 904
Caprine	7					
Cat	1 665					
Circus/zoo	26					
Dog	3 447					836
Donkey	1					
Equine	1 405					10 928
Fish	34 314		601			
Gastropod	4					
Invertebrate	1 201 865			31		
Laboratory animal	1 283				30	
Lepidoptera	206				127 827	
Mouse	1 527					
Ovine	53		15			5 911
Porcine						6 240
Rabbit	7					
Rat	127					
Reptile	7					
Spider	102					
Unknown	353			1	80	1
Total	**1 247 174**	**51 547**	**1 266**	**32**	**127 937**	**385 820**

better reflect MPI's intent and facilitate interpretation.

Pork and pork products

On 10 April 2014 porcine blood was removed from the IHSs for spray-dried blood from Canada and the USA, owing to outbreaks of porcine respiratory and reproductive syndrome. The amendment included the addition of a post-clearance condition for spray-dried porcine plasma and a directive to border staff that only spray-dried blood to be processed into cat food and lard for human consumption can be cleared; all other products must be sent to a Transitional Facility.

Horses

The IHS for horses was amended on 22 May 2014, to align with the Code recommendations. The changes included aligning requirements for equine viral arteritis and contagious equine metritis with the Code, and removing requirements for West Nile virus.

Veterinary certificates under this IHS were subsequently negotiated with Hong Kong, Singapore and Australia. As new veterinary certificates come into use, the IHSs they replace will be revoked.

Bovine semen and embryos

All current trading partners' veterinary certificates under the IHSs for bovine embryos and semen were negotiated. The new veterinary certificates were brought into use and the IHSs they replaced were revoked.

Duck meat and duck meat products

This new IHS, issued on 4 July 2014, allows the importation of duck meat and duck meat product from countries that meet the requirements of the IHS. Currently there are no countries approved under this IHS.

Specified foods for human consumption containing animal products

The IHS (ediproic.all) was amended on 19 August 2014, for the first time since 2010. The changes relate to personal consignments that are commercially prepared, packaged and unopened. Norway and Switzerland were added as countries that can import personal consignments of fresh meat, and meat products and pork are now allowed from Finland and Sweden. Further changes were made regarding commercial consignments, composite products and bee products, and minor amendments were made in response to quality improvement suggestions from border staff.

Tropical butterflies and pupae

The IHS for tropical butterflies and pupae was amended on 15 September 2014 to incorporate Environment Protection Agency decisions regarding species eligible for importation and controls.

Animal fibre

The IHS for animal fibre was issued on 25 September 2014. It combines 16 IHSs that importers continued to use until revoked on 25 January 2015.

Cats and dogs

The IHS and the guidance document (GD) were re-formatted as per MPI's Requirements and Guidance Programme. The GD was updated in November 2014 to reflect the nationwide implementation of post-arrival inspection and document verification by MPI veterinarians as of 1 December 2014.

Poultry hatching eggs and specific-pathogen-free chicken eggs

The IHS was amended three times in 2014. The amendments included adding alternative testing options for Newcastle disease virus and avian influenza virus, updating the testing options to give guidance on sample sizes and requiring the diagnostic tests used to be listed in the MPI Standard for Approved Diagnostic Tests, Vaccines, Treatments and Post-arrival Testing Laboratories (MPI-STD-TVTL) rather than listed in the IHS. The post-arrival testing requirements were amended to bring the sample sizes in line with those required for pre-export testing, and to include

tests listed in MPI-STD-TVTL. The terminology for avian influenza was updated in line with changes to the Code. New veterinary certificates under this IHS were negotiated and finalised with the UK and Canada. As new veterinary certificates are brought into use, the IHSs they replaced will be revoked.

Exports of live animals and germplasm

The major live animal and animal germplasm exports and their destinations in 2014 are presented in **Table 3.** **Table 4** compares volumes of live animal and germplasm exports by commodity since 2007. There were significant increases in cattle exports to China.

Export certificates issued

During 2014 there were 32 notices containing export requirements and the corresponding export certificate templates were determined and notified under the Animal Products Act 1999.

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

Animal Imports Team
Animal and Animal Products Directorate
Ministry for Primary Industries
animalimports@mpi.govt.nz

Animals and Aquatic Risk Analysis Team
Biosecurity Science, Food Science and Risk Assessment Directorate
Ministry for Primary Industries
risk.analysis@mpi.govt.nz

Table 3: Volume of live animal and germplasm exports to various regions in 2014

	Africa	Asia	Australia	Canada	Central & South America	Europe	Middle East	Other	Pacific Islands	United States	Total
Bee packages				38 444							38 444
Bees, queen & bumble				3 947		1 725					5 672
Bovine embryos	6		117		78	267				68	536
Bovine semen	209 161	12 014	233 358	9 341	523 875	505 184				103 627	1 596 560
Canine semen			416			4					420
Caprine embryos					3						3
Caprine semen		500	766								1266
Cats & dogs	17	287	2 793	115	14	622	22	45	97	266	4 278
Cervine embryos				108							108
Cervine semen			41	150						625	816
Equine semen			3 032								3 032
Live alpacas & llamas		55	2			143					200
Live cattle		85 730							2		85 732
Live goats		12							23		35
Live horses	4	683	1 797			86	16		13	23	2 622
Live sheep		51	28		24	77	900		2		1 082
Other		1	36			2			10	148	197
Other birds		192	3	50	12					1	258
Ovine embryos			1 754		82						1 836
Ovine semen		500	4 110		908						5 518
Poultry (day-old chicks)		739 966							949 117	11 400	1 700 483
Poultry (hatching eggs)		526 680					92 340		2 376 735	40 320	3 036 075
Zoo animals		2	15			18					35

Table 4: Comparison of live animal and germplasm exports from 2007 to 2014

	2014	2013	2012	2011	2010	2009	2008	2007
Bees (packages (kg), queen & bumble)	44 116	36 737	8 776	37 180	37 523	34 621	27 435	20 387
Bovine embryos	536	850	1 801	950	943	1 077	915	574
Bovine semen	1 596 560	1 573 105	1 160 455	1 085 082	1 073 877	1 237 044	785 939	716 865
Canine semen	420	9	41	12	166	56	48	3
Cats & dogs	4 278	5 980	6 151	5 873	4 247	3 999	5 051	4 797
Cervine semen	816	325	220	275	2 590	3 001	1 833	390
Equine semen	3 032	3 265	3 324	2 362	2 670	5 195	4 214	3 903
Ferrets	0	0	374	760	825	1 397	1 801	2 660
Live alpacas & llamas	200	156	456	404	198	375	353	123
Live cattle	85 732	36 573	39 636	30 499	16 150	12 847	17 075	25 909
Live deer	0	0	65	31	15	46	115	159
Live goats	35	0	0	979	58	190	6	349
Live horses	2 622	2 853	2 886	3 308	2 292	2 469	2 512	2 562
Live sheep	1 082	380	421	177	307	124	118	34 894
Ovine embryos	1 836	1 737	0	320	114	230	1 652	3 751
Ovine semen	5 518	1 877	7 271	11 819	4 954	10 374	19 921	12 365
Poultry (day-old chicks)	1 700 483	1 270 703	1 136 530	1 342 542	1 324 543	1 098 192	854 678	867 573
Poultry (hatching eggs)	3 036 075	2 536 565	2 365 466	3 173 403	5 185 128	3 860 755	5 275 056	7 471 678

Animal Health Laboratory

The Animal Health Laboratory (AHL) is New Zealand's national veterinary laboratory for diagnostic testing for exotic and emerging terrestrial and aquatic animal diseases to support biosecurity surveillance and response, and trade.

The AHL team includes scientists and technicians with specialist knowledge and experience of a range of different pathogens, such as avian influenza, transmissible spongiform encephalopathies (TSE), aquatic animal pathogens, anthrax, foot-and-mouth disease (FMD) and arboviruses. There is also specialist capability in molecular biology and bioinformatics. The scientific bench work is supported by expertise in biosafety, quality assurance and microbiological security. 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 through IANZ by operating to AS/NZS 2243.3 and ISO/IEC 17025.

We operate and maintain a variety of specialist resources including:

- an enhanced physical containment level three laboratory for work with exotic organisms and exotic disease investigation samples;
- molecular diagnostics capability including real-time PCR and Next Generation sequencing of whole genomes;
- classical virology and bacteriology techniques used to culture and identify unknown and new viruses and bacteria; and
- equipment and procedures for the safe handling and examination of zoonoses.

During 2014 we moved our PC2 laboratories including Cell Culture, Virology, Immunology, Bacteriology, Aquatic Animal Diseases and Molecular and Laboratory Services, together with staff offices, to temporary facilities on the same site for a period of three to four years during demolition of the PC2 laboratories and construction of our new high-biocontainment laboratory.

National Biocontainment Laboratory Project

The National Biocontainment Laboratory Project (NBLP) was established in 2012 to replace the existing high-level containment laboratory at MPI's Wallaceville site. The existing laboratory opened in 1999. While it meets current containment and biosafety standards, it is nearing the end of its intended lifespan. The lab has an excellent safety record but its age means it is increasingly expensive and time-consuming to maintain. In addition it would not cope with the extra pressures of a major animal disease outbreak.

Benefits of the project include ensuring that NZ maintains its capability for safe diagnosis and response to high-impact animal diseases, and the confidence of its trading partners. The laboratory will provide sufficient facilities to safely manage a major exotic disease event such as a FMD outbreak. Safely and rapidly confirming the presence or absence of an exotic disease through diagnostic tests will help limit its impact on animal health and the economy. The new facility will also increase our capability to support NZ's growing primary industries and international trade, by continuing to provide routine surveillance testing to give our trading partners confidence in NZ's freedom from serious diseases.

Another focus of the project is to collaborate with the Ministry of Health and ESR to allow the ongoing use of these specialist facilities for diagnosis of suspect cases of high-risk diseases affecting people.

This major investment in core biosecurity capability will enable the continuation of essential work supporting identification of risk organisms at the border, surveillance, investigation of suspect cases and emergency response to incursions. Further details are in the Editorial, page 3.

Supporting surveillance programmes

AHL supports a number of MPI surveillance programmes through laboratory testing to confirm the continuing absence of specific pathogens such as TSE and arboviruses, to annually sample wild ducks to monitor for the presence of avian influenzas and subtypes that could pose a risk to commercial poultry industries, and to support the continuing *Theileria* response.

Avian influenza

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. In 2014, cloacal and oropharyngeal swabs were collected from 880 healthy resident wild mallard ducks from various locations across NZ. Individual bird samples were tested by the influenza A real-time RT-PCR TaqMan. Positive or suspect samples were then tested using real-time H5 and H7 RT/PCR TaqMan and conventional H5, H7 RT-PCRs. No highly-pathogenic strains of avian influenza were detected. For a full report see p. 20.

Theileria

Ongoing work throughout 2014 helped research and surveillance activities supporting the *Theileria orientalis* Ikeda response. This resulted in the implementation of a multiplex qPCR assay to measure the quantities of Ikeda, Chitose and Buffeli genotypes in bovine blood. Measurements of parasitaemia in red blood cells produced by blood smear were compared with qPCR data. In a therapeutic study, qPCR was used to measure the load of Ikeda genome in bovine blood from animals treated therapeutically with buparvaquone or Imidazole, compared to controls. The studies were presented at a workshop on the 2012–2013 epidemic, held at Massey University in March, and a number of manuscripts have been written for a special edition of the *New Zealand Veterinary Journal*. The DNA sequences obtained have been submitted

to GenBank® from NZ isolates of Chitose, Ikeda and Buffeli major piroplasm surface protein genes, significantly adding to knowledge about these parasites.

Transmissible spongioform encephalopathy (TSE)

The MPI TSE Surveillance Programme focuses on scrapie, chronic wasting disease of deer and bovine spongiform encephalopathy. These are incentivised targeted passive surveillance programmes. A total of 690 samples were tested from cattle, sheep, goats and deer using either the IDEXX BSE scrapie or TSE ELISA tests. No TSE was detected. For a full report, see p. 26.

Arbovirus

The current Arbovirus Surveillance Programme was established in 1991. This year, 298 animals tested negative for bluetongue virus, epizootic haemorrhagic disease virus and Akabane virus. For a full report, see p. 28.

Facilitating trade

One of the core functions of the AHL is diagnostic testing to facilitate and support export and import trade, including our aquaculture, dairy, beef, lamb and bloodstock industries. The AHL also supports trade by performing diagnostic tests to support veterinary exotic disease investigations and responses, and for surveillance programmes. Importantly, our testing serves as a resource for passive surveillance, providing continued assurance to our trading partners in support of our claims of freedom from specific unwanted or notifiable diseases. **Table 1** summarises the numbers and types of tests performed by the AHL in 2014.

As the national veterinary reference laboratory, the AHL performs many tests unavailable elsewhere in NZ, often because they require specialist 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 more than 26 000 diagnostic tests performed at the AHL in 2014 either directly or indirectly facilitated trade of products (**Table 1**). This figure includes more than 6 500 cost-recovered tests that were undertaken to support trade.

The AHL frequently performs testing to support various NZ primary industries. We also help zoos and wildlife parks by testing unusual or novelty animal species to enable either import or export of these animals.

More than 3 000 tests to rule out the presence of exotic or notifiable animal diseases were performed by the AHL in 2014. These also helped secure the continued trade in animals and animal products.

Table 1: Summary of test numbers and decription of work conducted by AHL, 2014.

Purpose of testing	Number of tests performed / Accessions managed	Description of work
Exotic disease investigations	3 145 / 186	Tests to rule out the presence of exotic pathogens Fish pathology Identification of reptiles and amphibians that cross our borders.
Cost-recovery diagnostics	1 109 / 121	Cost-recovered diagnostic testing and project work, much of which uses capability not available elsewhere
Surveillance projects (Crown-funded)	12 613 / 131	Includes TSE, arbovirus and avian influenza surveillance.
Import/export/trade (cost recovery)	6 523 / 653	Import and export testing to maintain overseas trade in primary produce Trade in companion animals and animal travel oversea (e.g., racehorses) Quality assurance reference testing for industry partners
Artificial breeding (AB)	317 / 101	Tests for *Brucella abortus*, infectious bovine rhinotracheitis, bovine viral diarrhoea type 2 and leptospirosis
Quality assurance	2 451 / 251	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.

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 senior 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 NZ, in which case the AHL subcontracts the work overseas to suitably accredited reference laboratories.

As shown in **Table 1**, the AHL processed more than 26 000 tests in the 2014 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.

A number of new diagnostic tests were implemented across the laboratory to enhance our diagnostic capability for exotic animal disease. The majority of these were for aquatic and parasitic diseases.

High throughput capability was further enhanced through the purchase of an additional real-time PCR machine and the purchase of another high-throughput nucleic acid extractor.

Supporting incursion investigations

The following examples highlight the diversity of laboratory testing undertaken during 2014.

Insect pathogens

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

Suspect IAPV in wasps and ants was investigated after a university research laboratory tested Argentine ant colonies from several locations and presumptively found IAPV using an in-house-designed PCR. A test validation process was initiated as the suspect test results required validation and review of the methodology. Testing by AHL with a different PCR using different primers did not find IAPV in fresh ant samples, but did find the closely related Kashmir bee virus and deformed wing virus. This is consistent with published findings about ants and the fact that both of these viruses are known to be present in NZ bees.

Avian

Commercial and backyard chickens with clinical signs of respiratory disease provided a regular flow of investigations. Testing for the exotic diseases avian influenza, avian paramyxovirus, avian pneumovirus and *Ornithobacterium rhinotracheale* was performed at AHL and all tests were negative.

Mycobacterium avium hominissuis was identified in a lorikeet from a public aviary, which was unusual. This bacterium is primarily a pathogen of pigs and humans, and is thought to be acquired from the soil.

In a collaborative investigation between MPI, DOC and the Yellow-eyed Penguin Trust, diphtheritic stomatitis was identified in yellow-eyed penguin. This resulted in media interest and a TV One News segment about the investigation.

Aquatic

The wide range of wild and farmed freshwater and marine foods produced by the NZ seafood industry also led to an increasing number of biosecurity investigations and responses. Notably, a biosecurity response using culture, histology and PCR was initiated after the protozoan parasite *Perkinsus olseni* was found in farmed paua (*Haliotis iris*). *P. olseni* was also found in green-lipped mussels (*Perna canaliculus*) during routine monitoring, and also resulted in a biosecurity response. *P. olseni* had not been reported from these species before, but is broadly distributed in four NZ bivalves – cockles, *Austrovenus stutchburyi*; wedge shells, *Macomona liliana*; ark shells, *Barbatia novaezealandiae*; and pipis, *Paphies australis*.

During routine export testing of salmon, the AHL isolated *Carnobacterium piscicola*, an environmental bacterium, some strains of which have been reported to cause disease. This organism has not previously been reported from live fish in NZ. We concluded that *C. piscicola* is a non-pathogenic species that is part of the normal flora in NZ fish. This finding is supported by the fact that no mortalities were reported in association with this species.

Bovine

Work continues to support the response to *Theileria* outbreaks. A total of 387 farms now have confirmed *T. orientalis* (Ikeda), out of 443 from which samples yielding clinical *Theileria* were submitted for testing. The AHL was able to share its protocols developed for Ikeda PCR screening, with Gribbles and NZVP.

An investigation of sick calves on a farm repeatedly failed to isolate *Pasteurella multocida* or *P. histophilus* but PCR tests revealed that *Chlamydophila pecorum* was involved. Strains of *C. pecorum* cause numerous diseases in cattle, including sporadic bovine encephalomyelitis, polyarthritis, pneumonia, enteritis, vaginitis and endometritis.

A serum test required for export of bovine semen returned a positive titre for *Leptospira* Canicola. The bull in question had no history of travel outside of NZ, and had been vaccinated frequently for leptospirosis. The original MAT gave a low positive for *L.* Canicola, which was the only serovar initially tested for. Subsequently, serum was tested for several other *Leptospira* serovars, and was highest for *L.* Grippotyphosa and *L.* Mozdok (both 1:1 600), and *L.* Pomona (1:800). This pattern was thought to be consistent with high-intensity vaccination for several *Leptospira* serovars. *L.* Grippotyphosa and *L.* Mozdok are not present in New Zealand, but the former is commonly used in vaccines, and Mozdok is known to react with Pomona. Hence exotic disease was ruled out.

Tests were performed on samples from a calf with conjunctivitis. Tests included culture for *Moraxella bovis*, PCR for generic mycoplasmal material, and a specific PCR to rule out *Mycoplasma bovis*, an exotic pathogen. Testing for *Mycoplasma bovis* was negative. Sequencing of the product of the generic PCR reaction resulted in a mixed signal. Mycoplasmal cultures yielded *Mycoplasma bovoculi,* which was isolated and sequenced from two animals. This pathogen has previously been isolated in NZ during exotic disease investigations, and is known to have a synergistic relationship with *Moraxella bovis* in causing conjunctivitis (including keratoconjunctivitis in cattle). *Moraxella bovis* and *Mycoplasma bovoculi* are endemic in NZ.

Canine

A dog imported from Singapore became acutely ill in quarantine, with clinical signs including tachycardia, pallor, dyspnoea and hypothermia, and was infested with ticks when imported. The ticks were identified as *Rhipicephalus sanguineus* (brown dog ticks), which are

important vectors of disease, including *Babesia gibsoni*, *Theileria* spp., *Borrelia burgdorferii* (the agent of Lyme disease), *Anaplasma* spp., and *Ehrlichia* spp. Laboratory tests were negative for all tick-borne agents, including serology (IFAT) for *Babesia canis*, *B. gibsoni*, and *Ehrlichia canis*, and PCR (antigen detection) for *Anaplasma phagocytophilum*, *Babesia* spp., *Borrelia* spp. and *Ehrlichia* spp.

An MPI scientist contacted investigators after pre-export testing of a neutered adult female dog showed a weak positive reaction to *Leptospira* Canicola. The dog's vaccination history suggested that the most likely cause was recent vaccination for *L.* Icterohaemorrhagiae, following previous vaccination a year prior with a 4-in-1 *Leptospira* vaccine that probably included Canicola.

Equine

Neurological signs in horses were the focus of a major investigation during 2014. This originated with an outbreak of equine herpesvirus type 1 (EHV-1) equine herpesvirus myeloencephalitis (EHM) on a stud, and resulted in a biosecurity response. The outbreak was confined to a single property. A total of 15 clinical cases occurred in a group of about 290 at-risk animals over a 33-day period, during which seven affected horses were euthanased. AHL testing included virus isolation, serology and PCR, and the latter identified a neuropathogenic strain of EHV-1. This case alerted horse owners and vets to the clinical signs and resulted in numerous investigations of horses with neurological signs. None of these cases proved to be EHM, although EHV-1 and EHV-4 were sometimes present, and testing for some exotic diseases was also done to exclude other infectious agents such as West Nile virus and equine influenza.

Anaemia in a foal was investigated in a case where exotic causes could have included equine viral arteritis and equine infectious anaemia. Testing was negative for these viruses. In this case, symptoms were more indicative of a high worm burden with the roundworm *Parascaris equorum*, and parasitism was considered the most likely cause of the anaemia.

Ovine

Notable sheep investigations included malignant catarrhal fever (MCF)-like vasculitis in lambs. MCF is a widespread endemic disease caused by ovine herpesvirus-2 (OVH-2). Exotic causes of vasculitis and arteritis in ruminants include orbiviral diseases such as bluetongue and epizootic haemorrhagic disease. The exotic differentials bluetongue and enzootic haemorrhagic disease were excluded by negative tests of serum samples from flockmates. Flockmates were tested for the presence of OVH-2 and nine of 17 lambs were positive by PCR. MCF is a disease of cattle. Sheep are the host species of OHV-2, with high rates of infection but no clinical disease.

Caprine

A blood smear test on a goat with severe anaemia yielded red blood cell inclusions resembling parasites. There had been a previous report of *Eperythrozoon ovis* (now *Mycoplasma ovis*) in NZ sheep. This species can also pass to goats through transfer of blood. Blood samples from 11 affected goats were tested by conventional PCR and two were positive.

Young goat kids with severe fibrinous pleuropneumonia were investigated. The disease resembled contagious caprine pleuropneumonia (CCP), an exotic bacterial disease of goats caused by *Mycoplasma capricolum* ssp. *capripneumoniae*. Possible endemic causes included bacteria such as *Mannheimia haemolytica*, *Histophilus somni* and *Pasteurella multocida*. CCP was ruled out by PCR and culture. Culture of lung, pleural fluid and liver was positive for *M. haemolytica,* which is known to cause sporadic cases and small outbreaks of acute pleuropneumonia in goat kids.

Cervine

An unusual presentation of coccidial enteritis in one of 80 farmed deer was investigated. Histological examination showed that the coccidial stages were mostly present within the nuclei of affected enterocytes, rather than in the cytoplasm as is usual. Electron microscopy confirmed that an intranuclear Apicomplexan was present, with visible stages including macrogamonts, microgametes and merozoites. Sequenced PCR products gave 99 percent homology with *Cyclospora* sp. Guangzhou. Infection with this agent has been reported in two cattle from Japan, with a similar presentation of intestinal intranuclear coccidiosis. *Cyclospora* is a genus of the Eimeriidae family of coccidia, and with modern molecular techniques a greater diversity of *Cyclospora* organisms are being characterised. The present case represents the first known case of infection in deer, and the first known infection of *Cyclospora* in a NZ ruminant.

Porcine

Adults, juvenile pigs and neonates affected with scours and coughing were investigated to rule out porcine reproductive respiratory syndrome virus and porcine epidemic diarrhoea virus. Tests were negative for these exotic pathogens, and suggested that porcine circovirus, endemic bacterial pneumonia pathogens and parasitism may all have been contributing to the syndrome.

Exotic and zoo animals

An AHL scientist identified an alpaca that had tested positive in a cELISA for *Brucella* during export testing and an investigation was initiated. The seven-month-old female alpaca had been tested along with 11 others as part of routine pre-export testing. All animals were born on the same farm in NZ, and there were no significant health issues. The other animals had tested negative in the *Brucella* ELISA. The cELISA was positive at the repeat sampling. A Western Blot assay for *Brucella abortus*, *B. mellitensis* and *Yersinia* gave negative results for *Brucella* but developed a band consistent with *Yersinia enterocolitica*. The whole-blood sample was negative by PCR for *Brucella* spp but *Y. enterocolitica* serotype 0:9 was cultured from the faeces. This

enabled us to conclude that *Yersinia* was the likely cause of the serum reactors identified in the cELISA assay. *Yersinia* Serotype 0:9 shares common antigens with *Brucella* spp., and is well recognised as a cause of false positive cross-reactions in serological tests.

An investigation was carried out into fungal dermatitis in an adult female tuatara with skin lesions that resembled the signs of *Paranannizziopsis australiensis* (PA), formerly known as CANV (Chrysosporium anamorph of *Nannizziopsis vriesii*). PCR confirmed the presence of *P. australiensis*. This agent is unique to Australasia and has been associated with fungal dermatitis in captive tuatara. Previously in NZ it had only been identified in a single captive facility, and it has never been found in wild tuatara. This is the second known captive facility to have tuatara with PA.

Exotic disease preparedness

The AHL needs to be able to rapidly and accurately test for potential exotic animal diseases of animals in NZ, and has made further preparations for investigations and responses. Significant effort continues in advancing preparedness for FMD and other exotic diseases, including:

- participation in international laboratory proficiency testing;
- training of an AHL scientist in FMD diagnostics at the World Reference Laboratory for FMD in Pirbright, UK;
- training of external scientists from the New Zealand Veterinary Laboratory Network in FMD diagnostic testing;
- completion of the FMD in deer project, which determined the best diagnostic assays to test for FMD in red deer;
- development of NGS, with work to improve the IT infrastructure needed to analyse the data generated by this technology;
- introduction of new molecular tests for European foulbrood disease, *Burkholderia mallei* (Glanders) and *Coxiella burnetii* (Q fever);
- new molecular tests for *Anaplasma phagocytophilum*, Piroplasmas and small ruminant lentiviruses; and
- new molecular tests including orthopoxvirus conventional PCR, herpesvirus generic nested conventional PCR, porcine respiratory and reproductive syndrome TaqMan, porcine epidemic diarrhoea coronavirus TaqMan PCR, transmissible gastroentertitis coronavirus TaqMan PCR, equine coronavirus TaqMan PCR, equine viral arteritis real-time PCR, avipox real-time PCR, parapoxvirus and orthopoxvirus conventional PCR, sacbrood virus (bees) PCR, bovine papillomavirus conventional PCR, *Theileria orientalis* multiplex Taqman PCR, *T. orientalis* Chitose TaqMan and *T. orientalis* Buffeli TaqMan.

National and international connections

National and international connections are essential for the laboratory to maintain its diagnostic capability. Staff enhance their own skills and maintain networks with colleagues upon whom they can call for advice and assistance.

The NZ Veterinary Laboratory Network meeting was held at the Ministry for Primary Industries Wallaceville campus in September. The meeting was attended by representatives from AsureQuality, Gribbles, Hopkirk Research Institute at Massey University, Livestock Improvement Corporation, New Zealand Veterinary Pathology, Poultry Vet Services, Tegel Ltd, and MPI. Topics presented at this meeting included members' reports, the *Sub-Committee on Animal Health Laboratory Standards* meeting, the National Biocontainment Laboratory project, FMD preparedness and testing and validation of commercial kits. MPI representatives also provided information on the Export Laboratory Programme and Containment and Transitional Facilities expectations.

In March 2014, staff from AHL attended a Massey University symposium on the 2012–2013 *Theileria orientalis* (Ikeda) epidemic, organised by the Epicentre, Massey University. AHL staff met with veterinarians to discuss research conducted by MPI and Massey during the epidemic.

During 2014 Richard Spence visited colleagues at the World Reference Laboratory, Pirbright, UK, and undertook FMD diagnostics training.

In September 2014 AHL staff attended a mini-symposium on infectious disease research at Massey University's Wellington campus. This meeting covered many aspects of epidemiology, infection and immunity to a multitude of animal and human pathogens in New Zealand.

AHL scientific staff also presented to the Australian Association for Veterinary Laboratory Diagnostics in Adelaide in November 2014. This was an opportunity to share test expertise and capability with animal health laboratory staff from throughout Australasia.

AHL experts also represented NZ on the following multinational animal disease working groups:

- the sub-committee on Aquatic Animal Health Standards (Brian Jones);
- the sub-committee on Animal Health Laboratory Standards (an Australian and NZ 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);
- the 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); and
- Global Foot-and-Mouth Disease Research Alliance – international

collaboration working towards control and eradication of FMD (Richard Spence)

Staff publications in scientific and technical journals

Kittelberger R, McIntyre L, Watts J, MacDiarmid S, Hannah MJ, Jenner J, Bueno R, Swainsbury R, Lengeveld JPM, van Keulen LJM, van Zijderveld FG, Wemheuer WM, Richt JA, Sorensen SJ, Pigott CJ, O'Keefe JS (2014). Evaluation of two commercial rapid ELISA kits testing for scrapie in retro-pharyngeal lymph nodes in sheep. *New Zealand Veterinary Journal* 62(6), 123

Kittelberger R, Nfon C, Clough R, McFadden A, Zhang Z, Spence R, Alexandersen S (2014). Establishing critical diagnostic capability for FMD in deer. Global Foot-and-Mouth Disease Research Alliance Newsletter 3, 8.

McFadden AMJ, Tham KM, Stevenson M, Goodwin M, Pharo H, Taylor B, Munro G, Owen K, Peacock L, Stanislawek WL, Stone M (2014). Israeli acute paralysis virus not detected in *Apis mellifera* in New Zealand in a national survey. *Journal of Apicultural Research* 53(5), 520–527.

Nolan D, Stephens F, Crockford M, Jones JB, Snow M (2014). Detection and characterisation of viruses of the genus Megalocytivirus in ornamental fish imported into an Australian border quarantine premises: an emerging risk to national biosecurity. *Journal of Fish Diseases* 38(2), 187–195.

Peacock L, Kittelberger R (2014). Arbovirus surveillance programme. *Surveillance* 41(3), 31–32.

Vink D, Kittelberger R (2014). Transmissible spongiform encephalopathies (TSE) surveillance programme. *Surveillance* 41(3), 29–30.

Stanislawek WL, van Andel M (2014). Avian influenza surveillance programme. *Surveillance* 41(3), 22–23.

Wendy McDonald
Animal Health Laboratory Manager (Acting)
Animal Health Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
wendy.mcdonald@mpi.govt.nz

Table 2: Staffing and structure

Director, Investigation and Diagnostic Centres and Response:	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 Advisor:	Brian Jones
Fisheries Forensic Analysts:	Graeme Bremner (0.6 FTE)
Scientists:	Jenny Draper, Hye Jeong Ha, Cara Brosnahan, Sharon Humphrey, Milica Ciric
Technical staff:	Taryrn Haydon, Katy Booth, Henry Lane (0.4 FTE), Mary Ann Tuboltsev
Immunology	
Manager:	Richard Spence
Immunology Principal Adviser:	Vacancy
Scientists:	Rick Clough, Rudolfo Bueno, Richard Swainsbury
Technical staff:	Michaela Hannah, Manvi Yadav, 1x vacancy
Technical Resource Coordinator:	Judy Jenner
Biosafety Officer	Kanishka Fernando
Virology	
Manager:	Grant Munro
Scientists:	Wlodek Stanislawek, David Pulford, Edna Gias, Della Orr
Technical staff:	Mike Hansen, Ickel Marie Bueno, Smritri Nair, Sylvia Ohneiser, Maree Joyce, Vacancy
Technical assistants:	Barbara Black, Mary Mewett
Containment Laboratory	
Supervisor:	Bryan Schroeder
Quality Assurance	
Adviser:	Irina Bolotovski

Animal Health Surveillance

The following tables present animal health data collected by MPI from various sources during 2014.

Table 1 is a summary of the numbers of laboratory submissions from sick farmed animals, 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 from the salmon surveillance programme run annually in approved establishments for the export of salmon for human consumption to Australia. Testing is conducted by the Animal Health Laboratory, 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 2009–2014 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 2014 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 pathology laboratories during 2014

Cattle	
Total sick animal cases	**21 038**
Abnormalities of reproductive system	**327**
Neospora caninum	11
C. fetus ssp. *venerealis*	0
Pestivirus infection	4
Abortion	**808**
Neospora caninum	230
Mycotic abortion	25
Pestivirus infection	13
Leptospira spp.	11
Congenital defects	**10**
Ill thrift/diarrhoea	**12 058**
Pestivirus infection	302
Gastrointestinal parasitism	457
Johne's disease – suspicious and confirmed	2 627
Trace element deficiency	415
Yersinia spp.	616
Rotavirus	429
Nervous signs	**505**
Listeria monocytogenes	3
Hepatic encephalopathy	0
Metabolic disease	63
Malignant catarrhal fever	6
Polioencephalomalacia	14
Histophilus somnus	0
Sudden death	**1 288**
Clostridium spp.	5
Respiratory disease	**768**
Sheep	
Total sick animal cases	**1 585**
Abnormalities of reproductive system	**193**
Brucella ovis	13
Abortion	**315**
Campylobacter fetus spp. *fetus*	34
Other Camplyobacter spp.	7
Toxoplasma gondii	30
Salmonella Brandenburg	49
Congenital defects	**3**
Ill thrift/diarrhoea	**827**
Johne's disease	32
Trace element deficiency	38
Gastrointestinal parasitism	145
Nervous signs	**74**
Listeria monocytogenes	8
Polioencephalomalacia	1
Clostridium spp	1
Respiratory disease	**64**
Sudden death	**384**
Gastrointestinal parasitism	53
Farmed deer	
Total sick animal cases	**174**
Abortion	**1**
Congenital defects	**0**
Ill thrift/diarrhoea	**111**
Johne's disease	4
Trace element deficiency	10
Yersinia spp.	6
Nervous signs	**11**
Malignant catarrhal fever	0
Sudden death	**52**
Gastrointestinal parasitism	5
Malignant catarrhal fever	1
Horses	
Total sick animal cases	**6 246**
Abortion	**60**
S. zooepidemicus	2
Circulatory disease	**195**
Ill thrift/diarrhoea	**995**
Gastrointestinal parasitism	70
Nervous signs	**140**
Respiratory disease	**531**
Streptococcal infection	44
Sudden death	**17**
Pigs	
Total sick animal cases	**55**
Abortion	**2**
Ill thrift/diarrhoea	**16**
Nervous signs	**1**
Sudden death	**17**
Goats	
Total sick animal cases	**417**
Abortion	**5**
Ill thrift/diarrhoea	**175**
Gastrointestinal parasitism	66
Respiratory disease	**9**
Nervous signs	**12**
Listeria monocytogenes	1
Caprine arthritis encephalitis	1
Sudden death	**29**
Clostridium perfringens D (enterotoxaemia)	0
Gastrointestinal parasitism	8
Lamoids	
Total sick animal cases	**305**
Abortion	**6**
Ill thrift/diarrhoea	**110**
Gastrointestinal parasitism	19
Nervous signs	**10**
Respiratory disease	**7**
Sudden death	**18**
Avian species	
Total number of submissions	**385**

Table 2: Salmonella serotypes isolated from animals during 2014

Serotype	Bovine	Equine	Ovine	Caprine	Porcine	Avian	Canine	Feline	Reptile
Unspecified	5	1	0	0	0	0	3	0	0
Salmonella Agona	2	0	0	0	0	0	0	0	0
Salmonella Anatum	4	2	0	0	0	0	0	0	0
Salmonella Brandenburg	40	0	50	0	0	0	1	0	0
Salmonella Bovismorbificans	3	0	0	0	0	0	0	0	0
Salmonella Emek	1	0	0	0	0	0	0	0	0
Salmonella Enteritidis	3	3	1	0	0	0	0	0	0
Salmonella Hindmarsh	3	0	63	0	0	0	0	0	0
Salmonella Infantis	1	0	0	0	0	0	0	0	0
Salmonella Johannesburg	0	0	0	0	0	0	0	0	0
Salmonella Kottbus	1	0	0	0	0	0	0	0	0
Salmonella Kentucky	1	0	0	0	0	0	0	0	0
Salmonella Lexington	1	0	0	2	0	0	0	0	0
Salmonella Mbandaka	1	0	0	0	0	0	0	1	0
Salmonella Meleagridis	0	0	0	1	0	0	0	0	0
Salmonella Mississippi	0	0	0	0	0	1	0	0	0
Salmonella Montevideo	0	0	0	0	0	0	0	0	0
Salmonella Potsdam	0	0	0	0	0	0	0	0	0
Salmonella Ruiru	6	0	0	0	0	0	0	0	0
Salmonella Saintpaul	3	0	0	0	0	0	1	1	0
Salmonella Senftenberg	0	0	0	0	0	0	0	1	0
Salmonella Typhimurium	106	16	2	0	0	0	3	3	0
Total	**181**	**22**	**116**	**3**	**0**	**1**	**8**	**6**	**0**

Table 3: Salmon surveillance during 2014

Number of salmon farms visited			18
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	18	1 920	0
Myxobolus cerebralis	11	660	0
Yersinia ruckeri	18	1 920	1
Aeromonas salmonicida	18	1 920	0
Renibacterium salmoninarum	6	360	0

Table 4a: Cumulative list of significant(*A) negative investigations of suspected exotic diseases, 2009–2014

Disease agents investigated and confirmed as negative (1)	2009	2010	2011	2012	2013	2014	Total
Aeromonas salmonicida (fish)				3		2	5
African horse sickness					2		2
Africanised honeybee (*Apis mellifera scutella*)/ Cape bee (*Apis mellifera capensis*)	2	1	1				4
Akabane virus	1		2	1	1	1	6
Anaplasmosis				5	3	2	10
Anthrax	3	4	1	1	3	4	16
Aujeszky's disease	3	1					4
Avian influenza: highly pathogenic notifiable avian influenza & Newcastle disease *B	3	10	7	8	4	3	35
Avian influenza: low-pathogenicity notifiable avian influenza *B				6	2	2	10
Avian malaria *C	1	1					2
Avian polyomavirus *C	2			1	2		5
Avibacterium paragallinarum (infectious coryza)			*C 1		1		2
Babesia canis, B. gibsoni, B. felis	3	5		5	2	1	16
Bluetongue			4	6		2	12
Brucella abortus		2	2	3	2	2	11
Brucella canis	9	4	6	8	6	5	38
Brucella melitensis				2		1	3
Bovine herpes virus type 5			1	1	2	2	6
Bovine theileriosis/babesiosis (exotic strains)	1		2	3	6	1	13
Bovine viral diarrhoea type II	1	1	3	2		6	13
Canine distemper virus	1	1		1	1	2	6
Canine influenza		1	1				2
Canine transmissible venereal tumour			2				2
Classical swine fever	3	1	1				5
Chlamydophila abortus (enzootic abortion)	4		1	1		1	7
Colony collapse disorder (bees)		4	2				6
Contagious agalactia	1		2				3
Contagious bovine pleuropneumonia	1	1		2	1		5
Ehrlichia canis	3	7	3	1	1	1	16
Equine piroplasmosis	6	8	5	2	3	2	26
Equine herpesvirus type 1 (abortifacient strains, neuropathogenic strains) *C		2		3	1	6	12
Equine infectious anaemia/Equine viral arteritis	11	14	7	14	17	4	67
Equine influenza			2	1	2	3	8
European foulbrood (bees)	3	4	4	4	3	7	25
Exotic ticks	3		6		3	3	15
Fish mortality (wild or managed, marine) – exclusion of exotic and novel infectious disease agents	3	6	4	6	5	4	28
Haemogregarine parasite (reptiles)	1					1	2
Haemorrhagic septicaemia (*Pasteurella multocida* – toxogenic strains)	7	4	9	7	3		30
Heartworm (*Dirofilaria immitis*)	2		3	2			7
Hydatids (*Echinococcus* spp.)	1	3	1	1			6
Infectious bovine rhinotracheitis (exotic strains)			1	4	1		6
Infectious bursal disease	1	4	3	2	5	1	16
Infectious haematopoietic necrosis (fish)				1			1
Iridovirus (fish)				3			3
Israeli acute paralysis virus (bees)	2	2	2	3	1	3	13
Leishmaniasis		1	1	2			4
Leptospira (exotic strains)	2	1	1	2	1	3	10
Mycoplasma bovis	1	3	4	3	1	4	16
Mycoplasma mycoides mycoides (large colony)			1	2			3
Myxomatosis	1		1	1	2		5
Nosema ceranae (bees)	3	*C	1	1	1	2	8
Ornithobacterium rhinotracheale (birds)	1	2		2	1	1	7
Perkinsus marinus/olseni (molluscs)	3		2	1	2	2	10
Pilchard herpesvirus	1	1					2
Porcine reproductive and respiratory syndrome	3	2	1			1	7
Poxviruses (sheep, goats, deer, camelids)				3	1		4
Psittacine herpesvirus (incl. Pacheco's disease)					2		2
Pulmonary adenomatosis virus				2			2
Q fever (*Coxiella burnetti*)	4			3	1	2	10
Rabies	4	1		1	1		7
Rinderpest			1	2			3
Ross River virus			1	1			2
Salmonella (exotic strains)	5	2	2	4	4	2	19
Small hive beetle (*Aethina tumida*) (bees)	1	2	5	1		2	11
Slow paralysis virus, acute bee paralysis virus (bees)	2	2				1	5
Tracheal mite (Acarapis woodi) (bees)	6	2	3	2	1	3	17
Transmissible spongiform encephalopathy agents (scrapie; BSE; chronic wasting disease; FSE) *B				3	4	3	10
Trichinella spiralis		1			1		2
Tropilaelaps clareae (bees)	5	2	3	3	1		14
Viral haemorrhagic septicaemia (fish)				1		1	2
Viral vesicular disease	2	6	12	7	5	4	36
West Nile virus	1	1	2	1		4	9
Total	**127**	**120**	**130**	**161**	**112**	**107**	**757**

Table 4b: List of significant positive investigations of suspected exotic diseases, 2014

Disease agents investigated and confirmed as positive [1]	2014
Equine herpesvirus myeloencephalopathy (equine herpesvirus type 1 neuropathogenic strain) *D	1
Exotic ticks *E	5
Mycobacterium avium ssp. *hominissuis* (birds)	1
Mycoplasma ovis (goats)	1
Perkinsus olseni (green-lipped mussels *Perna canaliculus*)	1
Sporadic bovine encephalomyelitis (*Chlamydophila pecorum*) [2]	2

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 investigation reports are published in *Surveillance* [1].

*B Investigations reported here are in addition to the testing occurring in the MPI active surveillance programmes for these disease agents. See Watts J, Kittelberger R (2012), *Surveillance* 39(3), 27–28 for a review of the TSE surveillance programme. See Stanislawek W *et al.* (2014), *Surveillance* 41(3), 22–23, for the annual report on New Zealand's avian influenza surveillance programme.

*C 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.

*D An outbreak investigation involving several cases was conducted.

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

References for Tables 4a and 4b

(1) See Bingham P (2014), *Surveillance* 41(2), 16–20; Bingham P (2014), *Surveillance* 41(3), 52–58 & 63–64; Bingham P (2014), *Surveillance* 41(4), 15–18 & 23–24 and Bingham P (2015), *Surveillance* 42 (1), 10–16 & 18-19 (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 in 2014.

(2) Buckle K, Ha H (2015). Investigation of an unusual veterinary syndrome leading to confirmation of sporadic bovine encephalomyelitis (SBE) in New Zealand. *Surveillance* 42(2), 9–11.

Kylee Walker
Incursion Investigator
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Kylee.Walker@mpi.govt.nz

Jonathan Watts
Senior Adviser
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
jonathan.watts@mpi.govt.nz

Cara Brosnahan
Scientist
Animal Health Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
cara.brosnahan@mpi.govt.nz

Avian influenza surveillance programme

New Zealand's avian influenza surveillance programme is multi-faceted, incorporating active surveillance of resident wild birds, and enhanced passive surveillance. NZ 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 2014, the Ministry for Primary Industries (MPI), in conjunction with the NZ Fish and Game Councils, the Department of Conservation and other stakeholders, carried out surveillance for avian influenza (AI) on targeted migratory and resident birds. The first six years of surveillance focused on 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. Findings from surveillance from 2004 to 2010 indicated that migratory birds pose a very low risk for the introduction of AI to New Zealand, as no AI virus was isolated. These birds were targeted because of their migration pathway, along which AI viruses may be present: directly from the 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. Subsequently, from 2010 to 2014 surveillance focused on resident birds, mainly waterfowl (**Figure 1**).

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 2014, cloacal and oropharyngeal swabs were collected from 880 healthy resident mallard ducks (**Table 1**). A Fish & Game banding programme provided a convenient opportunity for MPI to collect samples from ducks for the avian influenza surveillance at the same time. Individual bird samples were tested by the influenza A real-time RT-PCR TaqMan (Spackman *et al.*, 2003) with modified primers to accommodate genomic changes in the matrix gene of some AI viruses circulating in birds in the Asia and Pacific regions. 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.

Figure 1: MPI AHL technician MaryAnn Tuboltsev collecting samples from a duck at Lake Te Roto Kare

Influenza A RNA was detected in 43.5 percent of the 880 ducks sampled, in cloacal or oropharyngeal samples or both. This was a lower incidence than in the previous year (47.5 percent). Influenza subtype H5 RNA was confirmed in seven samples from two locations but no H5 virus was isolated. No influenza subtype H7 was found in samples collected in 2014. The prevalence of H5 subtype viruses was also much

Table 1: Active surveillance for avian influenza viruses in wild birds, 2014

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	
Pipiroa, Piako River, Hauraki Plains	320 mallard ducks	640	1	0	0
Mouth of Kaituna River, Bay of Plenty	320 mallard ducks	640	6	0	0
Lake Te Roto Kare, Hawke's Bay	240 mallard ducks	480	0	0	0
Total	**880**	**1 760**	**7***	**0**	**0**

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

lower than in the previous year.

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. Virus isolation was carried out on a random sample of the remaining influenza A RT/PCR-positive samples, and influenza subtypes H3, H4, H10 and H11 were isolated from all three locations. This will provide information on AI virus subtypes other than H5 and H7 circulating in mallard ducks in NZ, with regard to subtype diversity and trends that may develop. The results 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. Where reports relate to native birds, they are handled collaboratively with the Department of Conservation.

A risk assessment determines the need to investigate the report further. Information used in this process includes:

- history of the event (e.g., numbers affected and timeline of events);
- signs observed in dying birds;
- the species of bird/s affected;
- availability of fresh samples (where these are unavailable, follow-up is instigated);
- location; and
- epidemiological trends over space and time.

Based on the risk assessment, the investigation is either stood down or expanded to look for a potential exotic or emerging disease aetiology.

A rapid field service using MPI-approved suppliers is in place for collecting and submitting samples in cases of unexplained bird deaths (Rawdon *et al.*, 2007). A standardised investigation protocol co-ordinated by MPI's Investigation and Diagnostic Centre at Wallaceville is applied to submissions. This includes necropsy and sample collection for histology, bacteriology and virology. The potential presence of avian influenza is tested 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 investigations are published quarterly in *Surveillance* as part of the IDC report of suspect exotic disease investigations. In 2014, 15 such investigations were conducted (**Table 2**). No H5 or H7 viruses were isolated from any of the samples submitted for these investigations, and in all cases exotic disease was excluded.

Table 2: Avian mortality reports and investigations, 2014

Month	Reports	Investigations
January	3	3
February	9	2
March	1	0
April	0	0
May	0	0
June	6	4
July	0	0
August	0	0
September	2	2
October	1	0
November	6	1
December	2	1

References

Bingham P (2009). Quarterly report of investigations of suspected exotic diseases. *Surveillance* 36(4), 21–27.

Bingham P (2011a). Quarterly report of investigations of suspected exotic diseases. *Surveillance* 38(2), 32–38.

Bingham P (2011b). Quarterly report of investigations of suspected exotic diseases. *Surveillance* 38(3), 50–60.

McFadden A, Rawdon T, Bingham P, Loth L (2007). Public reports of avian mortality. Part 2: Spatial and temporal trends. *Surveillance* 34(3), 14–17.

Rawdon T, McFadden A, Stanislawek W, Bingham P (2007). Public reports of avian mortality. Part 1:Risk profiling and investigation. *Surveillance* 34(3), 10–13.

Sidoti F, Rizzo F, Costa C, Astegiano S, Curtoni A, Mandola ML, Cavallo R, Bergallo M (2010). Development of real time RT-PCR assays for detection of type A influenza virus and for subtyping of avian H5 and H7 haemagglutinin subtypes. *Mol. Biotechnology* 44, 41–50.

Slomka MJ, Pavlidis T, Banks J, Shell W, McNally A, Essen S, Brown IH (2007). Validated H5 Eurasian real time reverse transcriptase polymerase chain reaction and its application in HN1 outbreaks in 2005–2006. *Avian Diseases* 50, 373–377.

Spackman E, Senne DA, Bulaga LL, Myers TJ, Perdue ML, Garber LP, Lohman K, Daum LT, Suarez DL (2003). Development of real-time RT-PCR for the detection of avian influenza virus. *Avian Diseases* 47 (Special issue), 1079–1082.

Stanislawek WL, Wilks CR, Meers J, Horner GW, Alexander DJ, Manvell RJ, Kattenbelt JA, Gould AR (2002). Avian paramyxoviruses and influenza viruses isolated from mallard ducks (*Anas platyrhynchos*) in New Zealand. *Archives of Virology* 147, 1287–1302.

World Organisation for Animal Health (OIE) (2014). Terrestrial Animal Health Code. 17th Edition. Chapter 10.4 Avian influenza. Paris.

Wlodek Stanislawek
Senior Scientist
Animal Health Laboratory,
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
wlodek.stanislawek@mpi.govt.nz

Tom Rawdon
Incursion Investigator
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
thomas.rawdon@mpi.govt.nz

Toni Tana
Senior Adviser
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
toni.tana@mpi.govt.nz

Wildlife disease surveillance

Surveillance of wildlife continues to be 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) wildlife surveillance programme is to:

- facilitate early detection of exotic and emerging diseases;
- support NZ's statements of freedom from specific pests and diseases;
- provide baseline information on endemic disease occurrence in New Zealand wildlife; and
- support fulfilment of NZ'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) helps New Zealanders to meet their obligations under section 44 of the Biosecurity Act 1993, which requires every person to report to MPI any suspect 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 working 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 that requires further investigation. As well as using MPI's own data, this work also draws on 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, captive or wild native animals meeting a sick animal case criterion that are submitted to diagnostic laboratories by veterinary practitioners, DOC rangers, 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 or IVABS, at Massey University, Palmerston North), animals found dead in the field or in captive facilities are sent to the laboratory 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.

Wildlife cases processed by veterinary laboratories

Records of wildlife mortality 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 2010–2014. Numbers of avian cases in 2014 decreased slightly compared to 2013 and 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 2014, birds comprised 87 percent of submissions, with lizards 5.5 percent, cetaceans (whales and Hector's dolphins, *Cephalorhynchus hectori*) 4.4 percent and pinnipeds 2.1 percent, while amphibians, fish, bats, tuatara (*Sphenodon punctatus*) and other wild mammals totalled about 1 percent. Mortalities of both adult yellow-eyed penguins or hōiho (*Megadyptes antipodes*) and adult little blue penguins (*Eudyptula minor*) were of concern in the coastal Otago region, and mortalities of black stilts (*Himantopus novaezelandiae*) and whiteheads (*Mohoua albicilla*) occurred following re-introduction programmes in the South Canterbury and Auckland regions respectively. There was an increase in the number of marine mammal necropsies performed following the stranding of pygmy sperm whales (*Kogia breviceps*) and pilot whales (*Globicephala melas*) in Hawke Bay and northern parts of the South Island.

Disease surveillance in highly threatened species such kakapo (*Strigops habroptilus*), black stilt, hihi/stitchbird (*Notiomystis cincta*) and the endangered

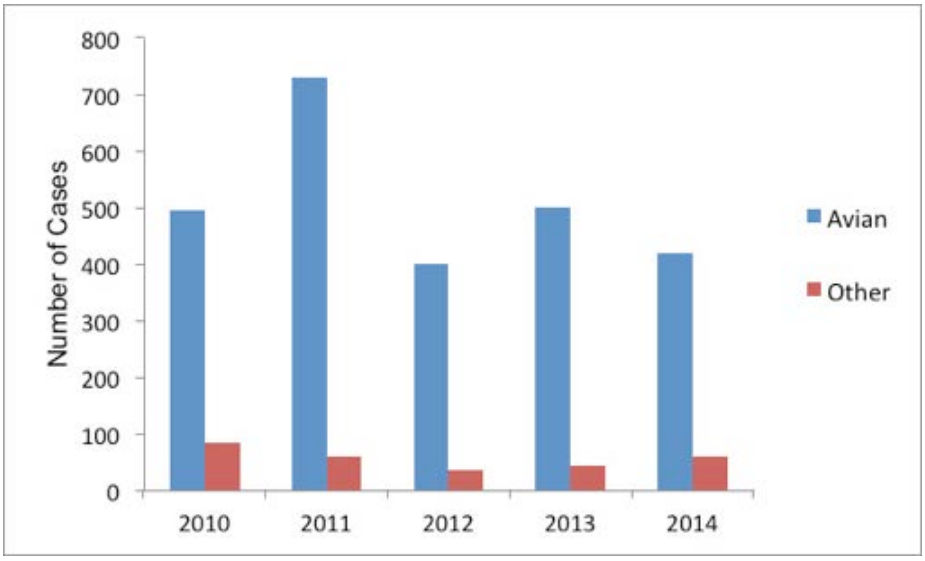

Figure 1: Numbers of wildlife cases in birds and other taxonomic groups recorded in the Huia database, 2010–2014

species 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 2014 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 in 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, in Christchurch. 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.

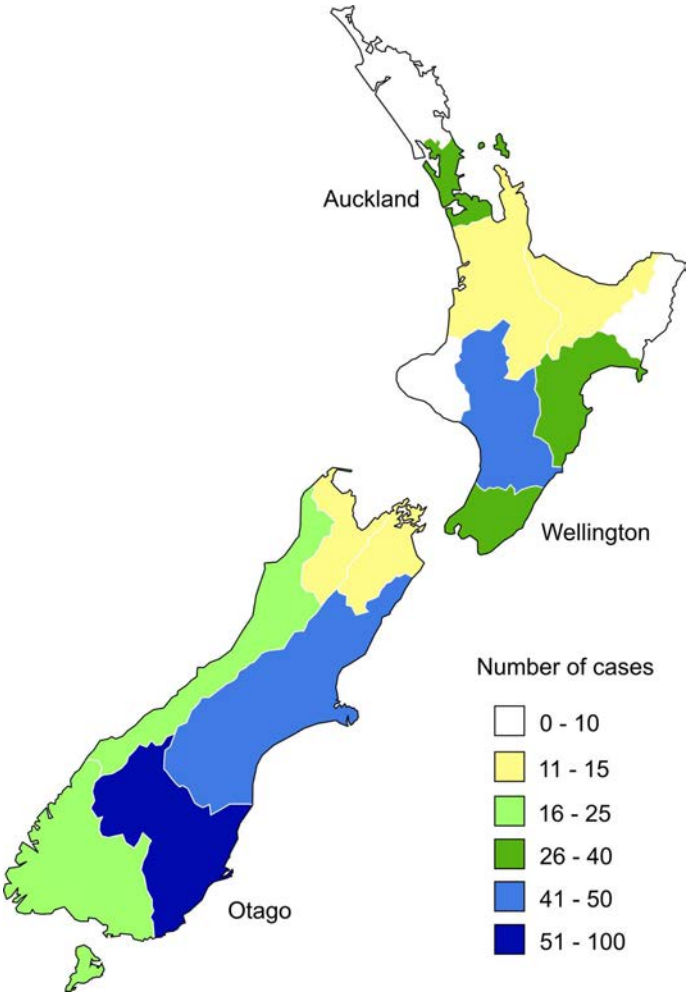

Figure 2: Number of bird cases recorded in the Huia database for 2014 by region

Wildlife cases of special interest in 2014

Avian tuberculosis in harriers

Tuberculosis in wild birds may enter the skin or oral cavity following puncture wounds that can occur during predation or scavenging of infected carcasses and coming in contact with sharp objects. In New Zealand, tuberculosis in raptors is less common than it is in many northern hemisphere countries, but because mycobacteria may survive for long periods in the environment, infection of birds from contaminated waste water, sewerage and soil should also be considered a possibility. Avian tuberculosis is present in some backyard poultry flocks in NZ and has been reported previously in the oral cavity of a harrier (*Circus approximans*) associated with a heavy oral and pharyngeal *Capillaria* infection (Alley *et al*., 2004). Other native birds that have been infected include captive kiwi (*Apteryx mantelli*) in Hawke's Bay (Davis *et al*., 1984) and two little blue penguins kept in captivity in Christchurch (Hunter *et al*., 2012).

A mature harrier from the Manawatu region presented at Wildbase Hospital with multiple nodular lesions on the ventral aspects of both feet. An incision biopsy showed that the bird had a severe granulomatous dermatitis with subcutaneous cores of caseous material bordered by heterophils and epithelioid macrophages (**Figure 3,** following page). Within the caseous material were multiple small clusters of rod-shaped acid-fast organisms. A diagnosis of mycobacterial dermatitis was made and the bird was euthanased. Histopathology confirmed the presence of a mycobacterial infection. In the mid-dermis and extending into deeper tissues was a large core of eosinophilic and pyknotic debris bordered by a thick layer of epithelioid macrophages, small numbers of multinucleated giant cells, scattered heterophils and fine bands of fibrous tissue, as well as small perivascular aggregates of lymphocytes and plasma cells. Clusters of acid-fast Gram-positive bacilli were scattered throughout peripheral areas of the necrotic core of these granulomas. There was no evidence of tuberculous lesions in the internal organs.

A second case of avian tuberculosis was seen two months later in a harrier from the Horowhenua region. This bird had a history of circling and falling over, and had a swelling on its left foot. It was radiographed after admission to a rehabilitation centre and an old proximal fracture was seen on the left femur, together with three osteolytic lesions in the mid-diaphyseal area of the tibiotarsus. Radiographic lesions were also noted in the liver and lungs, so the bird was euthanased. Post-mortem examination revealed severe soft tissue swelling of the dorsolateral surface of the left hock, extending to the first digit,

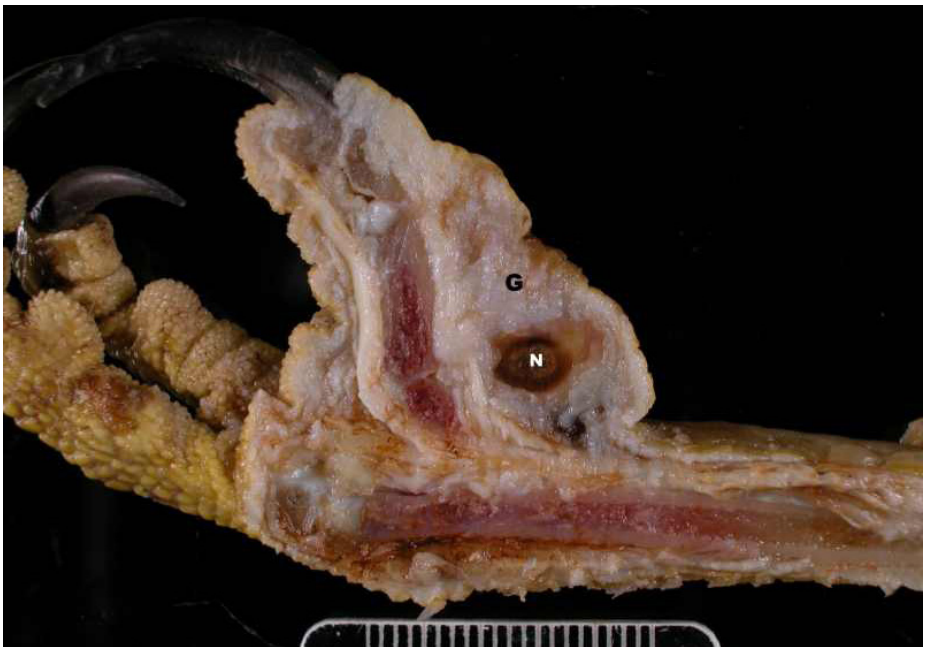

Figure 3: Longitudinal section of the foot of an affected harrier, showing a large subcutaneous granulomatous lesion (G) with a caseous necrotic core (N) on the plantar aspect of the rear digit. Scale graduations = 1mm. *Photo by Stuart Hunter*

and moderate soft tissue swelling over the second digit. The liver margins were rounded and there were half a dozen firm white foci 1–2 mm in diameter on the surface of the liver. The lungs were congested and contained multiple 1–3-mm firm dark green nodules. Similar nodules were attached to the serosa and mesentery of the intestines. Histologically, this case showed multiple early mycobacterial granulomas in numerous visceral organs, all of which contained large numbers of acid-fast bacilli. However, the severe skin lesions and associated osteomyelitis were advanced and suggested that the foot was the most likely route of mycobacterial infection.

Toxoplasmosis in endemic birds and dolphins

Although avian toxoplasmosis has been recognised as a cause of death and blindness in caged birds, particularly budgerigars and canaries (Vickers *et al.*, 1994; Alley, unpublished data), it has not been diagnosed in wild NZ birds until recently. Over the last five years the disease has now been diagnosed in eight individual wild birds of a variety of endemic species. These were two kaka (*Nestor meridionalis*), two kereru or wood pigeon (*Hemiphaga novaeseelandiae novaeseelandiae*), two brown kiwi (*Apterynx mantelli*), a paradise shelduck (*Tadorna variegata*), and a red-crowned parakeet or kakariki (*Cyanoramphus novaezelandiae novaezelandiae*). The clinical signs have ranged from depression, anorexia and lethargy with separation from the flock, to sudden death. Gross lesions seen were also non-specific and consisted of hepatosplenomegaly (which was marked in the kiwi but less severe in the parakeet), while the kaka and kereru had swollen slightly firm deep-red lungs. Microscopically, there was extensive hepatocellular necrosis in the liver of the kiwi while the kaka and kereru showed severe fibrinous bronchointerstitial pneumonia in which Toxoplasma tissue cysts were visible in a direct-impression smear of the cut surface. In the kiwi, protozoan organisms were present in both hepatocytes and Kupffer cells of the liver, and in the epithelial cells and macrophages of the interstitium of the lungs in the kaka, kakariki and kereru. The diagnosis in four of these cases was confirmed by immunohistochemistry, which identified both the toxoplasma-positive tachyzoites and intact tissue cysts in the lungs and liver, or by PCR analysis of paraffin-embedded formalin-fixed liver and lung tissue, or by both methods. Genotyping of up to seven markers revealed that an atypical Type II isolate of *Toxoplasma gondii* was present in at least three of the cases (Howe *et al.*, 2014).

In the past, the differential diagnosis of toxoplasmosis has been fraught with difficulty as the clinical signs and pathology are non-specific, and differentiation of the organisms from other protozoa such as *Plasmodium* has relied on subtle differences in the morphology of the intracellular tachyzoites. Improved diagnostic tools such as PCR tests and immunohistochemistry now enable both cystic and individual organisms to be identified in a variety of body tissues. Given the large numbers of feral and domestic cats (*Felis catus*, the definitive host of *T. gondii*) in New Zealand, it would not be surprising to find that wild birds are important reservoirs for the disease. The important role of cats in infecting wildlife is supported by the recent finding of a high prevalence of toxoplasmosis in Hector's dolphins (Roe *et al.*, 2013), which is assumed to be due to the contamination of freshwater runoff by cat faeces.

Penguin mortalities in coastal Otago

During the 2014 yellow-eyed penguin breeding season there was only one reported death from diphtheritic stomatitis, a disease that has previously been a major cause of chick mortality in Otago. This was likely due to a DOC field project involving extensive nest monitoring and treatment of chicks. However, adult mortality increased earlier owing to a number of bacterial, fungal and protozoan infections. Many of these cases were seen in birds that were in poor or emaciated condition. *Salmonella* Saintpaul was isolated from the faeces of one bird and *S.* Typhimurium DT 135 was isolated from another. In addition, at least 10 adult birds were found suffering from

infected, sharp-edged wounds to the skin and subcutaneous tissues of the flippers or feet. Although some of these wounds responded to treatment, others progressed to a septic arthritis or osteomyelitis requiring hospitalisation or euthanasia.

In November, 29 adult little blue penguins were found dead at Doctor's Point, north of Dunedin. All were in good body condition with moderate fat reserves, and many had recently-ingested fish in the proventriculus. All showed evidence of recent trauma to the head and neck, often consisting of full-thickness skin puncture wounds on the ventrolateral neck, sometimes paired and around 20 mm apart. Beneath these wounds were variable areas of haemorrhage and haematoma in the vertebral musculature and subcutaneous tissues, consistent with ferret (*Mustela putorius furo*) attack. The fact that none of the carcases showed evidence of having been eaten supports this diagnosis, as ferrets are known to kill many prey without eating them.

Predation of kiwi chicks by cats

Although stoats (*Mustela ermine*) are widely recognised as the main predator of brown kiwi chicks and older juveniles throughout New Zealand (McLennan *et al*., 1996), the notion that cats commonly kill wild birds has recently received much media attention. Birds killed by both urban and rural cats are mainly passerines (van Heezik *et al*., 2010) but a study of fledgling North Island brown kiwi in 1995 (McLennan *et al*., 1996) showed that feral cats killed just two of 49 kiwi chicks found dead. There have been few other reports of cats preying on kiwi since then, although Massey University records note at least 15 cases over the past 10 years.

The use of infra-red cameras (I.C. Castro, pers. comm., 2015) has recently provided good evidence of how vulnerable kiwi chicks are to cat attacks. The affected chicks show little or no awareness of approaching cats, and make no attempt to escape or resist. Video records and post-mortem evidence show that the cat usually grasps the chick across its thorax, causing a quick death from asphyxiation or pneumothorax. A hungry cat may then eat most of the carcase, leaving only the feathers, the distal portions of the legs, the feet, bill and skull available for post-mortem examination.

Wildlife cases notified via the MPI exotic pest and 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 tests for avian influenza, West Nile virus and Newcastle disease.

Multiple outbreaks of mass mortality in wild ducks were investigated, centred on the Kapiti Coast and Auckland. These occurred during the summer months, which were unusually warm and dry. Outbreaks centred around stagnant ponds. Potential causes including highly pathogenic avian influenza and Newcastle disease (caused by avian paramyxovirus-1) were ruled out. Given the environmental factors, avian botulism was thought to be the most likely cause of death. In a separate case reported from a zoo, avian influenza was ruled out in an emu with bloody discharge from the mouth, and the bird tested positive for infectious laryngotracheitis virus. In another case, a viral cause was suspected in cases of encephalitis in kaki/black stilt chicks because previous bacterial and histological testing by Massey Wildbase indicated the cause was likely to be viral. West Nile Virus was ruled out by PCR of brain from three affected chicks. A novel flavivirus, considered to be endemic, was isolated by viral culture from one brain sample. Further testing is planned to better characterise this virus.

A mortality event in feral hares (*Lepus europaeus*) was investigated to rule out exotic diseases including tularemia, myxomatosis, and European brown hare syndrome. A farmer called the MPI exotic pest and disease hotline to report finding four dead juvenile hares over a six-day period. Post-mortem examination of one hare revealed chronic parasitic enteritis and *Escherichia coli* bacterial overgrowth. There was a concurrent suppurative mesenteric lymphadenitis, from which *E. coli* was cultured. It is hypothesised that intestinal coccidiosis and possibly other unknown factors predisposed this hare and possibly others of a similar age to colibacillosis. Exotic diseases were ruled out.

References

Alley MR, Coomer AR, Gartrell BD (2004). Mycobacterial stomatitis and associated capillariasis in an Australasian harrier, *Circus approximans. Kokako* 11(1) 3–5.

Davis GB, Watson PR, Billing BE (1984). Tuberculosis in a kiwi (*Apteryx mantelli*). *New Zealand Veterinary Journal* 32(3), 30

Howe L, Hunter, SA, Burrows E, Roe WD (2014). Four cases of fatal toxoplasmosis in three species of endemic New Zealand birds. *Avian Diseases* 58(1), 171–175

Hunter SA, Howard PA, Alley MR (2012). An outbreak of avian tuberculosis in captive blue penguins, *Eudyptula minor. Kokako* 19(2), 30–31.

McLennan JA, Potter MA, Robertson HA, Wake GC, Colbourne R, Dew L, Joyce L, McCann AJ, Miles J, Miller PJ, Reid J (1996). Role of predation in the decline of kiwi, *Apteryx* spp. in New Zealand. *New Zealand Journal of Ecology* 20(1), 27–35.

Roe WD, Howe LJ, Hunter SA (2013). Toxoplasmosis in Hector's Dolphins, *Cephalorhynchus hectori. Kokako* 20(2), 33.

Vickers MC, Hartley WJ, Mason RW, Dubery JP, Schollum L (1992). Blindness associated with toxoplasmosis in canaries. *Journal of the American Veterinary Medical Association*, 200(11), 1723–1725.

van Heezik Y, Smyth A, Adams A, Gordon J (2010). Do domestic cats impose an unsustainable harvest on urban bird populations? *Biological Conservation* 143(1), 121–130.

Maurice Alley
Wildbase Pathology
Institute of Veterinary, Animal and Biomedical Sciences
Massey University, Palmerston North
M.R.Alley@massey.ac.nz

Kelly Buckle
Incursion Investigator
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
kelly.buckle@mpi.govt.nz

Transmissible spongiform encephalopathies (TSE) surveillance programme

New Zealand is free from the main TSEs, namely bovine spongiform encephalopathy (BSE) of cattle, classical scrapie of sheep and goats, and chronic wasting disease (CWD) of deer. The TSE surveillance and risk management measures implemented in New Zealand have been described in previous annual reports (e.g. Vink & Kittelberger, 2014). Surveillance for CWD is not mandated by the World Organisation for Animal Health (OIE), and is partly funded by industry; it is carried out to assure our trade partners of NZ's freedom from this disease.

Both passive and active surveillance activities are performed for the three abovementioned TSEs. 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, brain tissue samples from all imported cattle, sheep, goats and deer are tested for TSE after they die or are culled. Testing is performed by histopathology at accredited veterinary diagnostic laboratories; a rapid TSE test is done at MPI's Investigation and Diagnostic Centres (IDCs) when histopathology cannot rule out a TSE diagnosis. The IDEXX TSE enzyme immunoassay (EIA) (IDEXX Laboratories Inc., Westbrook, Maine, USA) has replaced the previous Bio-Rad TSE ELISA for all rapid testing.

Table 1 shows the numbers of samples tested in 2014.

New Zealand performs type B surveillance for BSE as specified by chapter 11.4 of the OIE Terrestrial Animal Health Code (OIE, 2015a). 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 2014 generated 37 178 BSE points and all tests were negative.

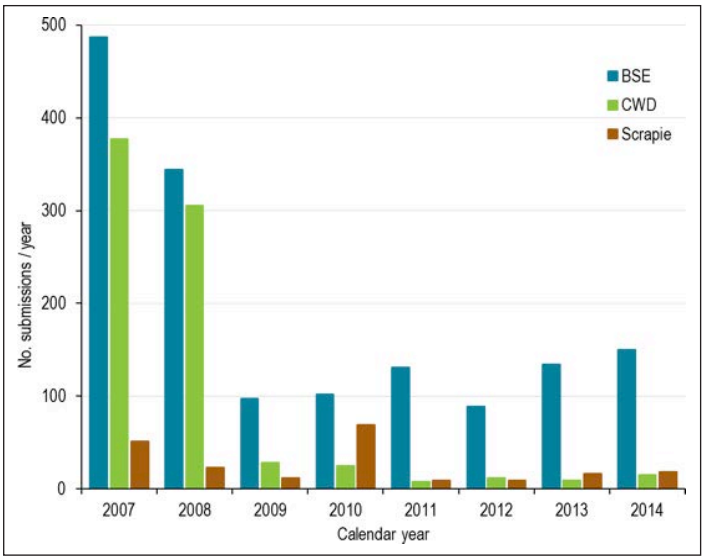

Figure 1: Numbers of brain samples tested for BSE, scrapie and CWD under the incentivised passive surveillance scheme from 2007 to 2014

The numbers of samples submitted under the incentivised passive surveillance programme have declined since 2005. Specifically, the number of deer submissions for CWD declined sharply in 2009 following the imposition of a maximum of two submissions per farm per year in 2008. The annual sample numbers 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**).

To complement the low submission numbers for classical scrapie and CWD, active surveillance has been performed since 2010. Samples from normal adult animals sent to slaughter were routinely collected from meat processing plants across the country. In 2014, 336 sheep and 332 deer were tested; these numbers were based on a sample size calculation designed to detect disease at a low prevalence in the population. All samples tested negative. The farms of origin of the sampled sheep and deer demonstrated reasonable geographic spread across the North Island as well as the South Island, which appeared to be representative of the underlying farm density (**Figure 3**).

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, 2015b). MPI therefore considers it to be a negligible biosecurity risk (Vink & McIntyre, 2014). The sensitivity of detection of the prion causing classical

Table 1: Numbers of samples tested for TSEs in 2014, by passive and active surveillance

Species	Tissue	Test type	Source of test issue		Surveillance stream
			Routine Surveillance	Imported animal	
Cattle	Brain	Histopathology	150*	-	Passive
		IDEXX TSE ELISA	6	3	Passive (rule-out)
Deer	Brain	Histopathology	18	-	Passive
		IDEXX TSE ELISA	0	0	Passive (rule-out)
	MRLN†	IDEXX TSE ELISA	332	-	Active
Sheep	Brain	Histopathology	15	-	Passive
		IDEXX TSE ELISA	0	10	Passive (rule-out)
	MRLN	IDEXX TSE ELISA	336	-	Active

* This level of testing earned 37 178 surveillance points for BSE in accordance with Chapter 11.4 of the 2013 OIE Terrestrial Animal Health Code. These points are calculated from clinical suspect and fallen stock cases submitted by veterinary practitioners under the surveillance programme.
†Medial retropharyngeal lymph node

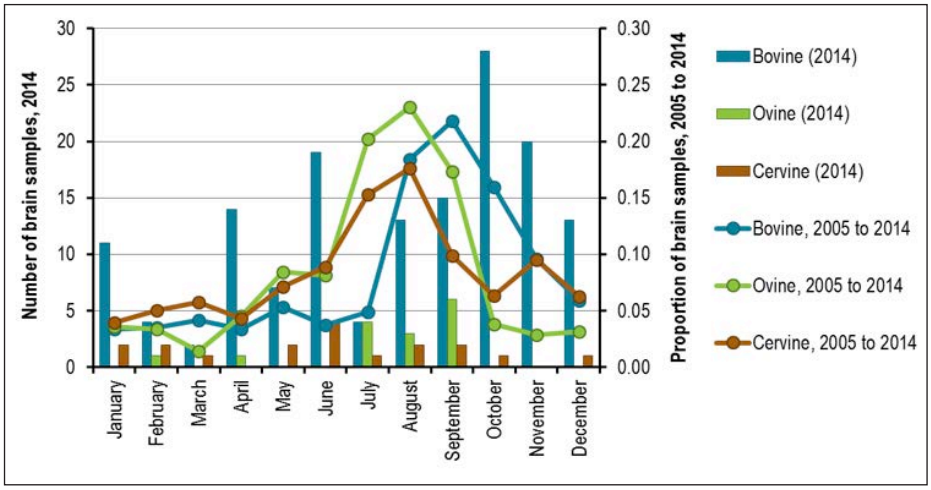

Figure 2: Numbers of brain samples tested for BSE, scrapie and CWD under the incentivised passive surveillance scheme during 2014 (left axis, bars), and trend by calendar month of samples submitted from 2005 to 2014 (right axis, lines)

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); therefore, testing of lymphoid tissue using an ELISA test is an attractive proposition. Research was initiated in 2010 at the IDC to evaluate whether lymphoid tissue testing could be used with confidence. This showed that testing medial retropharyngeal lymph nodes (MRLNs) from sheep and goats with the IDEXX TSE test had high diagnostic sensitivity and specificity (Kittelberger et al., 2014). Consequently, MRLN samples of sheep and deer taken under the active surveillance programme were analysed using this test. The TSE surveillance programme will continue to be refined in accordance with new knowledge, tests, standards and market access needs.

References

Kittelberger R, McIntyre LH (2009). A case of atypical scrapie/Nor98 in a sheep from New Zealand. *Surveillance* 36(4), 6–10.

Kittelberger R *et al*. (2010). Atypical scrapie/Nor98 in a sheep in New Zealand. *Journal of Veterinary Diagnostic Investigation* 22, 863–875.

Kittelberger R *et al*. (2014). Evaluation of two commercial, rapid, scrapie ELISA kits for the testing of retro-pharyngeal lymph nodes in sheep. *New Zealand Veterinary Journal* 62(6), 343–350.

Meloni D *et al*. (2012). EU-approved rapid tests for bovine spongiform encephalopathy detect atypical forms: A study for their sensitivities. *PLOS ONE*, doi: 10.1371/journal.pone.0043133. Accessed 27 July 2015.

OIE (2015a). *Terrestrial Animal Health Code* 24th Edition, Chapter 11.4. http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_bse.htm. Accessed 27 July 2015.

OIE (2015b). *Terrestrial Animal Health Code* 24th Edition, Chapter 14.8. http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_scrapie.htm. Accessed 27 July 2015.

Vink D, Kittelberger R (2014). Transmissible Spongiform Encephalopathies (TSE) Surveillance Programme. *Surveillance* 41(3), 28–30.

Vink WD, McIntyre LH (2014). Active surveillance for scrapie in New Zealand: towards tissue-based testing. *New Zealand Veterinary Journal* 62(6), 361–362.

Daan Vink
Senior Adviser
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
daan.vink@mpi.govt.nz

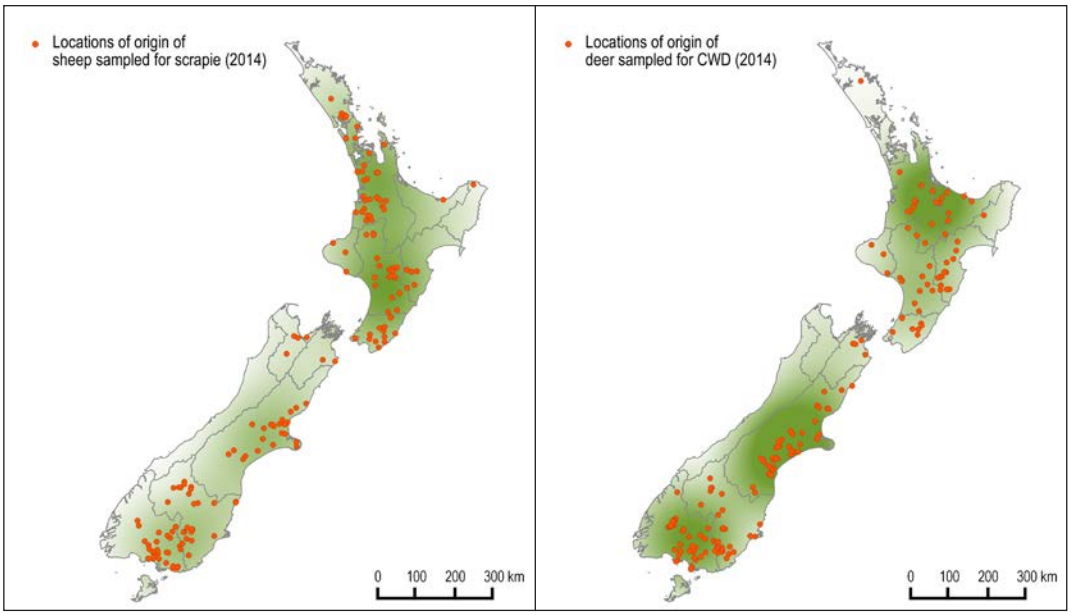

Figure 3: Locations of farms submitting sheep samples for classical scrapie (left; n=162) and deer samples for CWD (right; n=164) during 2014. Two animals were sampled per location. The underlying heatmap represents the density of farms with sheep and deer respectively (source: FarmsOnLine)

Arbovirus surveillance programme

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 require both an arthropod vector and vertebrate hosts. Biting midges of the genus *Culicoides* (Diptera: Ceratopogonidae) are important insect vectors that could possibly settle in New Zealand (Ryan *et al.*, 1991). Bluetongue virus, epizootic haemorrhagic disease virus and Akabane virus can replicate in biting midges and be passed on to susceptible animals via the insects' saliva (Mellor *et al.*, 2000). *Culicoides brevitarsus* and *C. wadai* are of particular concern owing to their tolerance of colder environments (Ryan *et al.*, 1991).

The surveillance programme has three components:

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

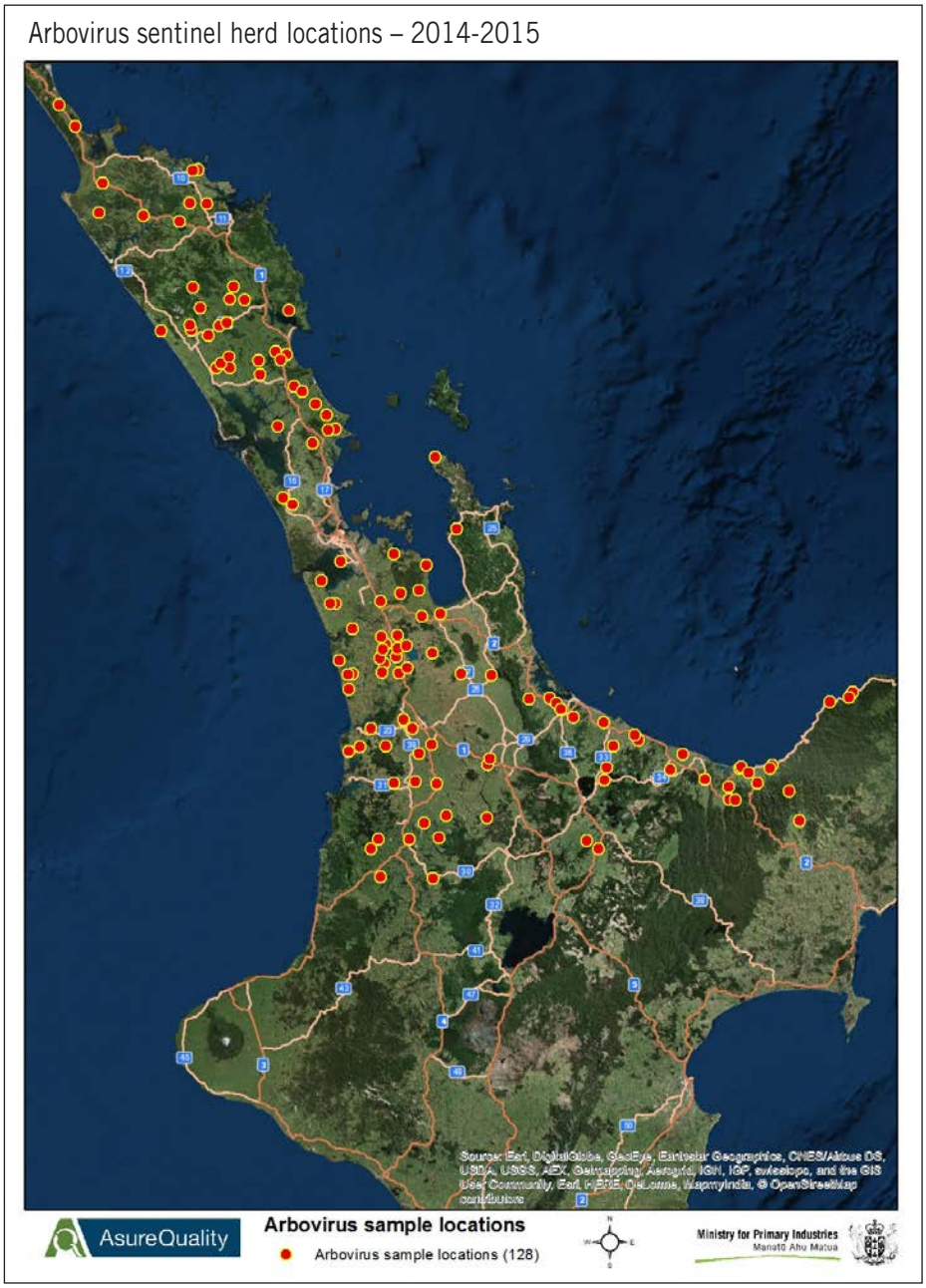

Figure 1: Locations of cattle sampling

Early warning system

The Ministry for Primary Industries (MPI) maintains an exotic pest and disease hotline that enables early reporting of suspected new to New Zealand pests and diseases. Exotic terrestrial animal pest and disease investigations are managed by MPI's Investigation and Diagnostic Centres and Response (IDC&R) Directorate at Wallaceville.

Herd testing

During the July 2014-June 2015 reporting period, 640 cattle from 32 farms in four districts (**Figure 1**) were bled for serological testing. These districts are considered to have favourable environments for the survival and establishment of *Culicoides* spp. Cattle from these areas could potentially get arbovirus infection if virally infected vectors were present. Blood samples for serological testing were taken after the possible period of virus transmission.

Vector surveillance

Twelve light traps were deployed on cattle farms this season. The traps contained green light-emitting diodes to maximise trapping efficiency (Bishop *et al.*, 2004, 2006). Insect vector surveillance was undertaken from the start of February until the end of April. During this period, conditions were 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 deployed on three consecutive nights of each selected week.

Test results

The aim of herd testing is to detect serological evidence of exposure to bluetongue, epizootic haemorrhagic disease and Akabane viruses. All blood samples sent to the Animal Health Laboratory at Wallaceville tested negative for antibodies to bluetongue virus and epizootic haemorrhagic disease virus by the agar-gel immunodiffusion test. Cattle sera were also negative to Akabane virus antibodies in the ELISA test.

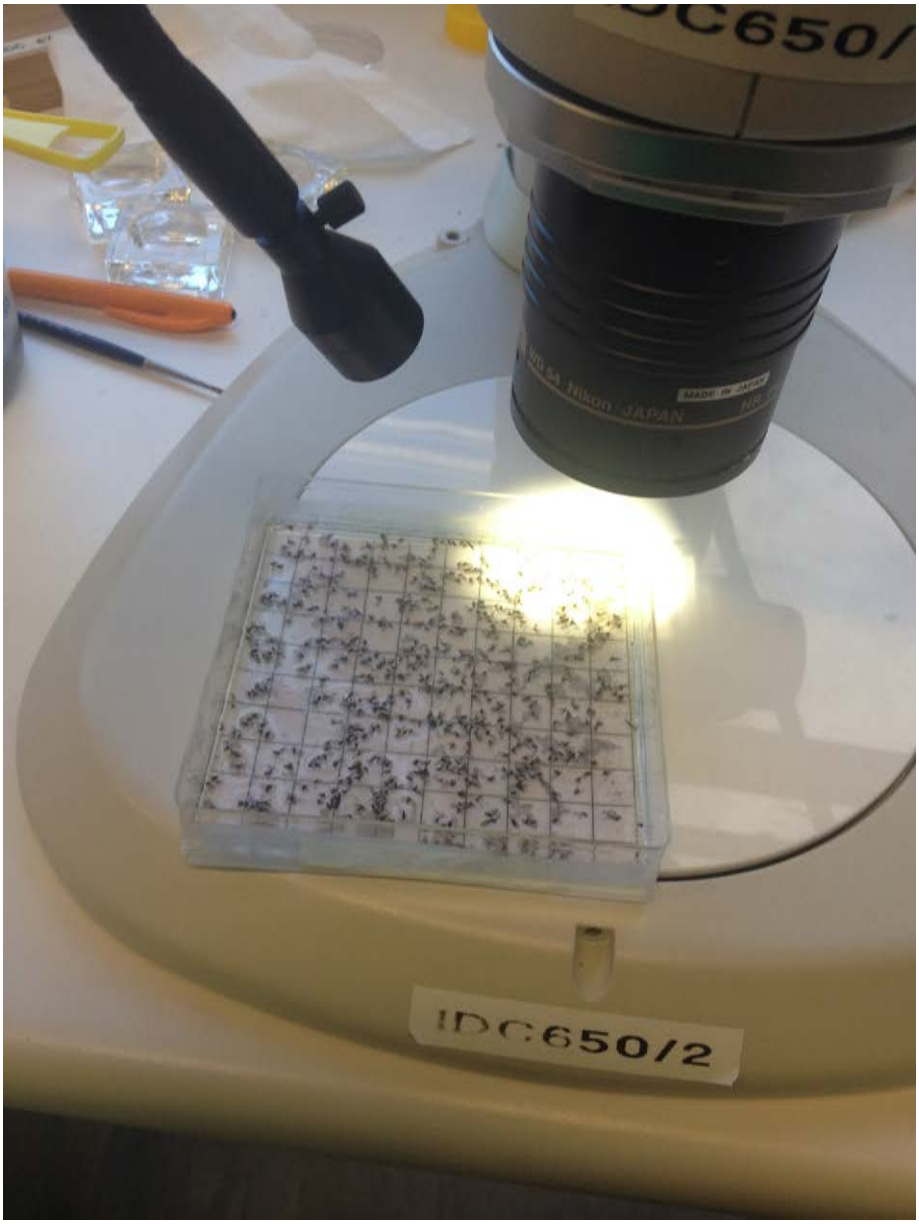

Figure 2: Screening of insect samples collected during surveillance

In all, 119 insect trap samples were received from AsureQuality field staff in 2015. Samples were processed by the Plant Health and Environment Laboratories of IDC&R in Auckland and Christchurch. In all, 512 627 insects were screened (**Figure 2**) but no *Culicoides* spp. were found. A total of 193 native midges of various species in the family Ceratopogonidae were also trapped, which suggests that the traps are likely to catch *Culicoides* spp. if these midges are present in New Zealand.

References

Bishop AL, Worrall R, Spohr LR, McKenzie HJ, Barchia IM (2004). Response of *Culicoides* spp. (Diptera: Ceratopogonidae) to light-emitting diodes. *Australian Journal of Entomology* 43, 184–188.

Bishop AL, Bellis GA, McKenzie HJ, Spohr LJ, Worrall RJ, Harris AM, Melville L (2006). Light trapping of biting midges *Culicoides* spp. (Diptera: Ceratopogonidae) with green light-emitting diodes. *Australian Journal of Entomology* 45, 202–205.

Mellor PS, Boorman J, Baylis M (2000). *Culicoides* biting midges: their role as arbovirus vectors. *Annual Review of Entomology*, 45(1), 307–340.

Ryan TJ, Frampton ER, Motha MXJ (1991). Arbovirus and arbovirus vector surveillance in New Zealand. *Surveillance* 18(5), 24–26.

Lora Peacock
Senior Adviser
Surveillance and Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Lora.Peacock@mpi.govt.nz

Reinhold Kittelberger
Principal Adviser
Animal Health Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Reinhold.Kittelberger@mpi.govt.nz

Rudolfo Bueno
Scientist
Animal Health Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Rudolfo.Bueno@mpi.govt.nz

Olwyn Green
Senior Technician
Plant Health and Environment Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Olwyn.Green@mpi.govt.nz

Carol Muir
Senior Technician
Plant Health and Environment Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Carol.Muir@mpi.govt.nz

Sherly George
Manager, Team B Entomology
Plant Health and Environment Laboratory
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Sherly.George@mpi.govt.nz

Honey bee exotic pest and disease surveillance report

This report summarises surveillance activities for the year 1 July 2014 to 30 June 2015.

Honey bee exotic disease surveillance is conducted by AsureQuality Ltd 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*); and
- bee viruses such as Israeli acute paralysis virus (IAPV).

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, and areas of high hive concentration (e.g., kiwifruit-growing areas). 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, 339 apiaries were inspected as part of high risk site surveillance, against a target of 350 apiaries. These apiaries were all inspected by Authorised Persons – Level 2. The target was not reached because many of the apiaries selected no longer had live bees in them. Varroa appeared to be the main reason for the large number of dead hives; it should be noted that a lot of these hives belonged to relatively new hobbyist beekeepers who lacked both experience with and knowledge of varroa control. Beekeepers are also reporting that the treatments are not effective and there is some anecdotal evidence that the varroa mite is developing resistance to the miticides used.

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.

The target was well exceeded this year, with samples from 521 low-risk apiaries contributing to the programme. The MPI Investigation Diagnostic and Response lab 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 detected.

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 works

Table 1: Number of apiaries surveyed and samples taken in 2014–2015

Samples tested	Routine samples (apiaries)	Suspect samples	Results	MPI specification for routine samples
Internal parasites	339	0	All negative	350
External parasites	339	1	All negative	350
European foulbrood	339	2	All negative	350 inspections, with any suspect larvae sampled for laboratory diagnosis
Small hive beetle	339	3	All negative	350 inspections, with any suspect beetle or larvae sampled for laboratory diagnosis
Exotic bee species	339	0	–	350 inspections, with any suspect bees sampled for laboratory diagnosis

with MPI's Surveillance and Incursion Investigation (Animals and Marine) team at Wallaceville to screen these calls and determine whether sampling is justified. Eight calls were received that resulted in further sampling. Two of the calls were regarding suspect European foulbrood, one was about a suspect external mite, three were related to unexplained bee deaths and two were for suspect small hive beetle. Two other investigations were for imported wax foundation and imported Indonesian honey. A number of additional calls were received but not further investigated after 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 10 cases investigated (**Table 1**).

Results

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

Reports

Each year, AsureQuality Ltd, on behalf of MPI, reports on exotic surveillance activities in *Surveillance* and *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 NZ beekeepers informed about surveillance activities.

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 NZ beekeeping industry. These articles covered Africanised bees, the Asian honey bee (*Apis cerana*) and the Asian mite (*Tropilaelaps* sp.). 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.

Apiary database

AsureQuality Ltd maintains an apiary database that contains information on beekeeping enterprises in New Zealand. As at 30 June 2015 there were 5 551 beekeepers managing 575 872 hives on 34 476 apiaries. New beekeepers are still entering the industry at a record rate, with 1 082 new registrations in the 12 months to 30 June. Almost 34 percent of beekeepers have less than two seasons of experience. This highlights the need to provide ongoing education about exotic disease identification, which is paramount to increasing the sensitivity of the passive surveillance programme. Educating the industry in the identification of exotic pests and diseases greatly increases the chances of finding an incursion sooner. This is because vastly more hives can be inspected by an educated industry than by 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.

Technical development

To maintain technical development of the surveillance programme, 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 training.

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

Tony Roper
Apicultural Technical Adviser
AsureQuality Ltd
tony.roper@asurequality.com

Reports from National Pest Management Plans: Bovine tuberculosis

TBfree New Zealand

On 1 July 2013, OSPRI New Zealand (OSPRI) was established as a new organisation. At the same time, TBfree New Zealand took over from the Animal Health Board (AHB) as the agency responsible for implementing the National Pest Management Plan (NPMP) for bovine tuberculosis (TB). OSPRI's role is to manage and deliver the TBfree NZ TB control and the National Animal Identification and Tracing (NAIT) programmes.

TBfreeNZ's current NPMP for TB control was introduced in July 2011. Its primary objectives, to be achieved by 1 July 2026, are:

- to eradicate TB from wildlife over at least 2.5 million hectares of vector risk areas (VRA), including two extensive forest areas representing relatively difficult operational terrain; and
- to maintain TB freedom in wildlife in in vector free areas (VFAs), including areas where TB has been eradicated from wildlife.

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

Review of the National Bovine Tuberculosis Pest Management Plan

During 2015–2016, and as required under the Biosecurity Act, the TB Pest Management Plan was reviewed. To provide independence from OSPRI, a Plan Governance Group (PGG) was established by the existing TB Plan funding parties. Its function was to oversee a joint programme of work that would first review the existing plan and then develop an amended Plan proposal for submission to the Minister of Agriculture. The Minister will then consider whether it meets the requirements for a National Pest Management Plan under the Biosecurity Act.

The PGG has an independent Chair (Chris Kelly) and an independent member (Russ Ballard). Other members include the Chief Executives of DairyNZ (Tim Mackle), Beef+Lamb New Zealand (Scott Champion), and Deer Industry NZ (Dan Coup); the Chair of the OSPRI Stakeholders' Council (Anders Crofoot); a Ministry for Primary Industries representative (Julie Collins); and two OSPRI representatives (Stu Hutchings and Peter Alsop).

When the present TB Plan was developed in 2009, it was intended that it would provide a large-scale proof of concept that TB can be eradicated from farmed cattle and deer, and from the wildlife species (principally possums) that act as a reservoir and vector of the disease; and that the demonstration of this in conjunction with new scientific research would inform subsequent Plan reviews.

In light of the scientific reviews of progress to date, modelling and costings of options, together with expected further technical and management developments to come, the PGG now considers that TB eradication is both feasible and economically justifiable. The PGG has therefore agreed that it is appropriate for the Plan to be amended to reflect this new situation.

Following recent consultation with farmers on the Plan, the PGG has agreed to amend its prime objective to that of New Zealand being biologically free of bovine TB by 2055. Milestones would include TB eradication from livestock by 2026 and from possums by 2040. It was also proposed to amend the Plan's secondary objective by reducing the maximum allowable national annual period prevalence of herd infection from 0.4 to 0.2 percent. This is the World Organisation for Animal Health (OIE)'s threshold for declaring a country TB free, and must be maintained until bovine TB has been completely eradicated.

A more targeted, risk-based approach to disease management and vector control will be fundamental to achieving the proposed new Plan objectives. Policies and measures to implement the new approach will be detailed, along with any transitional arrangements, in a revised National Operational Plan.

The proposal also outlines new funding arrangements for the Plan, to ensure it is funded in an equitable, secure and sustainable manner, but also enables funding shares to change over time to reflect changes in circumstances or benefits received by funders.

If implemented, the changes are expected to provide for more cost-effective control of TB in cattle and deer herds, to:

- prevent, avoid and manage animal health implications relating to TB infection;
- prevent, avoid and manage livestock production losses and associated costs of TB infection to industry;
- deliver upon and satisfy market and consumer assurance requirements;
- maintain and build on the significant gains made in managing TB; and
- realise cost-savings and gains in overall effectiveness from a single national programme, without duplication in separate industry or regional programmes.

This enables economies of scale in the design and delivery of operations. It also enables a skilled workforce and wide-ranging organisation capability to be built and maintained, in order to address the challenges posed by TB across NZ.

It is proposed that the amendments to the Plan will come into force on 1 July 2016.

Progress towards freedom from TB

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 remained at 0.21 percent. In September 2014, the national infected herd period prevalence rate again fell to 0.2 percent and the period prevalence rate for the 2014–2015 financial year was 0.14 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 maintain its infected herd period prevalence rate at 0.2 percent or less and hold it there for the next three years.

Tuberculosis in cattle

At 30 June 2015, 39 cattle herds (0.06 percent point prevalence) were classified as infected with TB. During the preceding 12 months, of the 81 infected herds that were in a position to have their infected status revoked, 54 (67 percent) tested clear. Of the 67 400 clear-status herds, 24 (0.04 percent) were identified as infected during 2014–2015. The 12-month infected-herd period prevalence to 30 June 2014 was 0.14 percent.

During the 12 months to 30 June 2015, 4.41 million cattle (3.19 million dairy cattle and 1.22 million beef cattle) were tested with the intradermal caudal fold tuberculin test (CFT). Of these, 104 skin-test-positive animals were identified and slaughtered.

An additional 9 640 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 179 reactors (2 percent) to these ancillary serial tests and they were all slaughtered. Ancillary parallel testing (gamma-interferon) was undertaken on 32 940 caudal-fold-test-negative cattle from infected herds. There were 87 reactors to the parallel tests and all were slaughtered.

In total, 370 reactor cattle (eight per 100 000 tested) were slaughtered, of which 141 (38 percent) either had visible lesions of tuberculosis, or *M. bovis* was cultured from samples taken from them.

A further 26 tuberculous cattle (1.1 per 100 000 slaughtered) were detected during routine meat inspection of the 2.6 million cattle sent for slaughter during the previous 12 months.

The 12-month period prevalence of tuberculosis in cattle (141 tuberculous reactors and 26 infected cattle found during routine slaughter) for the 2014–2015 financial year was 2.6 per 100 000 cattle (base cattle population ~ 10 million).

Tuberculosis in deer

At 30 June 2015, two deer herds (point prevalence = 0.08 percent) were classified as infected with tuberculosis. During the preceding 12 months, of the four infected herds that were in a position to have their infected status revoked, two (50 percent) tested clear. In addition, one of the 2 548 (0.04 percent) clear-status herds was identified as infected. The 12-month infected-herd period prevalence to 30 June 2015 was 0.16 percent.

During the 12 months to the end of June 2015, a total of 252 551 deer were tested with the mid-cervical intradermal tuberculin test (MCT). Of these, 207 test-positive animals were identified and slaughtered.

An additional 1 033 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 27 reactors (2.6 percent) to these ancillary tests and all were slaughtered. No ancillary parallel testing (IgG ELISA test) was undertaken in 2014–2015.

In total, 234 reactor deer (nine per 10 000 tested) were slaughtered, of which three had visible lesions of tuberculosis, or *M. bovis* was cultured from samples taken from them.

In addition, TB was detected in a single deer during routine meat inspection of about 397 000 deer sent for slaughter during the preceding 12 months. The 12-month period prevalence of tuberculosis in farmed deer for the 2014–2015 financial year was 0.4 per 100 000 (base farmed deer population ~ 1 million).

Prevalence of tuberculosis

The point prevalence of infected cattle and deer herds at 30 June 2015 was 0.06 percent and the 12-month period prevalence for 2014–2015 was 0.14 percent.

Tuberculosis in wildlife

Tuberculous possums and occasionally other wildlife (pigs, deer, cats, ferrets, stoats, hedgehogs and hares) have been identified historically 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 and the main wildlife vector for TB in cattle and farmed deer. However, in a number of VRAs 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.

In work undertaken to meet the NPMP objectives in the 2014–2015 financial year, possums were controlled on 3.36 million ha of land (2.91 million ha ground control and 0.45 million ha aerial control), with a cumulative area under vector control of about 7 million ha (26 percent of New Zealand's land area).

At June 2015, VRAs covered about 33 percent of New Zealand's land area. During the 2014–2015 financial year, wild animal surveys were undertaken in VRAs to provide objective data to:

- support areas that are in the process of proving that the possum population is TB free;
- determine whether buffer areas are

restricting movement of TB wild animals into Vector Free Areas;
- provide guidance to vector control operations; and
- support research programmes.

Table 1 shows the species and number of wild animals that were surveyed (or provided from Landcare Research projects) and the number that were found with TB in VRAs in 2014/15.

Table 1: Numbers of wild animals sampled and number with TB (pending diagnostic confirmation) in 2014–2015

	Possums	Wild pigs	Wild deer	Ferrets	Others
Number sampled	9 729	1 348	40	2 048	7 stoats 11 feral cats
Number with TB	12	35	1	7	0

VFAs account for 67 percent of the total land area and in 2014–2015 contained 28 percent of infected cattle herds. As a result of finding infection in herds within VFAs (or owing to concerns over wild animal releases), feral pig surveys were undertaken at Waitakere, Waiuku, Tokoroa, Urewera, Wairoa and Waitotara. This resulted in 60 wild pigs being killed and necropsied. All tested negative for TB.

Research summary 2014–2015

This year there was also a significant effort by 19 authors to write nine papers for a special issue of the *New Zealand Veterinary Journal*, titled *Control of bovine tuberculosis in New Zealand in the face of a wildlife host: A compiled review of 50 years of programme policy, design and research*. This collection of free-online papers provides a full account of the research that has underpinned TB eradication under the National Pest Management Plan for bovine TB in New Zealand (http://www.tandfonline.com/toc/tnzv20/63/sup1).

Survey-then-control: rapid declaration of TB freedom

The core requirement for knowing when to stop possum control is knowing when an area becomes free of TB. The standard approach to achieve this is to carry out several years of possum control followed by wildlife surveillance, which is expensive and takes many years. This project tried using wildlife surveillance first, followed by control, with the aim of reducing costs and the time to declaring freedom from TB. This Survey-then-Control (StC) approach was undertaken in a large-scale demonstration trial during an aerial 1080 operation in the Hokonui Hills in winter 2014. Given appropriate assumptions, the results showed a greater than 0.99 probability that TB has been eradicated from the possum population in the Hokonui Hills vector control zone. This trial will underpin design guidelines for implementing the new National Pest Management Plan from July 2016.

Using livestock as sentinels of TB in possums

If livestock are TB-free on farms in places where possums also occur, what does this tell us about the probability of TB in those possums? The aim of this project was to use livestock TB surveillance data to predict the probability that possums in the same space were also TB free. Livestock data can be used along with data from possums, pigs, ferrets, and deer to increase the sensitivity of surveillance programmes when generating probabilities of freedom using the Proof of Freedom (POF) Utility. This uses vector and livestock surveillance data to calculate the probability of freedom in both wild and domestic animals in a defined area. 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. The potential benefits from this project are lower surveillance costs and shorter time to achieve a target probability of TB freedom in wildlife.

Reducing aerial 1080 bait sowing rates

This project built on previous research to reduce the cost of aerial control and the amount of 1080 bait being applied to the environment, but looked specifically at using the lower-cost option of fixed-wing aircraft for applying the bait. Previous research had shown that in the North Canterbury/Marlborough high country, possums have a large forage range, averaging 339 metres over 3 nights. This trial was designed to evaluate the information on distance between bait swaths, and postulated that 95 percent of possums would be put at risk if bait swaths were deployed 150 m apart. In unforested Marlborough high country bait was sown in strips, but at the equivalent broadcast sowing rates of 400 g/ha (125 m flight path spacing) in one treatment block and 285 g/ha (175 m flight path spacing) in another. Both sowing rates achieved a 100 percent kill of radio-collared possums. These results show the potential of correctly matching the specifications of an aerial operation to the habitat and possum density.

Bird by-kill from 1080 operations

The aim of this project was to see if recent changes to aerial 1080 operations (e.g., sowing bait in strips or clusters, using pre-feed or adding deer repellent) pose any risk to birds. The number and relative abundance of birds found dead after 15 aerial baiting operations between 2003 and 2014 was reviewed. Of 81 bird carcasses found, 68 (84 percent) were introduced species (mostly blackbirds) and 13 (16 percent) were native species (comprising 8 kereru, 2 tomtits and 1 each of tui, fantail and silvereye). Overall, significantly fewer birds were found where strip- or cluster-sowing had been used than where standard broadcast sowing had been used. This may have been because of the lower sowing rates used rather than the sowing method itself. Residues of 1080 were detected in only 18 percent (2/11) of the native birds analysed (both tomtits), compared to 94 percent (33/35) of the introduced birds. Using deer repellent did not increase bird deaths. The results suggest that modern 1080 baiting operations pose only a small threat to native forest bird communities, especially relative to the threats they face from the targeted pests.

Sex pheromones as possum lures

From the time possums were first trapped for fur in New Zealand in the 1920s, trappers have used a wide variety of flavours such as aniseed, cloves, cinnamon and curry, believing these smells act as lures and therefore increase capture rates. Research has shown that most food-based flavours don't work as lures, but this project, which examined the effect of pheromones on possum behavior, showed both male and female possums were interested in trap sites where oestrous female urine was present (kept in small plastic pottles with holes in the lid). The compounds present in oestrous female urine have been identified using mass spectrometry and mixtures of synthetic compounds are now being tested to find which elicit the greatest response.

Paul G Livingstone QSO
Manager, TB Eradication and Research
TBfree New Zealand
paul.livingstone@tbfree.org.nz

Independent reviews praise OSPRI research

For more than 20 years, OSPRI has supported a significant research programme to ensure its policies and operational practices are based on robust science and that staff have access to relevant information for making informed decisions.

This year, as part of the TB National Pest Management Plan review process, the governance group commissioned two independent reviews of the research programme: of the effectiveness of research undertaken over the past 5 years, and of the science underpinning the proposition that TB can be completely eradicated from New Zealand.

The first review concluded that "New Zealand's TB research programme should be seen as a remarkable success story." The second review concluded that "The science underpinning the proposition that TB can be completely eradicated from New Zealand is on the whole sound."

These two reviews provide independent and positive confirmation that OSPRI's research programme, delivered by working with key research partners, has been well focused on improving the cost-effectiveness of vector control and disease diagnostics.

These excellent reviews are testament to the significant role Dr Paul Livingstone has played in guiding and managing the research programme over two decades, including managing the Research Technical Advisory Group and maintaining effective partnerships with external research providers. As Dr Livingstone has recently retired from this role, OSPRI would like to take this opportunity to acknowledge his contribution and the role the research programme has played in significantly reducing the incidence of infected herds in New Zealand and enabling our stakeholders to believe that bovine TB can now be eradicated.

Michelle Edge
Chief Executive, OSPRI

American foulbrood

American foulbrood (AFB) is caused by the bacterium *Paenibacillus 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 was transferred 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 at www.nba.org.nz. Recently, 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, i.e., the NBA.
- To become approved, beekeepers must first pass a competency test on AFB recognition and control, then submit a hive and AFB management plan to the Management Agency or its contractor, AsureQuality Ltd. This is called a Disease Elimination Conformity Agreement (DECA).
- Beekeepers must submit samples of bees and/or honey for AFB testing on request.
- 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 2015

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 2014 and 31 May 2015, 1 309 cases of AFB were found by beekeepers and/or AsureQuality staff, in 864 apiaries (0.23 percent of hives; 2.5 percent of apiaries). The corresponding AFB infection rates for 2013–2014 were 1 138 hives (0.22 percent) and 707 apiaries (2.3 percent).

As of 10 June 2015 there were 3 315 beekeepers with DECAs and a Certificate of Inspection (COI) Exemption (60 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 521 new DECAs were approved. This is a 30 percent increase on the number of approvals issued last year and has resulted in a slight increase in the percentage of accredited beekeepers. Additionally, 287 DECA reviews were undertaken this last season, with 188 beekeepers making some amendment to their agreement.

Apiary register and statistics

There were 5 551 beekeepers, 34 476 apiaries and 575 872 hives on 10 June 2015. This compares to 4 816 beekeepers owning 507 688 hives on 30 690 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 (15 percent) is rising at a faster rate than last year and is not showing any signs of levelling out in the next 12 months. Beekeeper numbers have now eclipsed pre-varroa levels and have more than doubled since the low point in 2008 (**Figure 1**). As in recent years, this net increase resulted from a combination of both commercial and hobby beekeepers, which resulted in little change to the average number of hives per apiary. Hive numbers increased by 13 percent over last year, which was mostly driven by the large corporate beekeeping interests continuing to expand their hive holdings in the interests of security of honey supply via vertical integration.

The main increases were again in the North Island, where 76 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. Additionally, for every hive in the South Island, there are

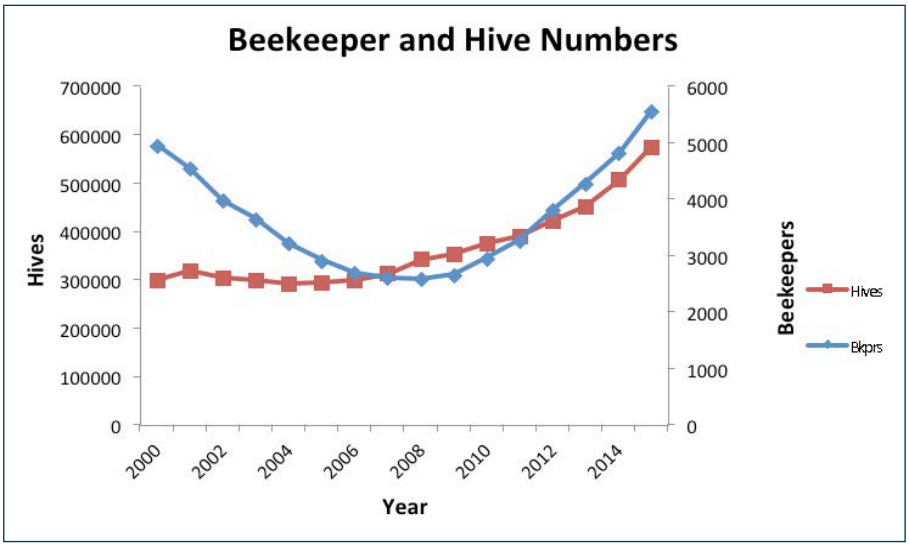

Figure 1: Number of hives and beekeepers, 2000–2015

Continued on page 37

Annual reports from industry surveillance and disease control programmes

Brucella ovis accreditation scheme 2014

Numbers of animals tested in 2014 were slightly down compared to 2013 (**Table 1**). The overall infection rate (reactors/samples tested) was 1.8 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.

From the table, it is apparent that not all flocks with reactors had any further investigation during 2014. Some of these 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.

Gail Ross and *Emma Sharland*
Gribbles Veterinary Pathology
Palmerston North
gail.ross@gribbles.co.nz
Emma.sharland@gribbles.co.nz

Table 1: *Brucella ovis* testing and eradication, 2014

Area	Flocks with reactors *	Flocks with eradication in progress or completed
Northland & Auckland	0	0
Waikato, Waitomo & BOP	0	0
Taranaki & Wanganui	7	7
East Coast	8	7
Hawke's Bay	1	1
Manawatu & Rangitikei	3	2
Wairarapa & Wellington	2	0
Marlborough & Canterbury	3	3
Otago & Southland	8	8

*Infected flocks are those that have had *B. ovis* reactors identified but not always confirmed by further testing

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 2014, the two private poultry laboratories screened a total of 9 099 blood samples collected under the whole-flock testing programme. Samples were screened using the IDEXX FlockChek ELISA. Fifteen sera were positive to the ELISA and these were forwarded to MPI's Investigation and Diagnostic Centre (IDC) for virus-neutralisation testing. Subsequently MPI carried out further on-farm investigations, including blood sampling, serology and collection of bursa for histology and PCR testing. All results were negative and the investigations concluded that IBD was not present.

Reference

Brooks M (2003). Poultry disease surveillance in New Zealand. *Surveillance* 30(1), 12–14.

Kerry Mulqueen
Senior Executive Officer – Technical
Poultry Industry Association of NZ
Egg Producers Federation of NZ
NZ Feed Manufacturers Association
Auckland
Kerry@pianz.org.nz

American foulbrood – from page 36

almost three hives in the North Island. There were 4 956 registered beekeepers before the discovery of varroa mite in Auckland in March 2000. The increase in all statistics continues to be driven by high manuka honey prices and also by a strong interest in pollination and home food production.

Byron Taylor
Apiculture Technical Manager
AsureQuality Limited
Hamilton
byron.taylor@asurequality.com

Poultry health surveillance

The tables presented here summarise results of health testing in the poultry industry during 2014. **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.

Kerry Mulqueen
Senior Executive Officer – Technical
Poultry Industry Association of NZ
Egg Producers Federation of NZ
NZ Feed Manufacturers Association
Auckland
Kerry@pianz.org.nz

Table 1: Serological test results summary: poultry – 2014

Disease	Number tested	Number positive	Vaccination status*
Newcastle disease†	1 974	8 ‡	
Egg drop syndrome	1 249	237	(V)
Chicken anaemia	1 843	1 235	V
Avian encephalomyelitis	2 363	1 756	V
Infectious bronchitis	3 265	2 216	V
Reovirus	2 700	2 690	(V)
Infectious laryngotracheitis	4 138	3 907	(V)
Mycoplasma gallicepticum	13 653	746	
Mycoplasma synoviae	10 836	311	
Mycoplasma meleagridis	8 464	515	
Salmonella Pullorum	3 070	0	
Infectious bursal disease	9 099	15♠	
Avian influenza	1 361	1♦	
Inclusion body hepatitis	206	62	

* V = all vaccinated; (V) = some vaccinated
† New Zealand has never experienced an outbreak of Newcastle disease. A subclinical enteric strain of avian paramyxovirus type 1 (AMPV-1), with an intracerebral pathogenicity index (ICPI) of 0.00-0.16, is endemic in this country
‡ Resolved as negative by subsequent further investigation
♠ Resolved as negative by subsequent further investigation; refer IBD annual report page 37
♦ Resolved as negative by subsequent further investigation

Table 2: Serotypes of *Salmonella* isolated during the year 2014*

Salmonella isolates	Finished and feed sources	Broiler samples *
Agona		20
Anatum		123
Infantis		8
Livingstone		1
Montevideo	1	
Senftenberg		8
Species group C		7
Species group E		1
Total positive/total tested	1/1 538	168/3 770

* Samples include environmental swabs and whole carcass rinse birds

Quarterly report of diagnostic cases: April to June 2015

New Zealand Veterinary Pathology

Bovine

Six calves less than six weeks old in the Waimakariri district had severe diarrhoea. Two pooled samples (each from three calves) showed evidence of **cryptosporidium** infection. Culture was positive for ***Salmonella* Typhimurium**.

A group of eight-month-old calves in the Waikato region had fleshy, warty growths on the lateral sclera. Histology on one of these growths revealed that it was composed of exuberant granulation tissue arising from chronic ulceration of the sclera and conjunctiva. Tests for BVD and trace elements on sera from two animals were normal, but GGT values for both were very high (3 341 and 2 988 IU/L; reference range 0–36). One animal was in very poor condition and was sacrificed for postmortem. Histology on tissues from this animal revealed evidence of biliary proliferation in the liver (likely secondary to sporodesmin ingestion), accompanied by a multifocal necrosuppurative hepatitis and splenitis, consistent with bacteremia. This animal also had ocular lesions similar to those described above. The cause of the eye lesions in this group was likely a direct contact irritant effect of the **sporodesmin** from grazing a highly contaminated pasture. The agent underlying the bacteremia in the necropsied animal was not established.

A 10-year-old cow in South Waikato was found down, with pale mucous membranes and a low heart rate. Biochemistry revealed a marked cholestatic hepatopathy with an elevated GGT (2 796 IU/L; reference range 0–36), consistent with ingestion of plant material containing elevated levels of **sporodesmin**. There was also a marked anaemia, with numerous organisms consistent with *Theileria orientalis* visible on the red blood cells. A PCR test confirmed the presence of ***Theileria orientalis* Ikeda**.

A farm in North Waikato reported last quarter as having an outbreak of ***Salmonella* Bovismorbificans** continued to experience losses and decreased production during this quarter. At the time of this report about 30 cases had been identified, accounting for about 10 percent of the milking herd.

Two cows from another dairy herd in the Waikato exhibited severe watery diarrhoea, reduced production and lethargy. A faecal sample was forwarded to the laboratory for culture, which yielded ***Salmonella* Bovismorbificans**.

A group of nine Angus cattle were bought from a sale and shipped to a new property. Ten days later all were lame, with tender feet and swelling above the claws on the plantar surface of the foot. There was no pain elicited when hoof testers were used. A **superficial neutrophilic dermatitis** was diagnosed on histological examination of a sample taken from one of the affected feet. Bovine digital dermatitis could not be ruled out.

A group of 10 cows in the Hauraki district exhibited weakness and ataxia two weeks after drying off. Serum cooper and selenium levels were markedly decreased in all animals tested. Copper levels ranged from 3.6 to 4.0 nmol/L (reference range 8.0–20), and selenium levels from < 50 to 120 nmol/L (reference range 150–3 500). **Selenium and copper deficiency** were considered to be underlying the clinical disease.

A herd of cattle in the Taupo region broke into a paddock of swedes and ate a considerable amount before being discovered. Biochemistry on one animal exhibiting colic signs revealed a marked increase in GGT (181 IU/L; reference range 0–36), a marked increase in GLDH (792 IU/L; reference range 8–41) and a marked hyperbilirubinemia. **Glucosinolate toxicity (turnip toxicity)** was diagnosed.

A yearling heifer in the Bay of Plenty had pale mucous membranes and appeared to struggle to rise, despite eating well. Haematology revealed a mild nonregenerative anaemia with low numbers of Heinz bodies. The GGT value was mildly elevated. Serum zinc was markedly elevated (82 µmol/L; reference range 11–20). **Zinc toxicity** was diagnosed.

Seven dairy cows died in South Waikato. They had been fed grass pasture, with increasing amounts of kale over the previous week. A further cow had been found dead the previous morning. The dead animals had ocular fluid nitrate levels ranging from 50 to 250 mg/L. Levels of > 25 mg/L are considered consistent with **nitrate toxicity**.

A group of heifers in the Waikato were noted to be coughing. Numerous ***Dictylocaulus* spp.** larvae (26 per gram of faeces) were found on testing with a Baermann apparatus. **Lungworm** was diagnosed.

A mob of Angus heifers in the Rotorua district were trucked from an area where the soil was high in arsenic, two days before presenting with neurological signs and scour. Biochemistry revealed moderate azotaemia, which was ascribed to dehydration. The kidney arsenic level was 11.1 mg/kg (toxic level > 4). **Arsenic toxicity** was diagnosed.

A group of 10-month-old calves in the Waikato region exhibited moderate scour and weight loss. Culture from several of the animals revealed ***Yersinia pseudotuberculosis***.

In early autumn nine dairy cows were found down in a paddock in the Waitaki district. They had not eaten any grass the previous night, owing to recent dispersion of effluent on the paddock. Magnesium oxide and calcium carbonate supplementation had also been stopped 48 hours prior. Calcium and magnesium testing revealed a marked **hypocalcaemia** in the seven cows tested. This was likely due to a combination of decreased feed intake and cessation of supplementation in the face of high demand, as the cows were likely still being milked.

A whole herd of cows in the Buller district showed a marked production drop in early autumn. Young cows appeared more affected, and one animal had recently died. Two cows

had evidence of haematuria. Testing of GGT levels in affected animals revealed a marked increase, with many animals having levels > 3 000 IU/L (reference range 0–36). Copper and zinc levels were normal. A severe **cholangiohepatopathy** was diagnosed, which was likely due to **sporodesmin** exposure.

Three dairy heifers aborted among a group of 100 in the Waitaki district. The cows appeared normal on physical examination, and there was no history of access to macrocarpa or pine. The herd had been vaccinated for leptospirosis, but not for bovine viral diarrhoea or salmonella. Histological examination of one of the aborted fetuses revealed evidence of a suppurative placentitis. ***Salmonella*** **Brandenberg** was isolated from the placenta and fetal stomach fluid.

Twelve dairy cows out of a herd in the Manawatu district died over two days, with evidence of acute mastitis. Culture from one of the animals revealed a pure growth of ***Escherichia coli***, suggesting that **coliform mastitis** was the cause of the deaths.

A yearling beef mob in Marlborough had a history of diarrhoea and had been recently dewormed. Faecal culture from two of these animals revealed the presence of ***Yersinia pseudotuberculosis*** in one. Five animals tested for serum selenium all had low levels (65–120 nmol/L; reference range 150–3 500). **Yersiniosis** complicated by **selenium deficiency** was diagnosed.

Faecal samples from three cows in the Waikato district with a history of diarrhoea and ill-thrift were submitted for culture. ***Salmonella*** **Typhimurium** was cultured from all three cows. **Salmonellosis** was diagnosed.

Equine

A yearling colt in the South Auckland area had a history of sudden onset of lameness two weeks prior to presentation. A pocket of fluid was palpable around the distal third metacarpus. Arthrocentesis was performed and culture of the fluid cultured yielded ***Salmonella*** **Typhimurium**.

An eight-year-old Standardbred mare in the Auckland region had scabs visible on the chest. Cytology on an impression smear taken from one of the scabs revealed the presence of characteristic paired cocci in a "railway track" formation. **Dermatophilosis** was diagnosed.

An 11-year-old Thoroughbred gelding in the Waikato region collapsed suddenly. Biochemistry revealed only a very mild elevation of serum amyloid A, with a normal creatinine kinase level. The whole-blood selenium level was 590 nmol/L (reference range 1 600¬–3 200), suggestive of selenium deficiency. The troponin I level was 113 ng/L (reference range 0–95), consistent with damage to the myocardium. **Cardiomyopathy**, likely due to underlying **selenium deficiency**, was diagnosed.

Ovine

A group of lambs in Marlborough had problems with increased mortality accompanied by death and ill-thrift. Faecal egg counts on seven samples revealed moderate numbers of strongyle eggs (1 100–3 500 per gram). A faecal swab from one animal produced a moderate growth of ***Yersinia enterocolitica***. Gastrointestinal parasitism complicated by **yersiniosis** was diagnosed.

Avian

A 14-year-old African Grey parrot (*Psittacus erithacus*) kept by a private breeder in Auckland died suddenly. It had been treated for seizures for a few days prior to death. Necropsy revealed extensive dermatitis affecting the proximal ends of both wings (likely the result of self-trauma) and there was evidence of haemorrhage over the surface of the skull. Histologically there was evidence of marked **atherosclerosis** affecting the aorta, accompanied by valvular endocardiosis.

A takahe (*Porphyrio hochstetteri*) from a collection in Auckland was found moribund and died two hours later. Histology on necropsy specimens submitted to the laboratory revealed the presence of numerous Gram-positive pleomorphic bacteria clustered within the blood vessels of the liver and spleen. Similar bacteria were also present along the tips of the intestinal villi, associated with small regions of necrosis. ***Erysipelothrix rhuseopathiae*** was cultured.

Reptile

A forest gecko (*Mokopirirakau granulatus*) kept in a private collection in Auckland died after a period of anorexia. Two other forest geckoes that had been in contact with the submitted animal had died previously. Histological examination revealed oophiritis, coelomitis and hepatitis, with evidence of proliferating short bacilli. There was also marked ulceration of the tail skin, with inflammation of the underlying muscle accompanied by Zygomycete fungal proliferation. ***Salmonella*** **Saintpaul** was isolated from a swab of the coelomic cavity, and **salmonellosis** was diagnosed. Another forest gecko that had been in contact with this animal and died several weeks previously was also submitted. It had been kept in a freezer until submission. *S.* Saintpaul was also cultured from this animal.

Zoo animal

Faecal samples from two cheetahs (*Acinonyx jubatus*) had a history of acute gastroenteritis. Tests for parasitism were negative, but enrichment culture of a pooled sample from both animals was positive for ***Salmonella*** **Infantis**, and **salmonellosis** was diagnosed.

Gribbles Veterinary Pathology

Bovine

In late April, 50 mixed-age Friesian cross dairy cows in North Waikato were showing a range of clinical signs including rapid weight loss, decreased milk production, diarrhoea, haemoglobinuria and icterus with no photosensitisation. Two had died and two were moribund. They had received zinc in their drinking water to prevent facial eczema, and were being fed maize silage and grass. Significant findings in

haematology and biochemistry from three cows were increases in GGT (up to 1 641 IU/L; reference range 7–40), AST (up to 5 033 IU/L; reference range 62–206), GLDH (up to 540 IU/L; reference range 0–45) and bilirubin (up to 114 umol/L; reference range 0–15). There was marked regenerative anaemia consistent with haemolysis in one cow, with PCV 0.08 (reference range 0.24–0.4), MCV 94 fL (reference range 38–56) and absolute reticulocytes 69.78 x 10^9/L (reference range 0–1 x 10^9). No *Theileria* organisms were seen and serum copper and zinc levels were unremarkable. It was felt that **sporidesmin toxicity (facial eczema)** was the most likely cause of the hepatopathy and haemolysis.

Two mixed-age autumn-calved dairy cows in North Waikato had weight loss and diarrhoea. A serum antibody ELISA test for *Mycobacterium avium* ssp. *paratuberculosis* was positive in both. One was euthanased and at necropsy prominent mucosal thickening and corrugation of the ileum was noted. Histopathology of the affected area showed many histiocytes infiltrating and expanding the ileal mucosa and submucosa. Special stains showed that they contained acid-fast bacilli, confirming a diagnosis of **Johne's disease**.

A three-year-old cow from the Auckland region was ill-thrifty and had a large submandibular lymph node containing multiple abscesses. Histopathology showed eosinophilic and granulomatous inflammation, fibrosis and haemorrhage centred on Gram-negative coccobacilli surrounded by hypereosinophilic material ("club colonies"). Nodal **actinobacillosis** was diagnosed, which was likely secondary to a primary oral lesion.

Two mature Simmental and Jersey cross beef cattle from the Auckland region aborted at about five months' gestation. There were no gross abnormalities on dissection of a fetus and a placenta (apart from fetal oedema), and no significant bacteria were isolated from fetal stomach contents. *Neospora* antibody IFAT titres on the dams were 1:1 000 and >/= 1:2 000, (> 1:600 is consistent with recent infection) and histopathology of the fetus from the dam with the higher titre showed myositis, myocarditis, encephalitis and nephritis, consistent with abortion caused by ***Neospora caninum*** infection.

Four mixed-age dairy cows in a herd of 280 from North Waikato had aborted. The feti were fresh and about six to seven months' gestational age. There had been no herd introductions or dietary changes but there was a history of access to pine needles, and the cows had recently ceased lactation, with related husbandry activities. Serology for *Neospora* by IFAT was negative in two animals. Samples of placenta from each cow yielded a heavy growth of *Escherichia coli* and light growth of *Streptococcus uberis*. Histopathology of both placentae revealed fibrinosuppurative placentitis with intralesional Gram-negative bacilli and other mixed bacteria. ***Escherichia coli* bacteraemia and placentitis** was suspected.

A group of one-to-three-week-old calves from the Auckland region developed diarrhoea and some died. Pooled faeces from four calves were positive for rotavirus antigen and *Cryptosporidium* antigen, diagnosing combined **rotaviral infection and cryptosporidiosis**.

Fifteen of 30 six-week-old calves from Northland developed diarrhoea. They had been previously diagnosed with rotaviral infection as neonates. Faecal cultures isolated *Salmonella* Typhimurium, and small numbers of coccidial oocysts were found in two calves, suggesting combined **salmonellosis and coccidiosis**.

Cases of fatal **adenovirus infection** are seen during autumn each year in rising-one-year-old cattle. Two cases were seen this year from dairy farms in Mid and South Canterbury. One calf died suddenly and the other was noted to be sick but died quickly. One had haemorrhagic diarrhoea. Typical adenovirus inclusions were visible on histopathological examination of several tissues and were especially prominent in the kidney.

Four 11-month-old dairy calves in a mob of 150 on a South Canterbury farm were lethargic and had bloody diarrhoea. They had previously had access to acorns, although none were present in the rumen of one calf at postmortem. As well as bloody diarrhoea, the calf had perirenal oedema and large amounts of pale yellow, clear fluid in the abdomen. Histological examination revealed lesions of renal tubular necrosis, consistent with **acorn toxicity**.

A total of 20 six-month-old calves in a mob of 250 died over a five-day period on a Southland beef farm. The dead calves were often found recumbent near water, with no signs of a struggle. At necropsy they were in very poor condition and had signs of diarrhoea. Their eyes were sunken, consistent with severe dehydration. The mucosa of the abomasum had a nodular appearance and a severe **parasitic abomasitis** was confirmed on histology of the abomasum, consistent with **ostertagiosis**. The calves had been drenched two weeks previously by an inexperienced worker, and when later checked the drench guns were found to be faulty and not delivering the stated dose.

A mature cow on a Southland dairy farm showed a markedly reduced milk yield at the night milking and was slow to come into the shed next morning. Clinical examination revealed severe dehydration and liquid, bloodstained faeces. Biochemical analysis and haematology revealed dehydration and lymphopaenia. The cow by this time was recumbent. As a guarded prognosis was given, the cow was euthanased and necropsied. The only post-mortem changes of significance were very congested mucosa of the lower small intestine and the colon, caecum and rectum. Histopathological examination of multiple sections of the colon showed a marked loss of the epithelial cells lining the crypts of the mucosa, and a heavy infiltration of lymphocytes. A PCR test performed on EDTA blood taken for haematology was

positive for **malignant catarrhal fever**.

A three-year-old milking cow in Otago deteriorated rapidly and had pale mucous membranes. Blood sampling confirmed it was anaemic, with PCV 0.07 (reference range 0.24–0.41). The cow was found dead the next day and necropsy revealed dark-coloured intestinal contents, enlarged sublumbar lymph nodes and a large amount of plastic baleage wrap in the rumen. Sections of the myocardium and enlarged nodes revealed numerous neoplastic lymphocytes infiltrating these tissues, confirming a diagnosis of **lymphoma**. Serological testing for enzootic bovine leucosis virus was negative.

Tutu (*Coriaria arborea*) poisoning killed 29 of 89 young beef cattle on an Otago hill farm. Another nine animals were found circling, ataxic and partially blind; they were aggressive, foaming at the mouth and regurgitating rumen contents. They had been introduced to a new paddock containing tutu bushes two days before and were short of pasture.

Pregnant heifers were introduced to a large paddock that furnished only a minimal feed supply and contained numerous wilding pines. Many of the heifers aborted over a short period after ingesting pine needles from these trees. The farmer had recently purchased the farm and was unaware of the potential danger of wilding pines, which can result in **abortion** as they contain **isocupressic acid**.

A milking cow on a Southland dairy farm had a two-day history of reduced milk production and anorexia, with profuse, watery diarrhoea containing flecks of intestinal mucosa. A heavy growth of ***Salmonella*** **Typhimurium** of an unidentifiable phage type was isolated from a faecal sample.

On an Otago dairy farm, eight cows were found recumbent in a paddock of fodder beet. They had broken through an electric fence break and gained access to the main area of the paddock. A blood sample taken from two of the recumbent cows showed very low serum bicarbonate levels (4 and 7 mmol/L; reference range 26–34), consistent with severe **ruminal acidosis**.

A number of dairy heifers on a Southland dairy farm developed severe bilateral conjunctivitis, with swollen lower eyelids and purulent ocular discharge. A few had a nasal discharge as well. Conjunctival swabs taken from three affected heifers failed to grow any significant bacteria but all the swabs were positive for **infectious bovine rhinotracheitis** by PCR.

Seventeen dairy cattle in mid-pregnancy on a Southland dairy farm aborted over a short period after being exposed to and eating macrocarpa foliage. **Macrocarpa (*Cupressus macrocarpa*)** contains **isocupressic acid**, which can result in **abortion**. Serological tests for other agents of abortion were negative.

There were two small outbreaks of **ergotism** on Southland dairy farms in late June. In both cases the cattle were exposed to ergot-contaminated ryegrass in baleage. In one case, eight out of a mob of 30 heifers exhibited swollen painful lower limbs and pyrexia.

On a Southland dairy farm, seven cows in a mob of second-calvers aborted over a two-week period. The calves were all autolysed and the affected cows had to be assisted and treated with antibiotics. Cows in the aborting mob had been fed fodder beet and baleage. Other pregnant cows grazing fodder beet without access to baleage were unaffected. A heavy growth of ***Salmonella*** **Brandenburg** was isolated from the stomach contents of one of the aborted calves.

On an Otago dairy farm, 110 winter-milking cows were being fed a mixed ration, including brewer's grain. After canola meal was added to the ration, eight cows became recumbent over the next three days. Affected cows appeared paralysed, were very depressed, unable to stand and had a protruding, flaccid tongue. These clinical signs resembled botulism but affected cows treated with activated charcoal by stomach tube recovered within 24 hours and were able to return to the milking herd. One untreated cow took longer to recover. **Mycotoxicosis** from the ration was suspected as a possible cause. The canola meal was removed from the ration and no more cases were seen for a few days, but then they resumed sporadically. In cases where the farmer detected the effects early, the cows recovered after being fed grass only.

A 700-cow herd on a Southland dairy farm was introduced to a paddock of herbicide-tolerant swedes. Within a few days 40 of the cows developed **photosensitivity**, mainly involving the udder and teats, while others had red, crusty lesions on the white skin of the nose. Blood samples were collected from seven affected animals. GLDH concentrations varied from 101 to 829 IU/L (reference range < 59) and GGT concentrations varied from 145 to 953 IU/L (reference range 6–37), consistent with acute **cholestatic liver disease**.

Two cows aborted on a Rotorua dairy farm and 18 abortions were reported on a neighbouring farm with a mob of 400 cows. Fetal tissues from the two most recent abortions were examined and lesions in the brain and heart from both were found to be characteristic of ***Neospora caninum*** infection. On another property in the Bay of Plenty, two cows aborted in a small dairy herd. Both had immunofluorescent antibody titres of > 1:2 000 against *N. caninum*, also confirming a diagnosis of **neosporosis**.

During pregnancy scanning on a Taranaki dairy farm two mummified fetal calves were found. Sera collected from the two dams and tested for antibodies to ***Neospora caninum*** had immunofluorescent antibody titres of > 1:2 000, confirming recent infection and the cause of the abortions.

Twelve cows from a mob of 300 mixed-age Angus cross cattle on a Central North Island sheep and beef farm developed necrosis of the distal limbs. Skin samples from one affected cow showed extensive **ischaemic necrosis**, which was most suggestive of **ergovaline exposure (ergotism)**.

Two 3-year-old Angus cross steers from a herd of 400 on a Rangitikei hill-country property lost condition and developed diarrhoea. Serum samples were tested for antigen to **bovine viral diarrhoea virus** (BVDV). One sample returned a high positive result for antigen, confirming persistent infection with BVDV.

Four 20-month-old Simmental cross steers from a mob of 40 on a Wairarapa farm developed diarrhoea and lost weight over a period of 10 days. Feed conditions were good and the steers had been recently treated with anthelmintics. Serum selenium concentrations were 75, 75, 90 and 90 nmol/L (reference range 140–2 000), confirming a diagnosis of **selenium deficiency**.

Seven dairy cows died and 12 were recumbent from a herd of 200 in the Rangitikei district. They died within 24 hours of ceasing milking. Each animal had been treated with intramammary antibiotics to prevent mastitis and then held in the yards for about 18 hours. Post-mortem and histopathological examination found evidence of sepsis in the tissues, and a heavy growth of *Escherichia coli* was isolated from milk samples from the affected cows. It was concluded that opportunistic infections of the mammary glands had developed after prolonged yarding, leading to **E. *coli* septicaemia**.

A mob of 40 ten-month-old bulls from Taranaki were ill-thriven and developed diarrhoea. Faecal samples collected from four bulls had a mean faecal egg count of 420 eggs per gram, and ***Yersinia pseudotuberculosis*** was isolated from three of the samples, confirming a diagnosis of **gastrointestinal parasitism and yersiniosis**.

Five cows out of 250 on a Taranaki dairy farm had aborted during the previous week. All the cows retained their fetal membranes. One animal in the process of aborting was found dead, so a necropsy was undertaken. Severe fungal pneumonia and placentitis was found on histopathology, and fungal placentitis was also present in fetal membranes collected from the live cows, confirming a diagnosis of **fungal abortion**.

A significant fraction of the animals in an 80-strong mob of yearling Friesian dairy heifers on a Manawatu farm developed very poor body condition. They were on pasture, but feed was reported to be inadequate. Two became recumbent and were euthanased. Gross examination revealed gelatinous atrophy of marrow fat, diffuse nodular thickening of the abomasal mucosa, and numerous adult lungworms in the bronchi. Histology confirmed the gross impressions, identifying chronic hyperplastic and eosinophilic abomasitis with intra-lesional *Ostertagia*, and gelatinous transformation of femoral bone marrow. One of the recumbent heifers had a faecal egg count of 3 750 strongyle eggs per gram, while the other had 150 eggs per gram. The final diagnosis was **malnutrition** complicated by **ostertagiasis**.

Raised papular lesions developed on the muzzle, chin and nares of 80 out of 100 nine-month-old crossbred dairy replacement heifers on a South Canterbury farm. In the worst-affected heifers, the entire ventral chin and nasal planum were covered by coalescing, moist, cracked plaques. The animals had lost an average of 5.4 kg body weight over the preceding 41 days. Many had nasal discharge and a few were coughing. In addition, the attending veterinarian developed a raised circular 2-mm-diameter lesion on the thumb. Blood samples and skin biopsies were taken from two affected heifers. Serum vitamin B12, copper, selenium, albumin, globulin and bilirubin concentrations were normal and an infectious bovine rhinotracheitis virus ELISA test was negative. Histology revealed diffuse epithelial hyperplasia with foci of ballooning degeneration in the stratum spinosum. Ballooned cells rarely contained eosinophilic globular bodies in the cytoplasm, suggestive of parapoxvirus inclusions. These findings confirmed a diagnosis of **papular stomatitis**.

Seven 18-month-old Friesian heifers were found dead on a Canterbury dairy farm. There was no history of illness in the dead animals or the remaining 240 heifers in the mob. The animals had been on a new grass paddock during the day and taken off to straw at night. They had been left to clean up the remainder of the grass paddock the night before the deaths occurred, and this coincided with a period of foggy, overcast weather. Post-mortem examination of two animals revealed non-specific changes, including petechial haemorrhages on the epicardial fat, and increased red-brown peritoneal fluid. Histological review of multiple tissues was impeded by advanced autolysis but did not identify any significant lesions. The most significant find was the high nitrate level (25–50 mg/L; reference range 0-25) in the aqueous humor of one dead heifer, confirming the clinical suspicion of **nitrate toxicity**.

A Taranaki dairy farmer reported a run of 10 abortions over several days among mixed-age cows. The farm had a history of abortions caused by *Ureaplasma* infection, which had been diagnosed from histopathology. A mid-gestation aborted fetus was submitted for evaluation. There was moderate post-mortem degeneration but no other gross lesions were detected. Histology revealed lesions consistent with **neosporosis** (foci of necrosis and gliosis in the brain; lymphohistiocytic inflammation in the heart). Serum samples from three recently aborted dams had *Neospora* IFAT titres of >/= 1:2 000.

Two outbreaks of mycotic abortion and pneumonia were reported among Jersey cows on Taranaki dairy farms. Two abortions occurred over two weeks on one farm, and five abortions over one week on the other. One cow in each outbreak developed fatal pneumonia. Histopathology was conducted on placenta of five cows and lung from one. There was necrosuppurative placentitis with vasculitis in all cases. Negatively staining fungal hyphae with bulbous swellings and infrequent septa were seen in blood-vessel walls. Similar inflammatory changes and fungal hyphae

were observed in the lung. Although culture failed to identify the causative agent, these changes were considered consistent with **mortierellosis** caused by ***Mortierella wolfii***.

A number of 10-month-old Jersey heifers in the Waikato died quickly after eating peach tree leaves. Rumen contents from a dead animal tested positive for cyanide. Peaches are members of the *Prunus* genus, many of which contain cyanide-producing compounds (cyanogenic glycosides). Leaves and seeds reportedly have higher levels of cyanogenic glycosides than the fleshy parts of the fruit. B-glucosidase and hydroxynitrile lyase are found in the rumen, and these convert cyanogenic glycosidase to free cyanide.

Ovine

An 11-year-old pet Romney sheep from the Auckland region was dull and anorexic. Haematology revealed anaemia, with PCV 0.11 (reference range 0.22–0.4), RBC 3.05 x 10^{12}/L (reference range 9–15 x 10^{12}), neutrophilia 28.2 x 10^9/L (reference range 0.4–5 x 10^9), lymphocytosis 21.2 x 10^9/L (reference range 1.6–7.5 x 10^9/L) and large numbers of mononuclear cells (655.7 x 10^9/L; reference level 0). The mononuclear cells had a medium to high nuclear-to-cytoplasm ratio, round to indented nuclei, reticular chromatin and nucleoli. All these cytological findings were consistent with acute lymphoblastic leukaemia or **end-stage lymphoma with leukaemia**.

Samples were received from a two-tooth ewe from a South Canterbury farm where four ewes out of a mob of 700 had died suddenly. The ewes were on pasture and being fed baleage. Histological examination revealed typical lesions of **enteric listeriosis**. No further cases occurred after feeding of the baleage was stopped. A further case was diagnosed in North Canterbury, in ewes fed mouldy baleage. Six ewes in a group of a thousand had died over a week and they had a light brown scour. Samples from one ewe were received and as well as histological lesions of enteric listeriosis in the abomasum and intestine there was a suppurative endometritis with small Gram-positive bacteria, consistent with ***Listeria***.

A farm in the Nelson area had had several sudden deaths in ewes, with signs of diarrhoea. Faecal samples from three ewes all yielded a *Salmonella* sp. in culture. Some animals had aborted but they were not sick and ***Salmonella* Hindmarsh** was recovered from one aborted fetus. The neighbouring properties had had cases of S. Hindmarsh infection in their ewes just before this property was affected.

Five ewes in good condition were found dead on a Southland sheep farm. A heavy growth of ***Salmonella* Typhimurium phage type 9** was found in the intestinal contents of one. This is a rare isolate of *Salmonella* from sheep in this area, as the most common cause of sudden death in sheep is *S.* Hindmarsh.

On a Southland sheep farm, 60 of a mob of 650 hoggets were found dead and 10 were sick after being placed on a paddock the same day that it had been topdressed with a mixture of superphosphate and 10 percent potassium chloride. Tissues were too autolysed for analysis but the most likely cause of the deaths was **superphosphate toxicity**.

A thousand ewe hoggets on a Southland sheep farm were given a new break of crop consisting of turnips and grass. Next morning 16 were found dead. A range of samples were taken from a freshly dead hogget. Serum from this animal contained high concentrations of nitrate, and turnip tops from the break had toxic concentrations of nitrate (3.8 g/kg dry matter; toxic level > 2), confirming **acute nitrate toxicity**.

Samples were collected from four mixed-age ewes unexpectedly found dead on a Wairarapa sheep farm. All animals were in excellent condition, with abundant fat reserves. Culture from small intestinal contents and lymph nodes isolated a *Salmonella* species that was confirmed as ***Salmonella* Hindmarsh** by the *Salmonella* reference laboratory.

On a lifestyle block in Taranaki, 12 hoggets were not growing as expected. They were weak, with pale mucous membranes and poor body condition. Faecal samples tested for nematode parasite eggs had a mean faecal egg count of 1 100 eggs per gram. Three serum samples were tested for vitamin B12 (a cobalt-containing vitamin), revealing a mean concentration of 273 pmol/L (reference range 500–1 500) and confirming a diagnosis of **gastrointestinal parasitism** and **cobalt deficiency**.

Lambs aged four to six months on a Taranaki sheep farm had been dying, so the farmer treated the remainder with an anthelmintic drench. Five weeks later other lambs were in poor condition, with diarrhoea. About half of the flock of 600 were affected. A faecal egg count found 25 100 eggs per gram, confirming significant **gastrointestinal parasitism**.

Six out of 600 female Romney cross hoggets grazing a Pasja (*Brassica campestris* x *napus*) crop in the Rangitikei district were found dead over a period of three days. The hoggets were reportedly in good body condition and no prior illness had been identified. All had been vaccinated against toxoplasmosis, campylobacteriosis and clostridial diseases. Samples from one hogget were collected for histology and culture. No *Salmonella* or *Yersinia* species were isolated from intestinal contents. The most significant histological changes were in the brain, where small blood vessels in the deep cortical white matter and midbrain were surrounded by protein-rich oedema. These changes are characteristic of **enterotoxaemia** caused by ***Clostridium perfringens* type D**.

A Hawke's Bay farmer reported sporadic cases of three-to-six-month-old lambs with hindlimb ataxia. Liver copper in one affected six-month-old lamb was 150 µmol/kg (adequate range 95–3 000). Histological examination of samples from an affected lamb revealed bilaterally symmetrical white matter degeneration of the spinal cord and brain stem, including the ventromedial and dorsolateral aspects of the cervical spinal cord. These changes were consistent with **enzootic ataxia**

caused by copper deficiency. The effects of copper deficiency on the CNS occur in *utero* and during early neonatal life, perhaps explaining the low-normal-range liver copper level in the sample tested.

Twelve mixed-aged ewes on an East Coast sheep farm developed neurological signs including staggering, collapse and circling, during a three-week period in early winter. The neighbouring farmer reported similar cases among sheep and goats. An affected hogget was euthanased and multiple tissues were collected into formalin. There were inflammatory lesions in the caudal brain, consistent with **listerial encephalitis**. The liver showed changes that were consistent with **hepatic lipidosis** caused by negative energy balance.

Caprine

A pet goat developed severe diarrhoea and failed to respond to anthelmintic treatment. A faecal egg count found 7 100 eggs per gram of faeces, confirming significant parasitism and prompting a need to check the efficacy of the anthelmintics used. In addition, an antigen ELISA test for ***Cryptosporidium parvum*** was positive, confirming a diagnosis of **gastrointestinal parasitism and cryptosporidiosis**.

Canine

A 10-month-old dog from the Auckland region had intermittent diarrhoea for months and was not maintaining weight. Faecal culture was negative for *Campylobacter* and *Salmonella*, and a faecal egg count was negative, but a *Giardia* antigen ELISA test was positive, confirming underlying **giardiasis**.

A one-year-old female Huntaway dog from South Taranaki showed clinical signs of dehydration and jaundice, with severe abdominal pain. There was severe hepatic disease, with bilirubin 355 µmol/L (reference range 1–3), alkaline phosphatase 529 IU/L (reference range 0–87) and alanine aminotransferase 481 IU/L (reference range 0–88). Renal failure was also present, with creatinine 812 µmol/L (reference range 48–109) and urea 90 mmol/L (reference range 2.5–9.0). Furthermore, amylase was 5 055 IU/L (reference range 0–1 074), which may have been the result of acute pancreatitis, though it could also have been caused by reduced deactivation with renal failure. Serology was negative for *Leptospira* serovars Pomona, Hardjo and Copenhageni. A PCR test was positive for pathogenic leptospires and gave a diagnosis of **leptospirosis**.

A seven-year-old Whippet dog ate a 220 g block of dark chocolate and was presented to a clinic a day later with clinical signs of panting, rapidly pounding heartbeat and generalised muscle fasciculations. Creatine phosphokinase was elevated (3 313 IU/L; reference range 48–109) as a result of the muscle fasiculations. **Theobromine toxicity or chocolate poisoning** was diagnosed. Clinical signs of chocolate poisoning in dogs appear 2–4 hours after ingestion, with cardiac arrhythmias, premature ventricular contraction, seizures and coma. Death may occur 18–24 hours after onset of cardiac arrhythmias but in some cases may be delayed for several days and then occur suddenly from cardiac failure.

Cervine

Seven of 150 red deer fawns from Northland were becoming lethargic, ataxic and then dying about five weeks post-weaning. They had been routinely vaccinated and drenched. Necropsy of two fawns revealed they were in poor condition with liver abscesses and one had a joint abscess. Histopathology of one abscess revealed an area of coagulative necrosis surrounded by leukocytes and containing filamentous bacteria, consistent with **necrobacillosis**.

Sporadic deaths occurred in weaner deer on a Southland deer farm during April. Postmortem of one dead animal revealed that it was in poor to moderate condition with diarrhoea, and the intestine contained bloody, liquid contents. There was no gross evidence of lungworm or abomasal worm damage. These deer had been drenched frequently and vaccinated twice against yersiniosis, but nevertheless ***Yersinia pseudotuberculosis*** was cultured from the intestinal contents. This diagnosis was confirmed by histopathological examination of fixed sections of intestine.

During May, seven out of a mob of 350 weaners were found dead in a paddock of swedes on a Southland deer farm. Thirty-six hours earlier they had been yarded, drenched orally with anthelmintic and injected subcutaneously with another anthelmintic, injected with an antibiotic and given a booster injection of a *Yersinia* vaccine. They were then introduced to the swedes, a crop they had not previously grazed. The weather was also cold and wet at the time. Necropsy of one dead deer revealed no obvious gross lesions but the intestinal contents were bloody. Histopathological examination of a range of fixed tissues including brain revealed no significant lesions, and culture of intestinal contents for *Yersinia* was negative. It was concluded that the stress of multiple procedures, limited intake and cold weather contributed to the deaths through **exposure and stress**. The farmer was advised to perform as few procedures as possible at each yarding, and afterwards to graze the deer on grass to minimise stress.

Ten serum samples were received from a group of 800 Hawke's Bay red deer hinds that were not thriving as expected despite a recent feed improvement. Serum copper concentrations averaged 6.5 µmol/L (reference range 8–18.5), confirming a diagnosis of **copper deficiency**.

Veterinary attention was sought by a deer farmer in the central North Island after five of 300 mixed-sex red deer weaners died suddenly over several days. The weaners were in good body condition but the farm experienced heavy rain and surface flooding before the outbreak. Postmortem findings were limited to increased quantities of straw-coloured fluid in the pericardial sac and peritoneum. Multiple tissues from three weaners were collected for histological examination. There were subtle renal changes in each, characterised by scattered reddish-brown intratubular pigment (haemoglobin) and tubular

epithelial degeneration and necrosis. Based on histological suspicion, urine samples from two fawns were tested for leptospires using PCR. Both samples were positive, confirming a diagnosis of **leptospirosis**.

Equine

A 14-year-old Arabian horse from Northland had a mass under its tongue, which was associated with weight loss, malaise, hypersalivation and abnormal upper respiratory noises. A swab yielded a light growth of *Rhodococcus equi*, and the mass was treated as an abscess. Several days later, two further firm and painful masses were noted at the base of the neck/thoracic inlet region. Cytological examination of smears from these masses revealed a mixture of small lymphocytes, plasma cells, macrophages, neutrophils, spindle cells, eosinophils, mast cells and plasmacytoid lymphoblasts consistent with the types of cells aspirated from lymph nodes, and suspicious for lymphoma. Histopathology of samples from these lymph nodes confirmed the cells seen on cytology were arranged as a pleomorphic infiltrate in the cortex of the lymph node. Some large round cells were noted with very large nuclei and a high mitotic rate. A diagnosis of likely **T-cell rich B-cell lymphoma** was made.

A horse aborted at six months' gestation on a Taranaki property. The submitting veterinarian reported that the uterine contents appeared purulent. When the fetus and placenta were examined histologically a suppurative placentitis and pneumonia were found. Culture of fetal lung isolated ***Staphylococcus intermedius***.

Lagomorph

Several outbreaks of sudden death in rabbits were investigated during autumn and winter. Cases occurred among rabbits in breeding establishments and in pet rabbits, in both urban and rural areas. In one case 15 of 30 rabbits on a Wairarapa property died, and in another, 10 of 25 died on a property in the greater Wellington region. Affected rabbits ranged from four months' age to adult. Some died without any observed clinical signs, while others presented with seizure activity prior to death. Post-mortem examination of two affected rabbits revealed pulmonary congestion and oedema, hepatic enlargement (including enhancement of the lobular pattern) and tracheal haemorrhage in one rabbit. Histological findings were characteristic, with widespread hepatocellular necrosis and dissociation, and intravascular thrombi in small blood vessels of various organs, especially in the glomerular capillaries. These findings were consistent with **rabbit haemorrhagic disease** caused by **rabbit calicivirus**.

Avian

A number of birds belonging to a poultry fancier in Otago became acutely ill and died rapidly. Necropsy of a nine-month-old rooster in good condition revealed dark, consolidated lungs, from which ***Staphylococcus hyicus*** was cultured. This is usually a secondary invader infecting birds under stress or with co-existent viral infections. Overcrowding may have been a contributing factor in this case.

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 2015.

Exotic vesicular diseases ruled out

A veterinarian called the MPI exotic pest and disease hotline after finding oral erosions in a dairy cow in the Manawatu. No other cows among the other 200 in the herd were affected. There was no recent history of animal introductions into the herd. The affected cow had erosions on the dental pad and upper surfaces of the mouth, but none on the tongue, and also presented with some weight loss and a normal temperature. Vesicular disease was ruled out on clinical and epidemiological grounds. Endemic differential diagnoses of bovine viral diarrhoea, mucosal disease and malignant catarrhal fever were ruled out by testing at the Animal Health Laboratory (AHL) IDC, Wallaceville. The Incursion Investigator had asked the veterinarian to submit a tissue biopsy from one of the oral lesions, and the causative agent was confirmed by bacteriology as being *Actinobacillus lignieresii* (woody tongue disease). The oral erosions and the cow's general health improved with a course of antibiotics.

A veterinarian called the MPI exotic pest and disease hotline to report teat lesions appearing over a period of two weeks in six of 700 lactating dairy cows. Teat lesions can be a clinical sign of exotic vesicular disease, for example foot-and-mouth disease (FMD) in cattle. The farm veterinarian forwarded pictures of the lesions to an MPI Incursion Investigator. In this case, the low morbidity, the appearance of the lesions and the absence of any other clinical signs in the herd enabled exotic vesicular disease to be ruled out on clinical and epidemiological grounds. Teat lesions in four of the six cows were considered typical signs of photosensitisation. An endemic diagnosis was pursued, given the atypical lesions in two of the six cows. Serum samples from all six cows with lesions were found to have significantly elevated GGT (203–3 395 IU/L; normal level < 100). Elevated GGT can be associated with liver damage, which may result in secondary photosensitisation. The location and feed history of the herd ruled out common causes of secondary photosensitisation including sporidesmin toxicity (facial eczema) and turnip-associated secondary photosensitisation. No further cases occurred and the investigation was stood down.

A Gribbles veterinary pathologist called the MPI exotic pest and disease hotline after negative bovine virus diarrhoea antigen ELISA results in four rising-one-year-old dairy heifers with oral lesions. These animals were among a mob of 30 that were reported to have stunted growth and most of which had a mild scour. An Incursion Investigator contacted the farm veterinarian and examined photographs of the lesions. Mild proliferative ulcerative lesions were seen in four of the 30 heifers. The lesions were small (< 1 cm), generally round in shape and limited to the lips and dental pad. No lesions were present on the tongue, hard palate, udder, vulva or feet. Discussion with the veterinarian suggested the group had not been well managed as the farmer had been away and a farmhand had been given this responsibility. Under the direction of the Incursion Investigator, the veterinarian collected fresh and fixed lesion biopsies from three of the affected cows. Histology identified multifocal areas of ulceration with intralesional bacteria and plant material present. Generic molecular assays for pestiviruses and poxviruses carried out at the AHL (Wallaceville) returned negative results. The mouth lesions were considered to have been initiated through trauma resulting from short grazing and the supplementary feeding of poor-quality hay. On one section the lesion extended into the submucosa, which supported the possibility of a penetrating wound. Exotic vesicular disease was excluded on clinical, pathological and epidemiological grounds and the investigation was stood down.

A veterinarian notified MPI of a yearling colt with oral lesions. Erosions were 2–6 mm in diameter, present bilaterally on the hard palate and sublingually, and concentrated in discrete areas on either side of the frenulum in the rostral sublingual area. No other horses among 30 in-contacts were affected. Routine haematology and biochemical analyses were unremarkable. Fresh and fixed biopsy samples, and acute and convalescent sera were collected and submitted to AHL (Wallaceville) for histopathology and exclusion of vesicular stomatitis virus (VSV). Histopathology identified focal lymphocyte aggregations, with germinal centre formation, immediately beneath the epithelium. Two small pieces of foreign material embedded in the superficial submucosa were also identified, one surrounded by macrophages. Molecular assays for VSV returned negative results. Virus neutralisation tests on the sera for antibodies to the Indiana and New Jersey VSV serotypes were carried out on acute and convalescent sera at the Australian Animal Health Laboratory, Geelong, with negative results. In an attempt to elucidate the cause, generic molecular assays for poxvirus and herpesviruses were carried out, with negative results. The condition resolved, although similar mucosal changes reappeared after a booster vaccination for herpesvirus one month later. In discussion with pathologists the condition was considered unlikely to be due to a vaccine reaction: a local contact irritant or hypersensitivity reaction was considered more likely. Although a definite aetiology for the condition remained elusive, exotic disease was excluded and the investigation was stood down.

Brucella abortus excluded

Three of 3 197 exported heifers returned positive results for *Brucella abortus* by the Rose Bengal test on arrival in their destination country. New Zealand is recognised as being free from brucellosis and the heifers were not tested for it as part of the pre-export protocol. Theis test has a reported specificity of 86 percent. Samples had been taken from the heifers for serological testing for other agents before export. Three archived sera samples were provided to the AHL IDC (Wallaceville) for *B. abortus* testing by CFT and ELISA and all were negative. From these results and epidemiological considerations the investigation was closed. The overseas authorities subsequently re-tested sera from these heifers at a *Brucella* reference laboratory in a third country and the results were consistent with the Wallaceville results.

Anthrax ruled out

A veterinarian called the MPI exotic pest and disease hotline to report a cow with suspected anthrax, in a herd of 1 600. The cow was determined at necropsy to have died of a haemorrhagic disorder and had petechial and ecchymotic haemorrhages on the skin and the myocardium. Postmortem revealed a severe haemorrhagic enteritis, and it had been bleeding from the rectum and had hyphaema prior to death. One other cow was reported to have had similar signs a week earlier but had responded to antibiotics. Anthrax was considered unlikely as only one animal had succumbed to haemorrhagic disease and there was no history of anthrax in the area. Nevertheless, tests for *Bacillus anthracis* were carried out at the AHL IDC, Wallaceville, because the veterinarian might have been exposed to this zoonotic disease during the post-mortem examination. Fresh liver and serum samples were negative for anthrax culture and also by PCR for bovine viral diarrhoea type 2 (an exotic disease that can cause haemorrhagic illness though thrombocytopaenia). Histology was non-diagnostic and the cause of the disease was not determined.

Enzootic bovine leukosis excluded

One Jersey dairy cow in a shipment of 4 000 to be sent to China returned a positive ELISA result for enzootic bovine leukosis (EBL) during pre-export testing. The MPI exotic pest and disease hotline was called, as EBL has been eradicated from New Zealand dairy cows. Samples were sent for confirmatory testing at the Livestock Improvement Company (LIC) where the indirect ELISA was repeated with the same suspect or weak positive result. LIC also carried out the more specific confirmatory blocking ELISA, with a negative result. The equivocal result on the indirect ELISA would be due to a non-specific reaction, and reflects the specificity characteristics of this test.

"Sciatic palsy" investigated

A veterinarian contacted MPI to report an outbreak of mild lameness in rising-three-year-old dairy cows. From previous cases seen, she believed this could be early "sciatic palsy", a misleadingly-named syndrome that sporadically affects NZ dairy cows and has not been described elsewhere. Affected cows progressively develop severe, usually bilateral dropping of the hocks, which is untreatable and requires euthanasing the animal. The causative agent and mechanism of disease are unknown but gross pathology and histology indicate that the nervous system is unaffected, showing neither degeneration nor inflammation. Even the sciatic nerve remains pristine, so the very term "sciatic palsy" is a misnomer. Investigation into predisposing factors has been unrewarding, possibly because of difficulties in establishing the onset of disease. Various aetiologies including *Clostridium botulinum* toxin exposure have been investigated, but no answers have been forthcoming (See **Figure 1**). The veterinarian in this investigation had previously seen "sciatic palsy" on another farm, preceded by shifting-leg lameness in a mob of cows. In the present case, 21 of about 32 rising-three-year-olds in the dry paddock were affected, whereas none of the 10 or so mixed-age, older cows were affected. Investigators visited the farm, since "sciatic palsy" is rarely reported early in the course of disease. Cows showed lameness of varying severity, which appeared to shift throughout the examination. Most were mildly affected but several appeared stiff and had a shuffling gait, with their feet well under them. The worst-affected cow stood with her hindlimbs parked far out behind her and her neck extended

Figure 1: "Sciatic palsy" in a severely affected cow. Bilaterally there is functional loss of the gastrocnemius muscle/tendon function. This represents the end stage of "sciatic palsy", which can begin with shifting lameness and mild dropping of the hocks. This cow was euthanased. (Chris Watson, Paddock Vets)

Click on image above to activate film clip showing "sciatic palsy" signs.

forward; she grazed well in front of her hindlimbs, moving them only when absolutely necessary. Hoof checks were performed on several lame cows and a mild hoof lesion was found around the coronary band of two, while another had soft hooves. These signs were felt to be sufficient to account for some but not all of the lameness. No swelling or warmth of the limbs was evident. CBC and biochemical results for 16 cows were unremarkable except for mild elevation of CK values in the three most lame cows (590–1 600 IU/L; reference range 35–280), and two others with a left shift and neutrophilia. Notably, the only cow with both changes was the one that subsequently developed "sciatic palsy". Three weeks after the initial signs were seen, the worst-affected cow mentioned earlier had developed the dropped hocks typical of "sciatic palsy", as well as a condition known as floating scapulae, which has been reported previously in a few "sciatic palsy" cases. The cow was euthanased and a post-mortem examination showed oedema and haemorrhage of the subscapularis muscles, which was consistent with that seen in other cows. Muscle damage is thought to be secondary to abnormal locomotion of these cows. No other cases reportedly developed on this farm. This investigation may represent an outbreak of early, mild lameness prior to development of full-blown "sciatic palsy" in dairy cows. Further investigation is needed to confirm that mild lameness in many cows precedes development of "sciatic palsy" in a few. If true, it would change the recognised timescale of the disease and could help explain possible causes and predisposing risk factors of this mysterious syndrome.

Chronic wasting disease ruled out

A pathologist reported via the MPI exotic pest and disease hotline a suspect case of chronic wasting disease (CWD) in a three-year-old red deer stag. The stag's brain had been submitted for histopathological examination through the transmissible spongiform encephalopathy (TSE) surveillance scheme run by MPI. The affected stag had a history of ongoing ill-thrift, which did not appear to respond to drenching for internal parasites. The pathologist reported a moderate diffuse vacuolar encephalopathy on histology, which was inconclusive but suspicious for CWD. The veterinarian in charge of the deer advised that there had been no import history associated with the farm, the animals having been bought in from a New Zealand breeding establishment or bred on the farm. The stag tested positive to Johne's disease, which may have contributed to the ill-thrift. Fixed brain stem tested negative at the AHL IDC (Wallaceville) by ELISA for TSE.

Fallow deer lymphotropic herpesvirus confirmed

A veterinary pathologist contacted MPI to report an unusual case of multifocal ranulomatous disease in a one-year-old red deer hind from a mob of 75 in Central Otago. Lesions noted at the slaughter plant consisted of multiple masses (considered to be granulomas by the MPI Verification Services veterinarian) scattered throughout musculature, lungs, myocardium and mesentery. The pelt reportedly had multiple lumps within it but could not be recovered for examination. Histology of colon, lymph node, lung and skeletal muscle showed multifocal granulomas within the lung and muscle, comprising multinucleated giant cells, macrophages, lymphocytes and small numbers of eosinophils with fibrosis, mineralisation and necrosis. Bovine tuberculosis testing was performed by PCR with negative results, and histological sections had no evidence of acid-fast organisms. A previous MPI investigation into granulomatous dermatitis in a red deer cross discovered a novel herpesvirus associated with intranuclear viral-like inclusions within lesions. Because of that, and the presence of suspect viral inclusions in the present case, tissues were tested for herpesvirus. PCR was positive, with sequenced results most closely matching fallow deer lymphotropic herpesvirus. Limited sequencing demonstrated that the virus was identical to that found in the previous case. The current investigation marks the second detection of a novel herpesvirus in farmed deer in New Zealand, associated with granulomatous inflammation within multiple organs. The condition appears to be sporadic and rare, and it is most likely that the virus is a widely distributed endemic virus (as is usual for herpesviruses) that rarely causes disease. However, information is extremely limited.

Maedi-Visna excluded

A veterinary pathologist phoned MPI to report three antibody ELISA test positives for caprine arthritis encephalitis virus (CAEV) in a flock of 32 sheep on a dairy goat farm in the Waikato. The ELISA test for CAEV does not differentiate it from Maedi-Visna virus (MVV), a multi-organ disease of sheep that NZ claims to be free of. The dairy goat herd was known to be CAEV-positive, and goat colostrum and milk had been fed to lambs in the sheep flock. Neurological or respiratory diseases consistent with MVV have not been seen in the sheep flock, although there have been cases of "hard udder", which in sheep can be a manifestation of MVV. Further testing by a commercial laboratory and the AHL IDC (Wallaceville) was performed to rule out MVV. ELISA tests for MVV and CAEV were both positive. However, PCR on EDTA blood was successful in identifying CAEV DNA, which ruled out MVV. The feeding of milk from infected goats to sheep provided the most likely route for transmission of CAEV to the sheep. Maedi-Visna virus infection was ruled out and the investigation was stood down.

Exotic strains of *Brucella* excluded

A veterinary pathologist called the MPI exotic pest and disease hotline to report orchitis and epididymitis of unknown bacterial cause in a hogget

ram. These signs were consistent with a syndrome known as ram orchitis and epididymitis. The ram had been found dead, with a swollen, abscessed testis. Suppurative orchitis and epididymitis were suspected grossly, and culture swabs were taken. Agents causing orchitis and epididymitis in rams include *Brucella ovis* (an endemic pathogen), exotic *Brucella* strains such as *B. mellitensis* and less often *B. abortus*, and other endemic organisms including *Histophilus somni* (formerly *Haemophilus somnus* and *H. ovis*), *Actinobacillus seminis*, and a variety of other pathogens (e.g., *Trueperella* (*Arcanobacterium*) *pyogenes* and *Escherischia coli*). The notifying commercial veterinary laboratory ruled out *B. ovis* by serological testing, and on bacterial culture isolated a Gram-negative bacterium from the testicular abscess, the cut surface of the testis, and the epididymis. Although these isolates were not consistent on biochemical tests, the agent was considered most consistent with *Histophilus somni*. Nevertheless, exotic *Brucella* strains and unusual agents of orchitis in rams could not be ruled out, so the isolates were forwarded to the AHL IDC (Wallaceville) for confirmatory testing. *Brucella* ELISA was negative, enabling exotic *Brucella* species to be ruled out. Biochemical testing of the isolates, followed by PCR with sequencing, confirmed the isolates were indeed *H. somni*. Five other rams on this property were reportedly affected by orchitis previous to this case, and during the course of this investigation another animal developed orchitis. This animal appears to be responding to antibiotics.

Atypical scrapie confirmed

A pathologist called the MPI exotic pest and disease hotline to report a sheep brain with lesions suggestive of atypical scrapie on histopathology. The four-year-old ewe had progressive non-responsive neurological signs including ataxia, weakness and high stepping. The sheep was euthanased and its brain submitted as part of the transmissible spongiform encephalopathy (TSE) surveillance scheme, with scrapie being the disease of concern. No condition loss, cutaneous hypersensitivity or pruritis were evident, these being common signs of scrapie. Histological examination ruled out classical scrapie but revealed a moderate diffuse vacuolar encephalopathy in the cerebellum. The lesions explained the neurological clinical signs seen and were similar to those reported in previous cases of Nor98/atypical scrapie. Atypical scrapie appears to be a non-contagious, sporadic, degenerative condition of older sheep (Kittelberger and McIntyre, 2009). The brain samples were sent for confirmatory diagnosis at the Animal Health and Veterinary Laboratories Agency in the UK. Immunohistochemistry for the abnormal form of the prion protein demonstrated widespread immunolabelling in the cerebellum and trigeminal nucleus of the brainstem, which was morphologically consistent with atypical scrapie and led to a positive diagnosis. As the disease is sporadic, not contagious, and has been reported before in New Zealand, no action was taken in relation to this find.

Hydatids excluded

The Gisborne Medical Officer of Health contacted MPI to report a probable case of hydatids (human infection with *Echinococcus granulosus*). This disease is notifiable in New Zealand because provisional freedom from *E. granulosus* in livestock was declared in 2002. The patient had developed marked abdominal swelling over the previous five years and after ultrasound and CAT-scan examinations a diagnosis of hydatid disease was made. The patient subsequently tested serologically positive for hydatids by a haemagglutination inhibition test. Tissue samples collected for histopathology at exploratory laparotomy confirmed hydatid infection. Histological findings were consistent with a long-standing infection. The patient was raised on a farm in the East Cape area, but had not lived or worked on a farm or in an agricultural setting for 45 years and now worked as a commercial cleaner. An interview with the patient revealed only intermittent contact with farm environments when visiting relatives, and only until late 1990. Epidemiological, clinical and pathological findings were consistent with historic exposure a number of decades ago. The patient received anti-parasitic medication after de-bulking surgery. No biosecurity risk to domesticated animals or livestock is posed by this detection, and the investigation was stood down.

EIA/EVA ruled out

The Animal Health Laboratory called the exotic pest and disease hotline to report a borderline positive VNT result for the exotic disease equine viral arteritis (EVA). The horse concerned was a three year old Thoroughbred colt undergoing routine pre-export testing, and was one of 15 horses in the same testing group. No clinical or epidemiological evidence of EVA was identified on discussion with the attending veterinarian. A second serum sample yielded a negative VNT result. The EVA VNT returns false positive results about one percent of the time. It is postulated that diet and vaccination can impact the serum composition and have non-specific effects on the VNT assay. Immune stimulation from recent illness or vaccination can also increase factors that impact virus neutralisation, leading to false positive results. The investigation was stood down once exotic disease was ruled out.

A veterinary pathologist called the MPI exotic pest and disease hotline to report anaemia and oedema in a 25-year-old Thoroughbred horse that had presented with recent weight loss and ventral oedema. Tests were negative for exotic differentials for equine oedema, i.e., equine infectious anaemia, equine viral arteritis, Piroplasmosis (*Babesia caballi* and *Theileria equi*) and anaplasmosis (*Anaplasma phagocytophilium*). Exotic disease was excluded and the investigation was stood down.

A veterinarian notified MPI via the exotic pest and disease hotline of a Thoroughbred colt, recently imported from Australia, with a fever. The horse was otherwise well, with no clinical signs to indicate any likely cause of the pyrexia. The horse had been imported 10 days

earlier from Victoria, where it had been resident since birth. Routine haematology identified a mild inflammatory leucogram with left shift, although fibrinogen levels were within the normal range. Acute and convalescent serum samples were submitted to the AHL IDC (Wallaceville). Exotic differentials for pyrexia were investigated. Equine viral arteritis and equine infectious anaemia were excluded after negative results in the VNT and AGIT respectively; and molecular assays for *Anaplasma phagocytophilium*, *Theileria equi* and *Babesia caballi* gave negative results. The acute and convalescent sera were also tested serologically for equine herpes virus (EHV) type 1–4 antibodies. The EHV-1 and EHV-3 assays were negative, while stable positive titres were identified by VNT to EHV-2 (1:128) and EHV-4 (1:4). The colt recovered uneventfully after symptomatic treatment, with the fever subsiding over 3–4 days and no further cases were identified. Exotic disease was excluded and the investigation was stood down.

Equine influenza excluded

Two horses from different Manawatu properties had coughing, high fever, anaemia and pneumonia, and were reported to MPI via the exotic pest and disease hotline. The horses were being held under quarantine in a veterinary hospital, where they had been for about a week. They had had no previous contact with each other. Of immediate concern was the possibility of equine influenza, and an Incursion Investigator who was coincidentally on site brought samples in for high-priority testing at the AHL IDC (Wallaceville). Within three hours of the samples arriving at the laboratory, equine influenza was ruled out by PCR. Normal priority was placed on the other disease testing and the horses were subsequently found to be negative for equine viral arteritis by VNT, equine infectious anaemia by AGID, *Babesia caballi* and *Babesia equi* by ELISA, and piroplasmosis by PCR. Both horses had antibodies to equine herpesvirus type 4, and one to equine herpes virus type 1, which was expected as most horses in New Zealand have been exposed to these agents. Both horses were negative for equine herpesviruses by PCR, indicating that active infection with these agents was not occurring. Both recovered from their illnesses but the causes were not determined.

Porcine reproductive and respiratory syndrome excluded

A Gribbles veterinary pathologist reported histopathological evidence of interstitial pneumonia in a grower pig. The pig was one of two kept on a predominantly sheep and cropping farm, and was fed household scraps and bakery waste. The pig's penmate had died about two weeks earlier after losing weight, but no investigation into that death had been carried out. The second pig had been coughing for a few days prior to death, although it continued to have a good appetite until it was found dead in its pen one morning. Fresh lung tissue was submitted to the AHL IDC (Wallaceville) for testing, and molecular assays excluded porcine reproductive and respiratory syndrome (PRRS) virus. PCR testing for porcine circovirus (PCV) type 2, which is endemic, was positive, and this excluded the involvement of PCV type 1. PCV type 2 has been associated with clinical entities such as porcine multisystemic wasting syndrome (PMWS), porcine dermatitis and nephropathy syndrome (PDNS) and necrotising pneumonia, but (like type 1) this can also be found in apparently healthy pigs. Exotic disease was excluded and the investigation was stood down.

Protothecosis confirmed

A pathologist from NZVP phoned MPI to report possible protothecal dermatitis in a former pig-dog from Oamaru. The veterinarian had performed cytology on inflammatory skin lesions, which contained parasitic organisms with wedge-shaped endospores resembling a *Prototheca* species. Presumptive identification was substantiated by the pathologist, who confirmed the organisms were positive for periodic acid-Schiff staining (which is consistent with Prototheca and some other microorganisms). *Prototheca* is a parasitic alga that has lost its chlorophyll, and in veterinary medicine there are two species of concern: *P. zopfii* and *P. wickerhamii*. Protothecosis is most commonly seen in New Zealand animals as a cause of bovine mastitis. The infection is also recognised worldwide as a cause of disease in dogs, but to our knowledge canine protothecosis has not previously been reported here. AHL IDC (Wallaceville) confirmed the presence of *P. zopfii* in multiple skin biopsies taken from the affected dog. This enabled exotic fungal organisms to be ruled out that might appear microscopically similar. Protothecosis is considered to be acquired from the environment, and thought to be widespread in damp places. Protothecosis was confirmed as the cause of the dermatitis, and the investigation was stood down.

Canine influenza ruled out

A veterinarian called the MPI exotic pest and disease hotline to report a farm in the Ruapehu district that had a highly contagious outbreak of kennel cough (canine infectious tracheobronchitis). All dogs on the farm had been vaccinated against *Bordetella bronchiseptica* and canine parainfluenza virus (two of the common causes of kennel cough), so the veterinarian was concerned that the vaccine might have failed. Nasopharyngeal swabs were collected from four of the affected dogs and preserved in various media designed to promote the viability of *Mycoplasma* species and viruses; and plain swabs were taken with no media, for bacterial viability. Canine influenza was excluded by PCR at the AHL IDC (Wallaceville). No viruses were cultured from the swabs, and no cytopathic effects were observed on inoculated Madin-Darby canine kidney cell cultures. No *B. bronchiseptica* was isolated from the samples, and there was no predominant organism present in general bacteriological culture. The *Mycoplasma* culture, PCR and sequencing yielded positive results with three of the four dogs, and this was determined to

be the cause of the syndrome. Protection against *Mycoplasma* spp. is not included in kennel cough vaccinations available for dogs, but these infections are treatable with targeted antibiotics and are generally self-limiting.

Canine heartworm excluded

A veterinarian contacted MPI to report a six-month-old dog that had been imported from Australia a few months earlier and had developed a cough over the previous 6–8 weeks. Radiology identified congested lungs and a marginally enlarged heart, potentially consistent with canine heartworm (*Dirofilaira immitis*). Whole-blood and serum samples submitted to the AHL IDC (Wallaceville) tested negative for canine heartworm antigen and microfilariae by ELISA and Knotts concentration test respectively. The dog responded well to symptomatic treatment, exotic disease was excluded and the investigation was stood down.

Infectious bursal disease ruled out

In May 2015, as part of the Poultry Industry Association of New Zealand (PIANZ) surveillance programme for infectious bursal disease, ELISA tests were conducted and one of three sheds on a layer farm returned positive tests on six of ten 60-week-old birds. Samples from the other sheds containing birds aged 19 and 116 weeks were negative. VNT on the samples from the shed with the positive ELISA results, at the AHL IDC (Wallaceville), returned eight positive but low titres that ranged from 1:16 to 1:128. An MPI Incursion Investigator visited the farm with a PIANZ-contracted blood sampler in June. Blood samples were taken from the previously tested age groups, along with samples from a younger group aged 13 weeks. ELISA tests were conducted at the AHL IDC (Wallaceville). This time, 25 samples from the previously positive shed were all negative but one of 10 birds from the shed with the birds that were now 121 weeks old was weakly positive. Twenty samples from the birds that were now 24 weeks old, and from the 13-week-old birds that shared a shed, were negative. Given the specificity of the ELISA test (85 percent), the low VNT titres, and the negative titres in the young birds in the absence of biosecurity control measures when moving between sheds, the positive cases were categorised as false positive results and attributed to non-specific immune responses. The investigation was stood down.

Flavivirus infection ruled out

This was a continuation of a previous investigation into encephalitis in black stilt/kaki (*Himantopus novaezelandiae*) chicks (Bingham, 2015), which resulted in isolation of a flavivirus from the brain of a chick with encephalitis. There are many species of flaviviruses, which occur worldwide and may be endemic in wild birds. West Nile Virus (WNV) is one that is emerging in several countries and is OIE-listed. This investigation was undertaken as part of monitoring for exotic flaviviruses such as WNV, and other endemic viruses that may not yet have been reported. Black stilts are an endangered species that breeds only in Canterbury, in the beds of braided rivers. Historically, a number of stilt chicks at the Department of Conservation's Twizel captive-breeding facility develop neurological signs each year. For the present investigation, in December 2014, at onset of neurological signs in two chicks at the Twizel facility, blood samples were collected and couriered to the AHL IDC (Wallaceville). These samples were collected whole, in EDTA, and in viral transport medium (VTM). Flaviviral PCR was negative for all samples. Viral culture was performed in BHK-21 and QT-35 cells on whole and VTM samples. There was no growth after four passes, so the samples were considered to be negative for flavivirus. The role of the flavivirus identified previously in a single neurologically-affected chick remains unclear, and further testing of chicks with encephalitis is required to establish any causal link. Further sampling is planned for the coming season.

Avian mortalites investigated

A Massey University veterinarian called the MPI exotic pest and disease hotline to report respiratory illness in ducks at an bird rehabilitation centre. The illness was characterised by a serous nasal discharge and increased respiratory effort, with audible rales and crackles over the air sacs. About 20 mostly juvenile ducks (from 80) were affected over a three-week period and four died. Post-mortem examination of three ducks was carried out at Massey University. Gross changes included microabscesses in the lung tissue and air sacculitis. Histopathology identified respiratory tract changes in two ducks, including sinusitis, pneumonia and airsacculitis, and there were chronic liver and splenic changes (scarring and granulomas with multinucleate giant cells). These changes were consistent with a previous or low-grade *Chlamydophila* infection complicated by secondary bacterial invasion. Respiratory tract samples (nasal, tracheal or lung swabs) from each of the ducks were PCR-positive for *Chlamydophila*. Bacterial culture performed on swabs taken from the affected air sacs identified a heavy mixed growth, including a single suspected *Reimerella anatipestifer* isolate. The *Reimerella* isolate had been preliminarily identified at the regional laboratory, using matrix-assisted laser desorption ionisation time-of-flight mass spectrometry. Swabs were re-cultured and three suspicious isolates were found and sent to the AHL IDC (Wallaceville) for assessment. These were identified as common commensals. One isolate was determined to be *Pseudomonas putida* and two others were a *Neisseria* species. *Reimerella* was not identified. *R. anatipestifer* has been occasionally isolated in ducks in New Zealand, in association with nervous disease and fibrinous meningoencephalitis. Voluntary biosecurity controls were put in place and re-homing of birds from the centre was stopped throughout the investigation. The rehabilitation centre owner worked with Massey University's wildlife service and the Incursion Investigation team at

the IDC (Wallaceville) to ensure personal protection measures were in place for workers at the centre, and to eliminate disease on the property through hygiene measures, age-segregation and antibiotic treatment. Exotic disease was excluded and the investigation was stood down.

A veterinarian from the Auckland Zoo reported the death of wild mallard (*Anas platyrhynchos*) and scaup ducks (*Aythya novaeseelandiae*) on zoo property. In the three weeks prior, seven ducks had been found dead or were euthanased. Typically three to five wild birds are euthanased each month at the zoo following traumatic events or as the result of ill-health. The seven most recent cases involved three juvenile and four adult birds. Botulism was suspected owing to the season, the very low recent rainfall and the clinical signs, which included weakness and often poor body condition. Postmortems were carried out on four of the recent cases and a range of tissues were collected for histological analysis but no significant underlying infection or inflammation was identified in any organs. The findings supported botulism as the most likely cause of the mortality event. Exotic disease was excluded and the investigation was stood down.

Avian influenza excluded

An MPI scientist contacted Incursion Investigators to report that samples had been sent to the AHL IDC (Wallaceville) from a sick male emu (*Dromaius novaehollandiae*) with respiratory disease. The emu had been noticed to be gurgling at the base of the throat and had frank blood around the beak and blood clots at the back of the mouth and base of the tongue. No wounds were noted in relation to the blood. Tracheal swabs were taken for avian influenza testing, and for infectious laryngotracheitis (ILT) virus testing by a separate laboratory. The emu was the only one of its kind at the zoo, although other birds were present nearby including feral chickens and a peacock. No other birds appeared to be affected. Avian influenza was ruled out after a negative PCR test by the AHL but ILT was confirmed by positive PCR. ILT is an endemic herpesviral disease of birds, and can be associated with bloody laryngotracheal discharge, as in this case. The emu recovered from the disease. Attenuated live vaccines are available, and impact and control of the disease are being considered, as well as population control of feral chickens.

European foulbrood excluded

An AsureQuality Apicultural Officer notified MPI via the exotic pest and disease hotline after finding a suspect European foulbrood (EFB) case. Only one colony of bees was affected, in a large beekeeping operation in Hamilton. The affected colony had originated as a swarm of bees found in the beekeeper's storage shed. The signs in the colony were most likely due to halfmoon syndrome, but there were a few changes that resembled those seen with EFB. Brood samples from the colony tested negative for the causal agent of EFB, *Melissococcus pluton*, in PCR tests at the AHL IDC (Wallaceville).

An AsureQuality apiary officer called the MPI exotic pest and disease hotline after finding dying larvae at a four-hive apiary north of Auckland. Affected larvae had a faint yellow-brown discolouration, and adult bee numbers had dropped. The notifier thought the signs were inconsistent with what is normally seen in infection with American foulbrood, which is endemic. Samples were obtained for testing and general culture for European foulbrood (EFB, caused by the exotic bacterium *Melissococcus plutonius*). PCR was negative for EFB. General bacterial culture returned an isolate of the genus *Providencia*, which showed similarity to several species on sequencing of the 16S rRNA subunit. Providencia spp. have a wide host range, having been found in the normal gastrointestinal tract of wintering bees (Lyapunov *et al*., 2008), in the human gut and in the haemolymph of *Drosophila* flies. The connection between larval death and *Providencia* is unclear, as primary disease in larvae of this genus has not been reported. The bacterium possibly had overgrown following death or weakness of larvae, which itself was possibly due to decreased care by adult bees. An exotic cause was ruled out and the investigation was stood down.

Beehive mortalities investigated

A beekeeper phoned MPI to report hive collapse in one apiary out of a number that he was operating in northern Hawke's Bay. Seventeen out of 32 hives were affected, with five colonies dead and four weak, with only a few frames full of bees. Affected hives had very few bees left, and even hives that the beekeeper considered to be unaffected had fewer of bees than expected. Another apiary owned by the same beekeeper less than 1 km away was unaffected. Another commercial operator 7 km away was reported not to have experienced this syndrome. Hive collapse is an unusual syndrome where adult bees disappear (presumably die) while away from the hive. Signs in this case were not considered typical of tracheal mite or deformed wing virus infection. The mortality event could have been caused by toxicity or is more likely to represent part of a syndrome that has been reported by other North Island beekeepers during the past year. This syndrome is being investigated in collaboration with apiculture experts. This notification was stood down.

A beekeeper with hives in Northland called the MPI exotic pest and disease hotline to report a mass mortality in his adult bees. Across four apiaries, about 60 hives were lost. In two of these apiaries, of 12 and 24 hives, every hive was affected, and in the other apiaries, half to two thirds. Large numbers of adult bees were found dead outside and around the hives. Mass mortality of bees can be caused by poisoning, infection with the exotic tracheal mite, and the endemic deformed wing virus (DWV). However, infectious causes tend to take a lengthier course, with fewer visible dead bees around hives. There were other reports over the same time period of hives losing adult bees, but this investigation was felt to be separate

from those, owing to the large numbers of dead bees seen outside hives. Dead bees were sent to the MPI Plant Health and Environment Laboratory (PHEL) and Animal Health Laboratory (AHL) for testing. PHEL ruled out tracheal mite, and AHL tested for DWV, *Nosema apis* and *N. ceranae*. Bees were negative for both *Nosema* species but were positive for deformed wing virus. The significance of DWV in this case is not clear, since it tends to cause overwintering loss of adults rather than sudden mortality. The beekeeper assessed the likelihood of poisoning by asking the farmer on an adjacent property about herbicide and pesticide use. Nearby pasture had been sprayed for facial eczema in January, but bee deaths did not occur until April so it was probably unrelated. Despite poor evidence, toxicity was considered to be the most likely cause of death. The investigation was not pursued further.

Exotic mites excluded

Mites were found in a beehive by a beekeeper in Waihi and were submitted to an AsureQuality Apicultural Officer, who notified MPI via the exotic pest and disease hotline. An entomologist at PHEL IDC Tamaki identified them as *Neocypholaelaps novaehollandiae* and *Varroa destructor*, both endemic in New Zealand. Tracheal mites were not detected on dissection of the trachea of bees submitted.

A beekeeper notified MPI via the exotic pest and disease hotline of suspect exotic mites in one of 50 hives. The beekeeper thought the mites he saw in the hives were different from *Varroa destructor*, a mite known to be present in New Zealand beehives. However, the beekeeper did not take material for identification at the time of the first sighting, and when he returned to obtain a sample, none were seen. He submitted some brood, bees and other material from the hive and these were examined for the exotic mites *Tropilaelaps* and *Acarapis woodi*, neither of which were found. The investigation was stood down but the beekeeper was advised to submit another sample if he saw them again.

Small hive beetle excluded

An insect was found in a beehive, in association with dead brood. The beekeeper submitted it to an AsureQuality Apicultural Officer, who notified MPI via the exotic pest and disease hotline. To rule out small hive beetle (*Aethina tumida*), the insect was sent to PHEL IDC Tamaki for identification. An entomologist reported the insect to be a New Zealand native beetle, *Saprinus detritus*, a carnivorous species that is not uncommonly in galleries created by other insects.

Pathogenic fungus of reptiles investigated

A zoo veterinarian contacted MPI to report suspect fungal dermatitis in two eastern water dragons (*Physignathus lesueurii*). The infection was thought to be consistent with *Paranannizziopsis australasiensis* (PA, also known as CANV), a severe worldwide fungal pathogen of reptiles that was formerly known as the *Chrysosporium* analogue of *Nanniziopsis vriesii*. The worst-affected animal had raised, slightly yellow/brown lumps on its ventrum and tail. PA had previously been isolated in this zoo, but not from its eastern water dragons. The two affected animals were housed together with four unaffected animals. Multiple samples were collected from one animal, including two skin biopsies, two skin scrapings and two swabs. One swab was unsuitable for testing and culture of the other swab was negative. Culture of one skin scraping and one biopsy yielded a heavy growth of *Paranannizziopsis* sp. DNA extraction from pooled samples and both culture samples showed highest similarity (99 percent) to *Paranannizziopsis californiensis* (PC). However, analysis of a recent phylogenetic tree of *Paranannizziopsis* (Sigler *et al.*, 2013) indicated a small genetic difference between the PA and PC. Further work is needed to identify and trace the origins of *Paranannizziopsis* spp. found in New Zealand and this is planned in collaboration with the zoo and the Department of Conservation. The taking of multiple samples in this case enabled the diagnostic efficacy of different sampling methods to be compared and it appears that skin scrapings and biopsies work better than swabs. This is consistent with the location of fungal hyphae within the dense keratin, which would be expected to exfoliate more readily with scraping than with swabbing.

In another case, a veterinarian contacted MPI to report possible fungal skin lesions in three NZ green geckos (*Naultinus elegans*) and again *Paranannizziopsis australasiensis* (PA) was considered a possible cause. The distribution and consequences of PA infection in NZ reptiles is still under examination. With these three geckos, photographs were taken and skin scrapings were sent to the AHL IDC (Wallaceville), where culture was performed. Culture was negative for PA. The cause of these wounds is more likely to have been trauma, based on reports by the zoo veterinarian and the culture results. PA was shown to be unrelated to the lesions in these animals and the investigation was closed.

Tularemia excluded

A zoo veterinarian called the MPI exotic pest and disease hotline to report the death of a ring-tailed lemur (*Lemur catta*). The three-year-old lemur had been imported from a facility in the USA six months prior and was one of four in the imported group. Several of the lemurs were intended for another zoo and the quarantine programme for these was thrown into question by the death. Prior to contacting MPI a postmortem and histopathology had been performed, which showed necrotising mesenteric lymphadenitis and multifocal hepatic necrosis, both of unknown aetiology. There was the suggestion of marginalised chromatin within hepatocellular nuclei, and a viral aetiology was thought to be possible. In addition, the necrosis of the mesenteric lymph node was suggestive of a bacterial cause. Because there were questions regarding quarantine and cause of death, multiple exotic and unusual agents were tested for, including *Francisella tularensis* (the agent of tularemia), *Bartonella hensalae* and generic herpesvirus. PCR tests for all

three agents were negative and no cause of death or of the lesions was identified. The other three lemurs were reported to be in good health following the death of their enclosuremate. No cause of death was established, but having ruled out several possible exotic agents the zoo was able to complete the quarantine and transfer of the remaining lemurs. The investigation was stood down.

A member of the public called the MPI exotic pest and disease hotline to report finding four dead juvenile hares (*Lepus europaeus*) over six days. One fully-grown juvenile was presented for necropsy. Exotic diseases (myxomatosis, European brown hare syndrome and tularemia) were ruled out. Findings included chronic parasitic enteritis and *Escherichia coli* bacterial overgrowth. There was a concurrent suppurative mesenteric lymphadenitis, from which *E. coli* was cultured. It was hypothesised that intestinal coccidiosis and possibly other unknown factors predisposed this hare to colibacillosis. In rabbits, colibacillosis is a poorly understood syndrome where the microflora of the intestine are upset, allowing the proliferation of *E. coli*. Multiple factors including intestinal damage and sudden dietary change are believed to predispose to colibacillosis. No further cases were reported and the investigation was stood down.

Lymphocytic choriomeningitis virus excluded

A veterinarian called the MPI exotic pest and disease hotline to report neurological signs in two guinea pigs from a Canterbury household. The guinea pigs had both developed acute partial paralysis with vestibular signs. The major exotic ruleout for neurological disease in guinea pigs is lymphocytic choriomeningitis virus (LCMV), a virus carried and excreted by rodents and not reported from New Zealand. The guinea pigs were euthanased and sent to the AHL IDC (Wallaceville) where a full postmortem was performed and samples were taken. Postmortem and histopathology were unremarkable, with no nervous lesions observed and no gross signs of otitis. Fresh brain was submitted for LCMV real-time PCR, and tested negative. Possible causes of neurological signs in guinea pigs include dual vitamin C and E deficiencies (Hill *et al.*, 2003), toxicity, and trauma or infection leading to spinal cord compression. No signs of vitamin C deficiency (e.g., haemorrhage) were seen. Experimentally, combined vitamin E and C deficiency has been found to cause nervous disease in guinea pigs by causing peroxidation of lipids within the CNS. No cause of the nervous disease was found, but the exotic agent LCMV was excluded so the investigation was stood down.

Brown dog ticks confirmed

A Christchurch veterinarian contacted MPI via the exotic pest and disease hotline to report finding seven ticks on two dogs from one household. The ticks were identified by the MPI Plant Health and Environment Laboratory (PHEL) IDC (Tamaki) as the exotic brown dog tick, *Rhipicephalus sanguineous*.
A biosecurity response was initiated and a report on the investigation and response will appear in a future issue of *Surveillance*.

Other exotic ticks intercepted

A scientist from a laboratory in Dunedin called the exotic pest and disease hotline to report a tick that had been submitted by a local medical centre. A person returning from Perth, Western Australia, had found a tick attached to their skin upon arrival in New Zealand, and had gone to the doctor to have it removed. The immediate concern was whether the tick species was a capable vector of Lyme disease and might have infected the traveller. The tick was identified at PHEL IDC (Tamaki) as an *Ambylomma* sp. but species level identification was not possible because the mouthparts were missing. This species is not considered a competent vector of Lyme disease or any other human diseases of concern from Australia, and has a low risk of establishment if accidentally introduced.

In another case a passenger arriving from Perth, Western Australia, found three ticks attached to their clothing. A specimen was again identified at PHEL IDC Tamaki as an *Ambylomma* sp. but species level identification was not possible because the mouthparts were missing.The notifiers were asked to carefully check their pets, and vacuum places where ticks hide.

A medical laboratory technician called the exotic pest and disease hotline to report receiving a tick submitted by a medical doctor. The tick had been removed from the thigh area of a traveller recently returned from Australia and was submitted to PHEL IDC (Tamaki) where it was identified as an adult female *Haemaphysalis bancrofti* or wallaby tick. The preferred hosts of this species are cattle and marsupials. *H. bancrofti* is occasionally intercepted on humans arriving in New Zealand but is not associated with any disease of animals or humans. Establishment was prevented and the investigation was stood down.

References

Kittelberger R, McIntyre L (2009). A case of atypical scrapie/Nor98 in a sheep from New Zealand. *Surveillance* 36(4), 6–10.

Bingham P (2015) Quarterly report of investigations of suspected exotic diseases. *Surveillance* 42(1), 10–16.

Lyapunov YE, Kuzyaev RZ, Khismatullin RG, Bezgodova OA (2008). Intestinal enterobacteria of the hibernating *Apis mellifera mellifera* L. bees. *Microbiology* 77(3), 373–379.

Sigler L, Hambleton S, Paré JA (2013). Molecular characterization of reptile pathogens currently known as members of the *Chrysosporium* anamorph of *Nannizziopsis vriesii* complex and relationship with some human-associated isolates. *Journal of Clinical Microbiology* 5(10), 3338–3357.

Hill KE, Montine TJ, Motley AK, Li X, May JM, Burk RF (2003). Combined deficiency of vitamins E and C causes paralysis and death in guinea pigs. *American Journal of Clinical Nutrition* 77(6), 1484–1488.

Paul Bingham
Manager
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
paul.bingham@mpi.govt.nz

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 2014 and April 2015.

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 non-indigenous and potentially invasive marine flora and fauna, including selected species that have documented international impacts, that present a significant risk of arriving and becoming established, and are likely to have negative consequences for New Zealand's environment and economy. The programme 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 (http://www.biosecurity.govt.nz/pests/registers/uor) 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 Asian clam *Potamocorbula amurensis*) and secondary target species (Australian droplet tunicate *Eudistoma elongatum*, Asian bag mussel *Arcuatula senhousia*, Mediterranean fanworm *Sabella spallanzanii* and clubbed tunicate *Styela clava*). All unidentified suspect samples collected during surveillance activities are sent for identification to the Marine Invasives Taxonomic Service (MITS), a marine taxonomic clearing house funded by MPI and operated by NIWA. All of these identifications are subsequently entered into the marine non-native species database for future reference. The data are accessible from http://www.marinebiosecurity.org.nz/#panel-2.

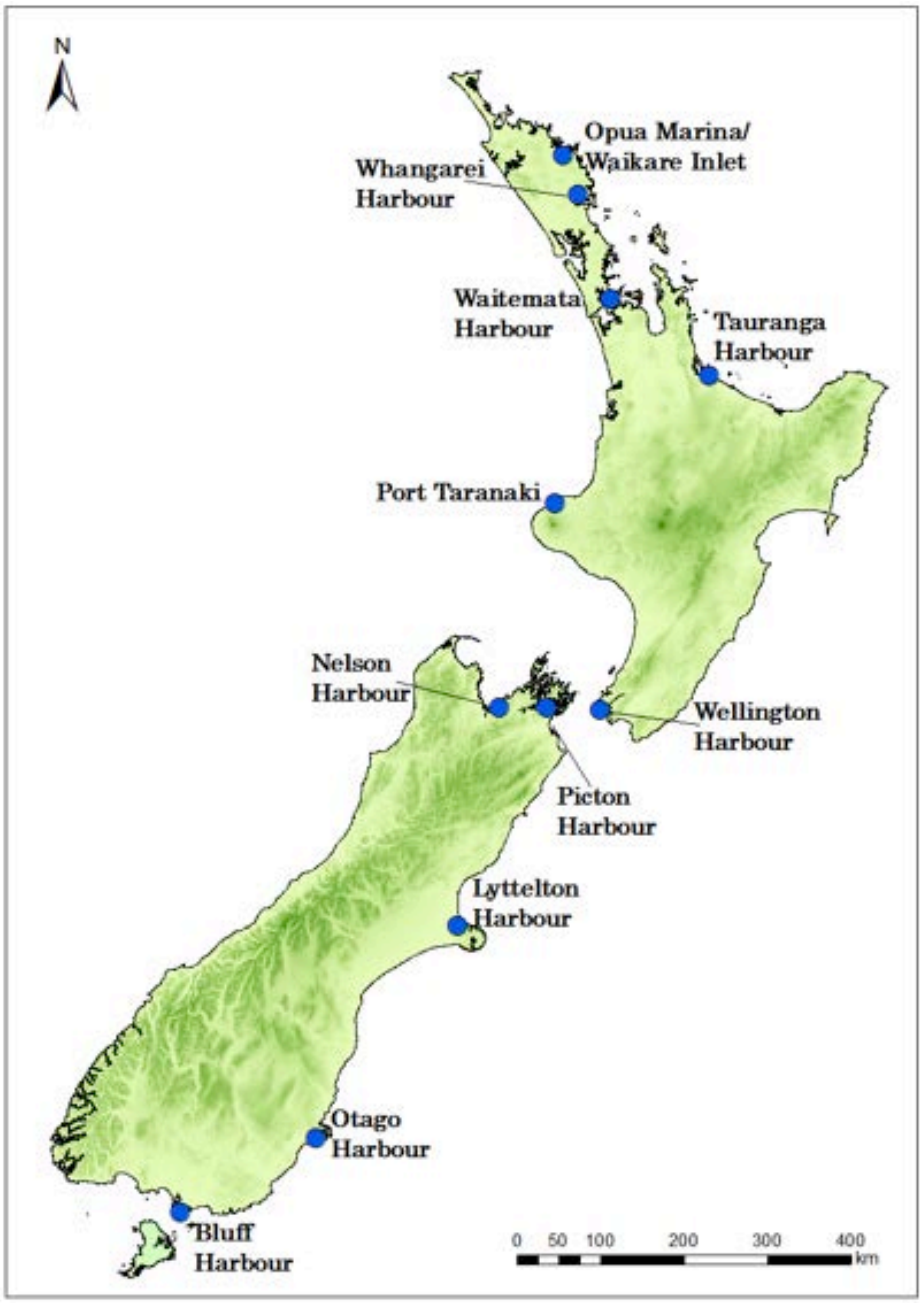

Figure 1: Locations of the 11 ports and associated marinas surveyed in the targeted surveillance programme. Note that Havelock is associated and included with Picton Harbour.

Sample collection

A total of 2 930 sites were surveyed during the 2014 winter sampling period (May to October) and 2 911 sites were surveyed during the summer months (November 2014 to April 2015), representing 100.9 percent and 100.3 percent of the target number of sites, respectively. Habitats sampled included soft and hard surfaces such as mud and gravel bottoms, rocky shores and artificial structures including marina pontoons, pilings, moorings, jetties and vessel berths. Techniques used included epibenthic sled tows, crab box traps, crab condos 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 nine of the ports surveyed (**Table 2**). This represents range extensions for two of these secondary target species: *Sabella spallanzanii* detected in Nelson Harbour and *Styela clava* in Picton.

Number of specimens collected and sent to MITS

In total 104 specimens were sent to MITS for identification: 32 for the winter round and 72 for the summer round. Suspect specimens found at high-risk sites represented 14 taxonomic groups and included 14 non-indigenous species (**Table 3**). Two of these are new records for New Zealand: the colonial ascidian *Distaplia viridis* Kot, 1957, detected in Whangarei in June 2014, and the brown alga *Stictyosiphon soriferus* (Reinke) Rosenvinge, 1935, detected in Wellington in February 2014.

MITS also identified 174 sample lots that were collected and submitted as part of MPI investigations into exotic marine organisms. These were generally received following notifications via the MPI exotic pest and disease hotline.

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

Table 1: Sample methods utilised for high-risk sites surveyed in 2014–2015*
Species in ***bold*** have been collected using this method during the present or previous surveillance programmes

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 50 m tow length and high replication enables a reasonably large area to be sampled (ca 2 500m^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. Shores and shallow subtidal habitats, 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, Hemiplax*).
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, Hemiplax*). 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. Wind direction on preceding days is 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 areas of hard substratum can be searched in detail	Depends on water clarity and level of biofouling

Table 2: Summary for the marine high-risk sites surveyed in 2014–2015

Location	Sampling round	Target number of sites	Actual number of sites	Target species found
Opua	Winter 2014	248	248	*Eudistoma elongatum, Styela clava*
	Summer 2014–2015	248	249	*E. elongatum, S. clava*
Whangarei	Winter 2014	243	246	*Arcuatula senhousia, E. elongatum, Sabella spallanzanii, S. clava*
	Summer 2014–2015	243	245	*A. senhousia, E. elongatum, S. spallanzanii, S. clava*
Auckland	Winter 2014	486	485	*A. senhousia, S. spallanzanii, S. clava*
	Summer 2014–2015	486	494	*A. senhousia, S. spallanzanii, S. clava*
Tauranga	Winter 2014	243	254	*S. spallanzanii*
	Summer 2014–2015	243	245	*S. spallanzanii*
New Plymouth	Winter 2014	243	243	
	Summer 2014–2015	243	244	
Wellington	Winter 2014	243	243	
	Summer 2014–2015	243	240	*S. spallanzanii, S. clava*
Picton & Havelock	Winter 2014	243	244	
	Summer 2014–2015	243	242	*S. clava*
Nelson	Winter 2014	243	242	*S. clava*
	Summer 2014–2015	243	241	*S. spallanzanii, S. clava*
Lyttelton	Winter 2014	243	243	*S. clava*
	Summer 2014–2015	243	243	*S. clava*
Otago	Winter 2014	243	243	*S. clava*
	Summer 2014–2015	243	243	*S. clava*
Bluff	Winter 2014	225	225	
	Summer 2014–2015	225	225	

Table 3: Samples collected and identified by MITS from each sampling locality, 2014–2015.

Non-indigenous species are in BOLD. Range extensions are in BLUE. First detections for New Zealand are in RED.

(Note: During the 2014-15 season no samples were sent for identification from the Port of Lyttelton)

Location	Taxonomic Identification	
	Taxonomic group	**Species**
Opua	Ascidian	*Microcosmus squamiger*
	Bivalve	*Corbula zelandica, Ennucula strangei, Maorimactra ordinaria, Musculus impactus*
	Bryozoan	***Conopeum seurati, Watersipora subatra***
	Decapod	*Heterozius rotundifrons*
	Anthozoan	*Culicia rubeola*
Whangarei	Algae	*Callithamnion* sp. ‡, *Griffithsia* sp. ‡, *Valeriemaya* sp. †
	Sea Anenome	*Epiactis thompsoni*
	Annelid	*Megalomma suspiciens,* ***Sabella spallanzanii****, Parasabella aberrans*
	Ascidian	***Botrylloides giganteum****, Didemnum vexillum,* ***Distaplia viridis****,* ***Styela clava***
	Bivalve	*Pratulum pulchellum*
	Decapod	*Pariliacantha georgeorum*
	Gastropod	Unidentified (Tonnoidea)Δ
Auckland	Ascidian	*Aplidium thomasi,* ***Botrylloides giganteum****, Botrylloides leachii, Molgula mortenseni*
	Porifera	*Clathrina coriacea*
Tauranga	Algae	*Anotrichium crinitum, Gigartina atropurpurea, Plocamium angustum, Schizoseris* sp.Δ
	Annelid	***Sabella spallanzanii***
	Ascidian	***Botrylloides giganteum****, Botrylloides leachii, Polyandrocarpa* sp. (cf. *robusta)* †
	Hydroid	*Aglaophenia* cf. *laxa*Δ*, Clytia hemisphaerica*
	Porifera	*Chelonaplysilla violacea*
New Plymouth	Algae	***Grateloupia turuturu****, Polysiphonia* sp.§*, Rhodymenia sp.* §
	Annelid	*Boccardia syrtis*
	Fish	*Tewara cranwellae*
	Gastropod	Gastropoda§
Wellington	Algae	***Striaria attenuata****, Gloioderma saccatum,* ***Stictyosiphon soriferus***
	Annelid	***Sabella spallanzanii***#
	Ascidian	***Ciona intestinalis, Styela clava***
	Bivalve	*Corbula zelandica, Ennucula strangei,* ***Limaria orientalis****, Pratulum pulchellum*
Picton/Havelock	Algae	***Grateloupia turuturu****,* ***Schizymenia apoda***
	Asteroid	*Sclerasterias mollis*
	Hydroid	***Ectopleura crocea***
Nelson	Algae	***Grateloupia turuturu***
	Decapod	*Halicarcinus varius*
Otago	Algae	*Rhodoglossum* cf. *latissimum*,* ***Schizymenia apoda***
	Ascidian	*Botrylloides* cf. *magnicoecum*‡
	Holothurian	*Chiridota nigra*
Bluff	Algae	*Callophyllis hombroniana, Centroceras clavulatum,* Kallymeniaceae*, *Plocamium* sp. ** Pugetia delicatissima*
	Ascidian	*Botrylloides leachii, Botrylloides* cf. *magnicoecum*‡
	Fish	*Auchenoceros punctatus, Grahamichthys radiata, Nemadactylus macropterus*

* Molecular techniques required for identification to species level
# Detected on a vessel hull
§ Unidentifiable
Δ Juvenile, or lacking morphological characteristics necessary for identification
† Species yet to be described
‡ Genus poorly understood in NZ

Tim Riding
Senior Adviser
Surveillance & Incursion Investigation (Animals and Marine)
Ministry for Primary Industries
Tim.Riding@mpi.govt.nz

Chris Woods
Scientist
National Institute of Water and Atmospheric Research
Chris.Woods@niwa.co.nz

Serena Wilkens
Scientist
National Institute of Water and Atmospheric Research
Serena.Wilkens@niwa.co.nz

Graeme Inglis
Principal Scientist
National Institute of Water and Atmospheric Research
Graeme.Inglis@niwa.co.nz

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

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

Scallop mortalities investigated

A member of the public contacted MPI by email to report that the scallops around Great Barrier Island were afflicted with a disease. The notifier said that many scallop beds around the island were barren, and where scallops were present they were in poor condition. The animals were described as showing poor roe development, with deformed roes and unusually small, soft muscles. This change had first been noticed five years ago and appeared to be getting worse. Five years ago morbidity was estimated at 10 percent in contrast with the current estimate of 100 percent morbidity on the western side of the island. When comparing with scallops from the Coromandel area, the notifier said Great Barrier animals were about half the size.

Fisheries officers in the Auckland and Waikato (Coromandel) regions were contacted to determine whether there had been other reports of sick scallops in the area, and to gain general information about the fisheries environment around Great Barrier. They had not received any reports of sick scallops from recreational or commercial fishers. However, while patrolling Great Barrier over the Christmas period they received anecdotal reports that the scallop fishery around the island had all but disappeared and many of the scallop beds contained only dead shells. This was confirmed after fisheries officers dived in areas where shellfish used to be prevalent and reported the sea floor was now covered in thick mud. Massive sediment discharge from flood events could be a contributing factor. The notifier subsequently reported that scallops around Great Mercury Island, east of the Coromandel Peninsula, were also starting to look diseased.

MPI collected 15 specimens from each of two sites, one off Great Barrier and the other off Great Mercury, for testing at the MPI Animal Health Laboratory. Tests included general aquatic bacteriology, histopathology and molecular testing for oyster herpesvirus type 1, *Perkinsus olseni* and *P. marinus*.

P. olseni was identified at a low prevalence by five positive PCR results from the Great Barrier population, but was not found on histopathological examination. However, histopathology of the these animals showed inflammation and degeneration of digestive tubules, and the presence of concretion bodies in the kidneys. Nothing significant was cultured on bacteriology.

In contrast to the Great Barrier population, the Great Mercury specimens exhibited the presence of *P. olseni* on both PCR and histopathology. The histopathological examination showed that all of the scallops had metazoan cysts, indicating the presence of a parasite, and half exhibited a marked haemocyte response. There was also evidence of mineralisation and disruption of the digestive tubules in some specimens. Bacteriological culture did not identify anything significant.

The haemocyte response in the Great Mercury population was likely an inflammatory response that was due to the presence of the metazoan cysts. Such an infestation is not thought to be significant in healthy animals, but if they were already under stress it could compromise their health. It is not known whether the concretion bodies found in the Great Barrier population are normal or whether they are caused by problems with the digestive system. Both views are found in the literature (Hine & Wesney 1997; Lohrmann 2009; Austin 2010).

The common feature of both populations was disruption of and damage to the digestive tubules. There is some literature that attributes this damage to a "virus-like particle", but little research has been done and there is not enough evidence to implicate a virus in these cases of digestive tubule damage.

Regardless of the cause of the this damage, it compromises the health of the organism by reducing its resilience to other stresses, whether they be environmental (e.g., changes in salinity or levels of nutrients in the water) or biological (e.g., opportunistic pathogens). Even natural events that have high energy requirements, such as spawning, could be enough to cause population declines when the animals' digestive capacity is diminished.

In this case, no single casual factor or disease was found so the morality and poor condition of scallops is believed to have had multifactorial causes. Exotic disease was ruled out, the results were conveyed to the fisheries management team and the investigation was closed.

Amoebic gill disease confirmed

A veterinarian contacted the MPI exotic pest and disease hotline to report a mortality event on a salmon farm. By the time of the notification, mortalities were already declining and the veterinarian considered that the outbreak was coming to an end. Laboratory testing had been organised at a commercial laboratory and amoebic gill disease was diagnosed. This disease, caused by *Neoparamoeba perurans*, though rare, has been previously reported in New Zealand and occurs during particularly hot and still weather. The laboratory reports were sent to the AHL fish pathologist, who concurred with the diagnosis. The investigation was closed.

Exotic crabs excluded

A member of the public called the MPI exotic pest and disease hotline to report many small crabs feeding on kahawai (*Arripis trutta*) caught in a net at Akaroa, Banks Peninsula. The caller had fished

Continued on page 61

Biosecurity Response Group overview

The Ministry for Primary Industries (MPI) Biosecurity Response Group (BRG) sits within the Operations Branch and is responsible for responding to the biosecurity risks posed by exotic and emerging pests and diseases found in New Zealand. The BRG is also involved in preparing for exotic diseases and potential emerging pests or diseases such as brown marmorated stink bug, foot-and-mouth disease and marine pests. This report covers activities undertaken by the BRG for the year 1 July 2014 to 30 June 2015.

MPI initiates biosecurity responses to organisms or risk goods that may affect New Zealand's primary industries or marine, freshwater and terrestrial environments (**Figure 1**). Each organism is assessed for the risks it poses, including economic, environmental, social, cultural and human health risks. An assessment is also made of:

- the complexity of any response,
- the ability of the organism to spread,
- methods available for eradication or control,
- the feasibility of eradication and resources required, and
- possible barriers to eradication of the organism (such as legal considerations and stakeholder and public concern).

All these questions are considered before we initiate a response. Answers to these questions may also limit our ability to eradicate the target organism, for example if it is widespread and there are limited control tools available.

Responses make use of MPI's Single Scalable Response Model (SSRM), which is based on the New Zealand Coordinated Incident Management System (CIMS) approach. This allows us to tailor the response model to the scale and complexity of each incursion or detection.

Surveillance is a vital component of any MPI response. Targeted surveillance programmes such as the National Fruit Fly Surveillance Programme and the Marine High Risk Site Surveillance Programme often lead to a response being initiated, as seen in the recent Auckland fruit fly incursion and the discovery of clubbed tunicate (Styela) in Picton Harbour during 2013. Surveillance is also used during a response to continue to define population boundaries, monitor response progress, and for other responses including containment, management and eradication.

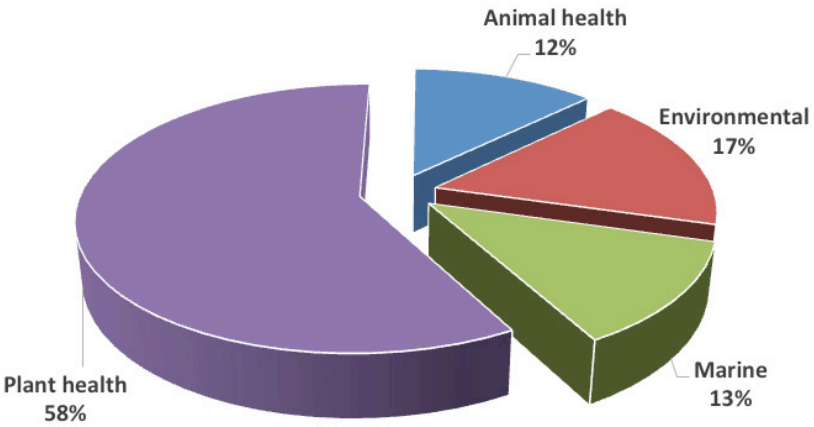

Figure 1: Rapid Assessment Reports by sector, 1 July 2014 – 30 June 2015

At the end of June 2015 the BRG was managing 39 high-priority responses. In addition, the group manages responses to nine pest plant species as part of the National Interest Pest Response (NIPR) programme. The group also manages responses in partnership with stakeholders such as AsureQuality, the Department of Conservation, regional councils and industry.

The length of a biosecurity response can vary from four weeks for short responses and up to 10 years for some of the more complex cases.

Marine and freshwater investigations - continued from page 60

the area for many years but had never previously noticed these crabs. The notifier was able to submit a sample of the crabs to the Marine Invasive Taxonomic Service, where they were identified as pillbox crabs, *Halicarcinus varius*, a common species that is endemic to New Zealand. These crabs are commonly found in sheltered areas among algae, on rocks, under stones or on sandy and muddy shores. They usually grow about 1 cm long. In summer months they can reach higher densities but tend to remain cryptic. There was no biosecurity risk associated with these crabs so the investigation was closed.

References

Austin B (2010). Vibrios as causal agent of zoonoses. *Veterinary Microbiology* 140, 310–317.

Lohrmann KB (2009). How healthy are cultivated scallops (*Argopecten purpuratus*) from Chile? A histopathological survey. *Revista de Biologia Marina y Oceanografia* 44(1), 35–47.

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

Paul Bingham
Team Manager
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
paul.bingham@mpi.govt.nz

Queensland fruit fly in Auckland

A single male Queensland fruit fly (*Bactrocera tryoni*, or QFF) was found in a cue-lure trap in Grey Lynn, Auckland, and reported to MPI on 17 February 2015. This trap is part of MPI's National Fruit Fly Surveillance Programme.

Initially this detection resulted in a Level One response, which focused on movement controls (including a Controlled Area Notice under the Biosecurity Act 1993) and intensive surveillance to determine whether a breeding population existed. Movement controls were put in place to prevent further spread of potentially infested material. A governance group was formed including MPI, the Department of the Prime Minister and Cabinet, the Ministry of Foreign Affairs and Trade, Auckland Council, Government Industry Agreement partners, Kiwifruit Vine Health and Pipfruit New Zealand.

The response also set out to inform the general public about the problem, and as a result someone noticed and caught a female fruit fly and reported it to MPI. As a consequence, the first larvae in New Zealand-grown fruit were discovered on 20 February 2015 and the response was escalated to Level Two. This included baiting activities, treating infested properties, and surveillance and movement controls.

A total of 14 adult flies have been found: 13 males from traps and the abovementioned single female. The last adult was found on 6 March 2015. A total of five infested properties (with larvae) have been identified, all within a relatively small area.

This response has had a significant impact on elements of the community and local businesses, requiring the establishment of dedicated welfare staff to support them. In addition, the urban location of this case has created some particular challenges, with many visitors to Auckland around that time for events such as the Cricket World Cup and the annual Pasifika Festival, so additional resources and activities were required to manage the risks. Plans were developed to specifically address these issues and the associated operations were successful.

Based on the surveillance work to date, MPI is confident that this is an isolated population and that eradication is achievable and likely. The programme has slowed over the winter months (as the flies are inactive) and planning for eradication in the spring is well underway.

European alpine newt on the Coromandel Peninsula

A self-sustaining population of European alpine newt (*Icthyosaura alpestris*) was discovered on the Coromandel Peninsula in late 2013, close (within 8 km) to populations of the endangered native Archey's and Hochstetter's frogs (*Leiopelma archeyi* and *L. hochstetteri*). This newt poses a significant threat to New Zealand's rare and endemic native fish and amphibians. It is a voracious predator that eats small vertebrates and amphibian eggs, and has been confirmed to be carrying chytridiomycosis, a fungal pathogen causing global amphibian decline. There are no native newts in New Zealand, and the European alpine newt also has the potential to occupy habitats here with little competition.

Following the initial find MPI initiated an eradication response in conjunction with a compliance investigation. The neighbouring property owner, who introduced the newts to his property, obtained them from a now-deceased friend some time between eight and 14 years ago. The compliance investigation concluded that the suspected perpetrator could not be prosecuted owing to a lack of evidence. A Restricted Place Notice was issued, restricting material from leaving his property.

The eradication response has used a variety of methods including fyke and box nets, dip nets, drift fences, pitfall traps, detector dogs and manual searches in and around water bodies and high-risk areas within a 650 m radius of the initial detection. To date, dogs have been used very rarely in New Zealand for this work, but have the potential to be a valuable tool.

Environmental DNA sampling is being developed in conjunction with the Department of Conservation and Otago University to strengthen our certainty around surveillance and delimitation. Investigations into control by using rotenone in some water bodies to eliminate juvenile newts have also begun.

To date, newts have only been found within 350 m of the first detection site, presenting an opportunity for successful eradication. With over 3000 newts removed to date, efforts seem to have made a good impact on this localised population.

Brown dog tick response 2015

The brown dog tick case reported in the last issue of *Surveillance* remains isolated to a single household. No further ticks have been found on any dog or property in Canterbury, and the monthly tick checks and treatments of in-contact dogs are drawing to a close.

Part of the Canterbury response involved alerting practising veterinarians across the country and asking them to watch for suspicious ticks on dogs. Subsequently, in early June a Wellington veterinarian reported suspicious ticks on an urban dog, and these too were identified by MPI as brown dog ticks. In total, 10 adult ticks were found on the dog between 28 May and 15 June 2015. No other life stages (larvae or nymphs) were found, suggesting that a single life-stage had been brought into the house and that there was not yet a breeding population present.

Investigations confirmed that the Wellington case was isolated to a single residential property and there were no obvious links to the Canterbury case. In both cases the infested dogs were born and bred in New Zealand and had no evident links with recently imported dogs. This may suggest that the ticks came in with human travellers or imported goods. In the Wellington case, family members frequently travelling

Continued on page 63

National Invasive Ant Surveillance Programme Annual Report 2015

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 through human activity and commonly intercepted in air and sea cargo including fresh produce, timber, sea containers and personal baggage. They are major urban pests, invading homes, shops, cafes, etc., where food is readily available. They also threaten natural biodiversity by displacing native invertebrate species and encourage horticultural pests. Invasive ants such as Singapore ant (*Monomorium destructor*) gnaw holes in fabric and rubber goods, remove rubber insulation from electric and phone 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).

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 and 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) or protein (peanut butter, oil and sausage meat) are placed in 10 x 10 m grids (**Figure 1**), with some 46 311 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 reducing 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

Figure 1: A protein-baited pottle deployed during NIAS, 2015

Biosecurity Response Group – continued from page 62

to Australia were considered the most likely carriers and DNA testing of the ticks also supported an Australian origin. The objective of eradicating known populations of brown dog ticks in Canterbury and Wellington now appears to have been achieved and continued surveillance over the coming months should confirm this.

New oyster parasite drives first marine Biosecurity Control Area

New Zealand's first-ever marine Biosecurity Control Area was implemented in early June in a move to contain a newly detected parasite of flat oysters.

The parasite, *Bonamia ostreae*, has caused deaths in flat oyster species overseas although it has no impacts on human health or food safety. Its presence in NZ was confirmed for the first time in samples of flat oysters from a South Island aquaculture facility, by MPI's Animal Health Laboratory. As *B. ostreae* is a Notifiable Organism and listed by the World Organisation for Animal Health (OIE), the OIE has been advised.

Further sampling is ongoing to determine the distribution and abundance of *B. ostreae* in NZ. Surveillance and diagnostics have been completed on 60 sampled oysters from flat oyster farms and harvest areas. In addition about 600 oysters from NIWA flat oyster samples collected in 2013 have been tested, but *B. ostreae* has not been found in these.

To date, *B. ostreae* has only been found in stock from the aquaculture facility and two Marlborough oyster farms. Because its distribution appears limited to the top of the South Island, and its impacts on New Zealand flat oysters are uncertain, MPI has restricted some shellfish movements to prevent its spread.

The movement controls are set out in a Controlled Area Notice that came into force on 10 June 2015, restricting the movement of some shellfish species (including spat) from the higher-risk areas of Marlborough and Nelson to places where there are significant wild-capture oyster fisheries – Foveaux Strait, Stewart Island, Otago and the Chatham Islands. Some stock movements from the top of the South Island now require a permit from MPI. A new permit system has been established, with marine farmers now able to apply on line.

The controls relate to aquaculture stock transfers and there are no restrictions on the movement of shellfish sold for eating, or on personal taking of shellfish in the affected areas.

MPI continues to work closely with the aquaculture industry to make sure the controls are as practical as possible while still affording robust protection of New Zealand's flat-oyster fisheries.

Further information is available at http://www.biosecurity.govt.nz/pests/bonamia

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 original find.

Results

In the 2015 season of NIAS there was a 4.8 percent decrease in the number of pottles deployed (46 311) compared to the 2014 figure of 48 526. Pottle deployment varies from year to year owing to variations in site selection and weather. Climate is a significant factor that affects ant distribution, behaviour and the number and size of nests. The environmental influences to which ants are sensitive include air and soil temperature, rainfall and soil moisture deficit. Accordingly, favourable conditions during the lead-up to the surveillance period have been implicated as a cause of increased interceptions: the presence of more nests means more interceptions are likely (Gunawardana *et al*., 2013; Browne *et al*., 2012; Porter, 1988). A case in point was the warmer-than-average winter prior to the 2014 NIAS season. The nationwide average temperature in winter 2014 was 9.1°C, which was 0.8°C above the 1971–2000 winter average (NIWA, 2014a). However, temperatures in spring and early summer were highly variable, with soil moisture deficits in some areas (NIWA, 2014b). Varying conditions (especially temperature) can interrupt or slow nest development, and soil moisture deficits also adversely affect some ant species (Paul Craddock, pers. comm.). Fine weather, with fewer weather interruptions in January, enabled field operations to run smoothly during the season.

The 2015 NIAS season has seen a decrease in the number of detections of exotic ants (15, compared to 19 the previous year) but 13 of these detections were from just six separate nests. On one occasion the same nest was detected after ants were found in three different sample pottles that had been placed close together.

Table 1: Location and numbers of ant detections during NIAS, 2015

Species	Location	Date of detection	No. of nests found
Tapinoma melanocephalum	Port of Napier	11 Jan	nil
Tapinoma melanocephalum	Auckland International Airport	12 Jan	1
Tapinoma melanocephalum	Port of Tauranga	13 Jan	nil
Monomorium sp.	Port of Tauranga	19 Jan	1
Brachymyrmex obscurior	Ports of Auckland	19 Jan	nil
Tapinoma melanocephalum	Ports of Auckland	21 Jan	1
Paratrechina longicornis	Ports of Auckland	21 Jan	1
Monomorium destructor	Ports of Auckland	21 Jan	1
Paratrechina longicornis	Port Nelson	27 Jan	nil
Paratrechina longicornis	Ports of Auckland	16 Feb	nil
Paratrechina longicornis	Ports of Auckland	17 Feb	1
Monomorium sp.	Ports of Auckland	17 Feb	nil
Paratrechina longicornis	Port Otago	5 Mar	nil

Five exotic species were recorded (**Table 1**), including *Tapinoma melanocephalum* (ghost ant), *Paratrechina longicornis* (crazy ant), *Brachymyrmex obscurior, Monomorium destructor* (Singapore ant) and *Monomorium* sp. The Ports of Auckland recorded seven exotic detections, while the Port of Tauranga recorded two. The Ports of Napier, Nelson, Otago and Auckland International Airport recorded one exotic find each. All these ants and their associated nests were destroyed.

The 2014–2015 NIAS season again demonstrates the value of early intervention in preventing the establishment and spread of exotic ant species in New Zealand.

References

Browne G, Craddock P, Mattson L (2012). National Invasive Ant Surveillance Programme Annual Report: 2012. Unpublished report prepared by FBA Consulting & AsureQuality Ltd for the Ministry for Primary Industries, June 2012.

Global Invasive Species database (2014) http://www.issg.org/database/species/ecology.asp?si=960&fr=1&sts=sss&lang=EN. Accessed 29 July 2015.

Gunawardana DN, Peacock LR, Flynn AR, Ashcroft TT, Green OR (2013). Why is Napier sea port a hot spot for invasive ants? *New Zealand Plant Protection* 66: 10–16.

NIWA (2014a). National Climate Summary: Winter 2014. National Institute of Water & Atmospheric Research, September 2014. http://www.niwa.co.nz/climate/summaries/seasonal/winter-2014. Accessed 10 June 2015.

NIWA. (2014b). National Climate Summary: Spring 2014. National Institute of Water & Atmospheric Research, December 2014. http://www.niwa.co.nz/spring-2014. Accessed 10 June 2015.

Porter SD (1988). Impact of temperature on colony growth and development rate of the ant Solenopsis invicta. *Journal of Insect Physiology* 34: 1127-113.

Lora Peacock
Senior Adviser
Surveillance and Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
lora.peacock@mpi.govt.nz

Lester Mattson
Auditor
AsureQuality Limited
lester.mattson@asurequality.com

Paul Craddock
Operations Manager
Flybusters/Antiants
paul@flybusters.co.nz

Jonathan Pettigrew
Surveillance Manager, Biosecurity
AsureQuality Limited
Jonathan. Pettigrew@asurequality.com

National fruit fly surveillance programme 2014–2015

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 the country to export fresh produce 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 damage they cause. As an illustration of how important this is, horticultural exports in 2014 earned $3.9 billion, and more than 80 percent of fresh and processed fruit exports by value were of species that are considered hosts for fruit flies (Horticulture New Zealand, 2014).

New Zealand's National Fruit Fly Surveillance Programme entails seasonal monitoring for the presence of economically important fruit flies, using lure traps placed at high-risk locations throughout the country. 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.

Fruit flies belong to the family Tephritidae, which includes more than 4 500 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 nine recorded interceptions of exotic economically important fruit flies: six in Auckland and three in Northland. Six of these interceptions (including one incursion in February 2015) involved Queensland fruit fly; one was *B. passiflorae* (Fiji fruit fly); one was *B. papayae* (papaya fruit fly), and an incursion in May 1996 involved the Mediterranean fruit fly. This latter find resulted in an eradication programme being initiated whereas the previous finds were found not to be from an established population (as determined by heightened surveillance). The exception was an incursion in February 2015, when the discovery of a Queensland fruit fly breeding population resulted in an extensive trapping programme and an organism management programme over a large area of Auckland to eliminate that population. Additional trap inspections were carried out after the detection in February, until July, and will continue in a smaller 1.5-km radius from the original detection in addition to high-risk areas that have been identified, until

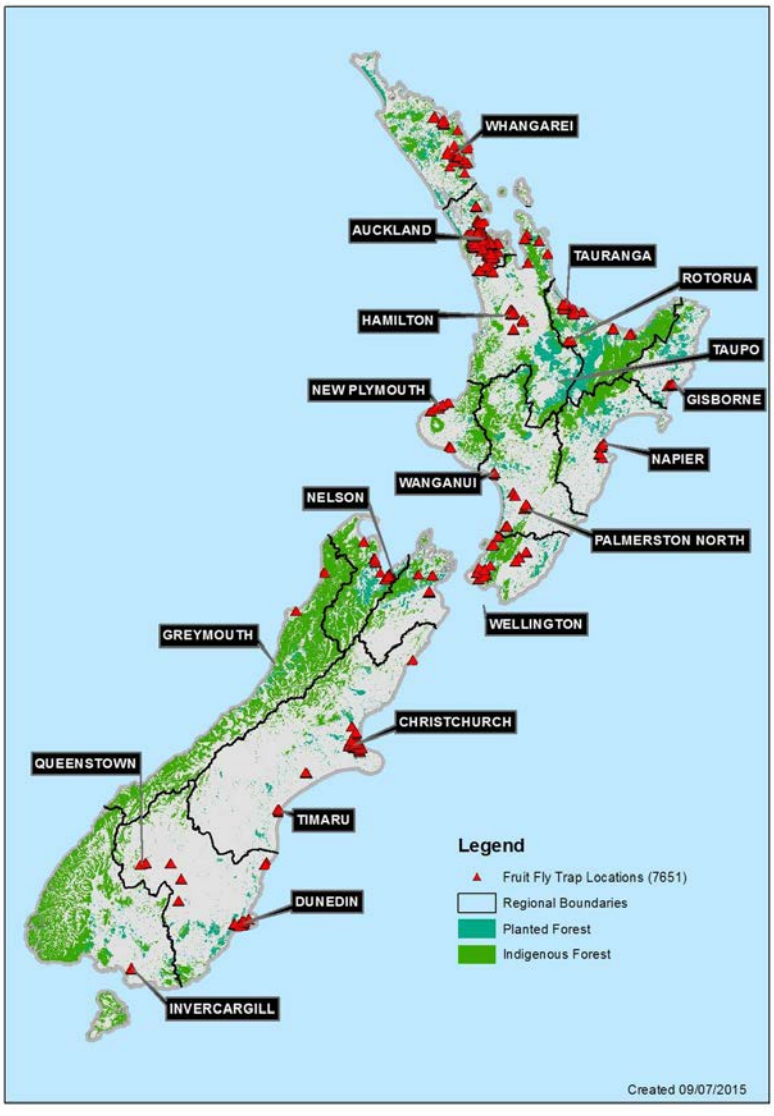

Figure 1: Distribution of trap sites for fruit fly surveillance

Table 1: Numbers of traps and trap runs by region, 2014–2015 season

REGION	Number of trap runs	Number of traps
Auckland/ Northland	73	4 920
Waikato/Bay of Plenty	18	672
Lower North Island	28	928
Upper South Island	20	757
Lower South Island	12	374
Total	**151**	**7 651**

eradication is confirmed. Since March 2015 no more Queensland fruit flies have been found.

AsureQuality has conducted fruit fly surveillance for MPI (formerly the Ministry of Agriculture and Forestry) for almost 20 years. In all, 7 651 fruit-fly traps were serviced fortnightly in 151 individual "trap runs" by AsureQuality staff servicing the North and South Islands (**Figure 1, Table 1**). A trap run is a set of traps located in a number of cells in a defined area. Each cell has one trap placed near the centre, in a host tree selected by a hierarchical ranking system, and collectively the cells make up a grid that covers the area at risk for fruit fly introductions. (**Figure 2**). Traps are serviced by a trained trapper, and the number of traps in each area varies from seven to 98, with a mean of 51.

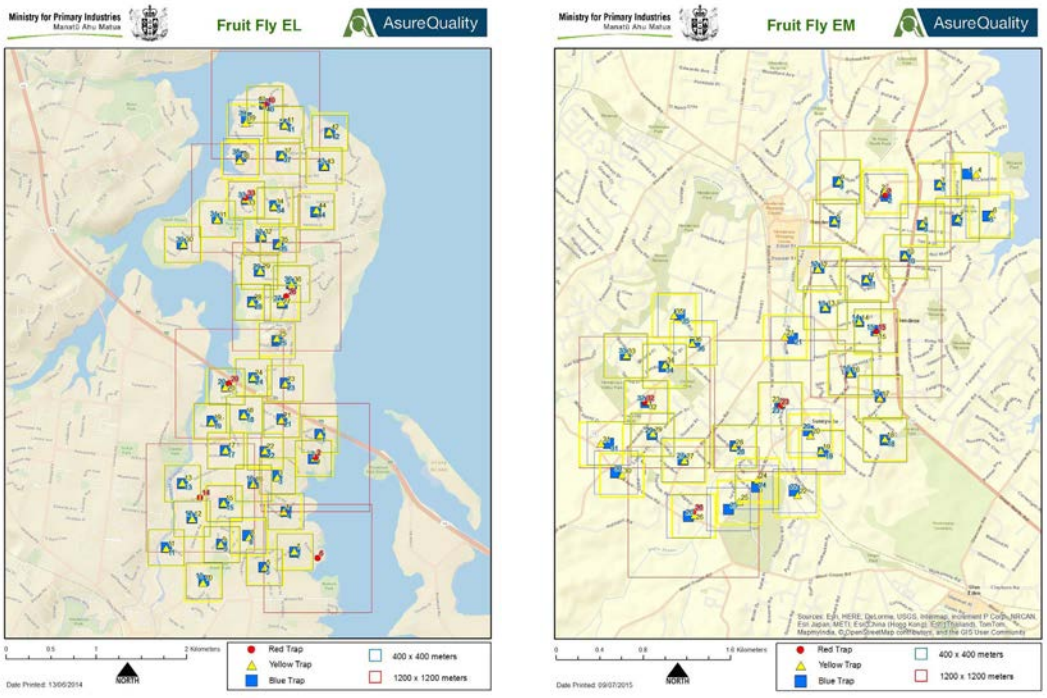

Figure 2: A grid made up of cells overlaid on an aerial photograph, showing the run of Queensland and Mediterranean fruit fly (blue) traps and Oriental fruit fly (yellow) traps in the western suburbs, Auckland.

A pheromone-impregnated fruit fly lure and a plastic strip impregnated with dichlorvos insecticide are placed in 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 identification.

Although the Fruit Fly Surveillance Programme season ran from mid-September 2014 until the end of June 2015, each region has 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 period ran from 15 September 2014 to 1 July 2015.

Trapping

Each trap is clearly labelled "Fruit Fly Trap" and displays the MPI and AsureQuality logos and a freephone contact number. The distance between the centres of cells that contain the traps depends on the efficacy of each lure and biology of targeted species. For example, cells that contain trimedlure and cuelure traps are 400 x 400 m, while those that contain methyl eugenol traps are 1200 x 1200 m. The minimum size of any trapping run is two adjacent cells, and both cells are selected so as not to overlap if possible. An example of a run in the western suburbs of 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.

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. This increases 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 flies are sent to the diagnostic laboratory within two working days after trap servicing. Nil returns are also submitted, to confirm that the traps on the run have been checked. 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

In terms of meeting the programme objectives, the 2014–2015 surveillance season was a success. One adult male Queensland fruit fly was found, initiating a response that resulted in the detection of a total of 14 adult fruit flies during the season (13 males and one female), plus numerous larvae. The first male found in a trap was in Grey Lynn,

Auckland, in February 2015. Unlike the three single male Queensland fruit flies found in Auckland and Whangarei during the last three years, this find was followed by the discovery of other life stages (eggs and larvae) by slicing and incubating fruit collected from the area of the initial find. This confirmed that a small breeding population was present. A level two response was initiated that included additional intensive trapping, a controlled area notice, movement restrictions on risk goods, fruit-fly bait spraying, forward and backward tracing, treatment of infested trees on properties, monitoring of collected fruit, and a public awareness campaign. The additional trapping, fruit collection and inspection over a period of 14 weeks determined that the small population was restricted to a 200 m radius from the initial detection. From this point until eradication is declared, additional trap inspections will be carried out over a 1.5 km radius from the February 2015 find as well as identified high-risk areas. No further life stages of Queensland fruit fly have been found since mid-March 2015.

There were 2 842 routine submission events, with a total of 4 061 suspect fly samples. A futher seven suspect samples were forwarded for taxonomic determination as a result of trapper passive surveillance within the fruit fly programme (i.e., when a trapper notices a specimen of concern that is at the trapping site but not in the fruit fly trap.)

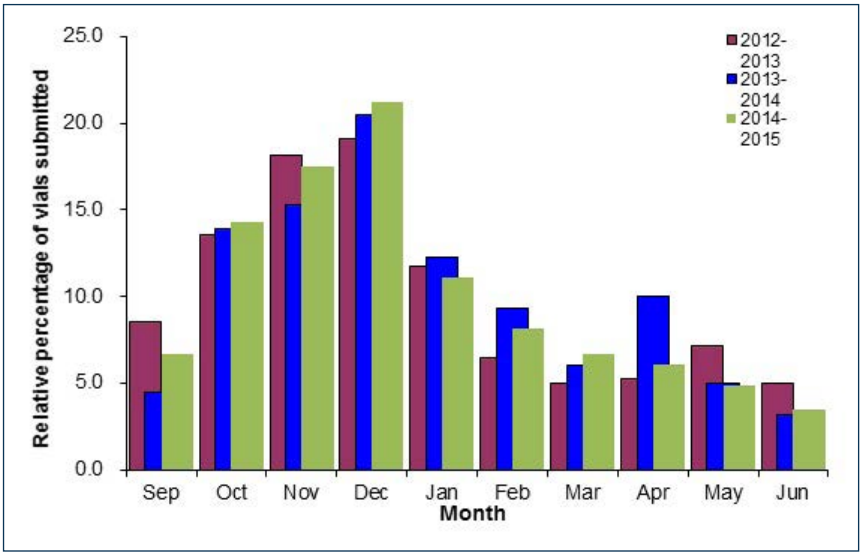

Figure 3: Fruit fly sample submissions by month and year.

Table 2 records that 4 061 suspect fly submissions were made. The Auckland/Northland region recorded the highest number of suspect samples (1 489, or 37 percent of the total). The number of traps per run ranged from seven to 98 (mean = 51, S.E. = 0.6), with a total deployment of 7 651 traps (**Table 1**). More than half of the submissions (64 percent) were made from October to January (**Table 2**).

Submissions generally followed a similar pattern to previous years (**Figure 3**), with the majority of submissions made between October and February. This indicates that a trapping season from September to May/June sufficiently spans the period when fruit flies are most likely to be found.

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

Table 2: Numbers of suspect submissions by region, 2014–2015 season

Month/ region	Auckland & Northland	Waikato & Bay of Plenty	lower North Island	upper South Island	lower South Island	Total
September 2014	195	22	28	27	0	272
October 2014	210	24	67	217	61	579
November 2014	200	40	103	272	94	709
December 2014	266	46	93	330	127	862
January 2015	140	32	54	134	89	449
February 2015	73	18	62	104	74	331
March 2015	68	27	82	61	35	273
April 2015	73	21	58	53	42	247
May 2015	122	15	35	12	13	197
June 2015	142	0	0	0	0	142
Total	**1 489**	**245**	**582**	**1 210**	**535**	**4 061**

Reference

Horticulture New Zealand (2014) Fresh Facts. http://www.freshfacts.co.nz/. Accessed 3 August 2015.

Rory MacLellan
Senior Adviser
Surveillance and Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Rory.MacLellan@mpi.govt.nz

Kerry King
Surveillance Coordinator
AsureQuality Ltd
Kerry.King@Asurequality.com

National saltmarsh mosquito surveillance programme 2014–2015

The present contract specification for the National Saltmarsh Mosquito Surveillance Programme (NSP) has been in operation for five years and during 2014–2015 the programme continued surveillance for post-border evidence of exotic saltmarsh mosquitoes. This year, field sampling of saltmarsh sites (**Figures 1 & 2**) has produced 8 758 mosquito larvae (**Table 1**) and 1 761 adults (**Table 2**), belonging to 10 species and five genera. This result is similar to previous years and within the normal variation produced by seasonal weather.

Table 1: Larval mosquitoes identified, 2014–2015

Ae. antipodeus	1 111
Cx. pervigilans	7 385
Cq. irucunda	0
Ae. notoscriptus	1
Cx. quinquifasciatus	0
Ae. subalbirostris	157
Cs. tonnoiri	0
Ae. australis	43
Cq. tenuipalpis	0
Op. fuscus	61
Total	**8 758**

Table 2: Adult mosquitoes identified, 2014–2015

Ae. antipodeus	516
Cx. pervigilans	813
Cq. irucunda	297
Ae. notoscriptus	47
Cx. quinquifasciatus	10
Ae. subalbirostris	42
Cs. tonnoiri	1
Ae. australis	0
Cq. tenuipalpis	35
Op. fuscus	0
Total	**1 761**

The NSP uses a statistically proven methodology for directing surveillance effort. It is designed to provide a high statistical probability that, if a fertile female exotic saltmarsh mosquito breaches the border and finds suitable breeding habitat, the resulting population will be detected before it can become widely dispersed. It is therefore comforting to report that no exotic saltmarsh mosquitoes were detected post-border in 2014–2015. However, over the 10 years the NSP has been in existence, it has been totally focused on the narrowly defined saltmarsh habitat. This narrow brief is largely an artefact of the original (2005) mandate, when the NSP ran alongside another programme that ran from 1998 to 2010, to eradicate the southern saltmarsh mosquito (SSM) (*Aedes camptorhynchus*), at a cost of $70M. The brief also reflects a close watch on all saltmarsh habitats since, to protect the SSM eradication investment and provide ongoing protection against the unknown pathway or pathways of SSM entry. However, it has long been recognised that five of the seven known exotic mosquitoes of concern to New Zealand are not confined to saltmarsh habitats.

In 2013 MPI and the Ministry of Health jointly commissioned external expert reviews of the NSP and Border Health Programme, to recommend responses to present and future exotic mosquito biosecurity threats at the border and post-border. These reviews were carried out by Professors Scott Ritchie and Richard Russell. Briefly, their recommendations were that:

- surveillance of the post-border mosquito breeding habitat types should in future include other high-risk exotic mosquito species in places close to Transitional Facilities;
- surveillance operations should be empowered to take urgent measures to minimise the risk of internal spread of any high-risk exotic mosquito species found; and
- given the time that has elapsed since SSM was eradicated in 2010, the frequency of some saltmarsh habitat visits could be reduced to less than the current minimum of four times per year.

There now exists the opportunity, as recommended by Ritchie and Russell, to change the next phase of mosquito surveillance to include a wider range of high-risk exotic mosquito species and revise the post-border programme specification to accommodate the more complex human and biological factors that influence the biosecurity risk.

Darryl McGinn
Mark Disbury
Mosquito Consulting Services (NZ)
PO Box 30719
Lower Hutt 5040
Darryl.McGinn@mcspty.com
Mark.Disbury@mcspty.com

Figure 1: Sampling mosquito larvae

Figure 2: Trapping adult mosquitoes

High risk site surveillance programme annual report 2014–2015

The High Risk Site Surveillance (HRSS) programme is a post-border risk-pathway-focused surveillance programme operated by the Ministry for Primary Industries (MPI), targeting vegetation (mainly 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 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).

Data collection for the programme is completely electronic, including the sample forms for submissions to FHRL. Everything is running smoothly and Scion's diagnosticians can access data on each sample while actually inspecting it.

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 risks are mapped in GIS. This enables better allocation of limited surveillance resources and makes the programme more effective.

Probability of detection in the HRSS programme is based on Carter (1989). Using this model, it is clear that repeated surveys within RSAs increase the probability of detection . Additionally, as the risk of incursion is ongoing, repeated inspections mean incursions in a smaller population are increasingly likely to be found. 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 2014–2015 season 503 RSAs and 7 006 transects were surveyed. Most surveillance was carried out around Transitional Facilities or their associated vegetation-rich areas (VRAs) (90 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 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.

As part of surveillance the HRSS programme inspects more than a thousand species of tree. While production trees are specifically targeted, there are many pests which can also be found on multiple hosts, and many areas where there are no production species planted. To overcome this, a good cross-section of native and urban exotic tree species are also inspected. On average about 240 trees and shrubs of each species are inspected, including about 35 trees, per transect.

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) identified samples not associated with trees and shrubs, or suspected of containing viruses, bacteria or nematodes.

Table 1: Calculated regional risk compared with percentage of transect inspections completed in 2014–2015

Region	Calculated biosecurity risk (percent)	Completed transect inspections (percent)
Auckland	61.1	50.6
Mid-Canterbury	11.1	8.4
Bay of Plenty	8.5	8.4
Wellington	5.6	5.5
Waikato	3.3	3.9
Hawke's Bay	3.1	3.6
Dunedin	1.4	3.0
Nelson	1.2	1.8
Southland	1.1	1.9
Wanganui	1.0	1.6

Source: Fraser *et al.*, 2015

Table 2: Summary of detection probabilities for the major risk ports, 2011–2015

Risk site	Mean detection probability 2011–2012 (percent)	Mean detection probability 2012–2013 (percent)	Mean detection probability 2013–2014 (percent)	Mean detection probability 2014–2015 (percent)
Port of Auckland	87	91	85	80
Auckland Airport/ Auckland Metro	76	89	88	82
Port of Tauranga	89	93	90	90
Port of Wellington seaport & Wellington Airport	63	55	60	66
Christchurch Airport	69	55	63	63
Port of Lyttelton	62	57	55	55

Source: Fraser *et al.*, 2015

IDC-PHEL was also responsible for validating all new to New Zealand identifications.

From 1 July 2014 to 30 June 2015 the diagnostic labs were sent 651 submissions (**Table 3**). 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). Fungi were identified in 18 percent of samples, but many of these yielded inconclusive results so they were further processed by the pathology sectuons of the 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 896 identifications were made during the season, of which about 63 percent were made to species level.

From the identifications a total of 124 PPIN reports were forwarded to MPI from FHRL. All species identifications made by FHRL were completed or fully evaluated within 15 days for their potential to be a biosecurity threat, and 92 percent of insect identifications were completed within 15 days.

The HRSS programme generated 55 sample submissions directly to the IDC-PHEL. In addition, four samples came via FHRL. Eleven 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 made (either new to New Zealand, new to science, new host associations or new distributions) in 2014–2015. The number of significant identifications is down on 2012–2013 and closer to the level found in the two previous reporting periods.

Table 3: Identification types made by FHRL and PHEL, 2012–2015

Sample type	2012–2013 (percent)	2013–2014 (percent)	2014–2015 (percent)
Entomology	47	61	61
Mycology	33	16	18
Inconclusive or other	20	23	21
Total	100	100	100

Source: Fraser *et al.*, 2015

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 total number of significant detections has decreased slightly, the proportion of submissions that produced significant detections has been maintained at the level achieved over the previous three years. The number of new to New Zealand records reported via this programme has dropped since last year. There could be many factors contributing to this, including increased 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.

References

Carter PCS (1989). Risk Assessment and Pest Detection Surveys for Exotic Pests and Diseases which threaten Commercial Forestry in New Zealand. *New Zealand Journal of Forestry Science* 19(2/3): 353–374.

Fraser A, Kane W, Sopow S, Bulman L, Rogan B, Bennett S, Flynn A (2015). High Risk Site Surveillance: Annual Report 2014–2015. Programme report to Ministry for Primary Industries.

Stevens P (2011). High Risk Site Surveillance Annual Report 2010–2011. *Surveillance* 38(3), 72–74.

Paul Stevens
Senior Adviser
Surveillance and Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Paul.Stevens@mpi.govt.nz

Table 4: Diagnostic trends from 2011 to 2015 (FHRL and PHEL)

Type	2011–2012	2012–2013	2013–2014	2014–2015
Submissions	740	1 106	860	651
Identifications	966	1 627	1 154	896
New to NZ	5	6	2	0
Significant detections	147 (20 percent)	228 (21 percent)	153 (18 percent)	135 (21 percent)

Source: Fraser *et al.*, 2015

Gypsy moth surveillance programme annual report 2014–2015

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 message about this unwanted species.

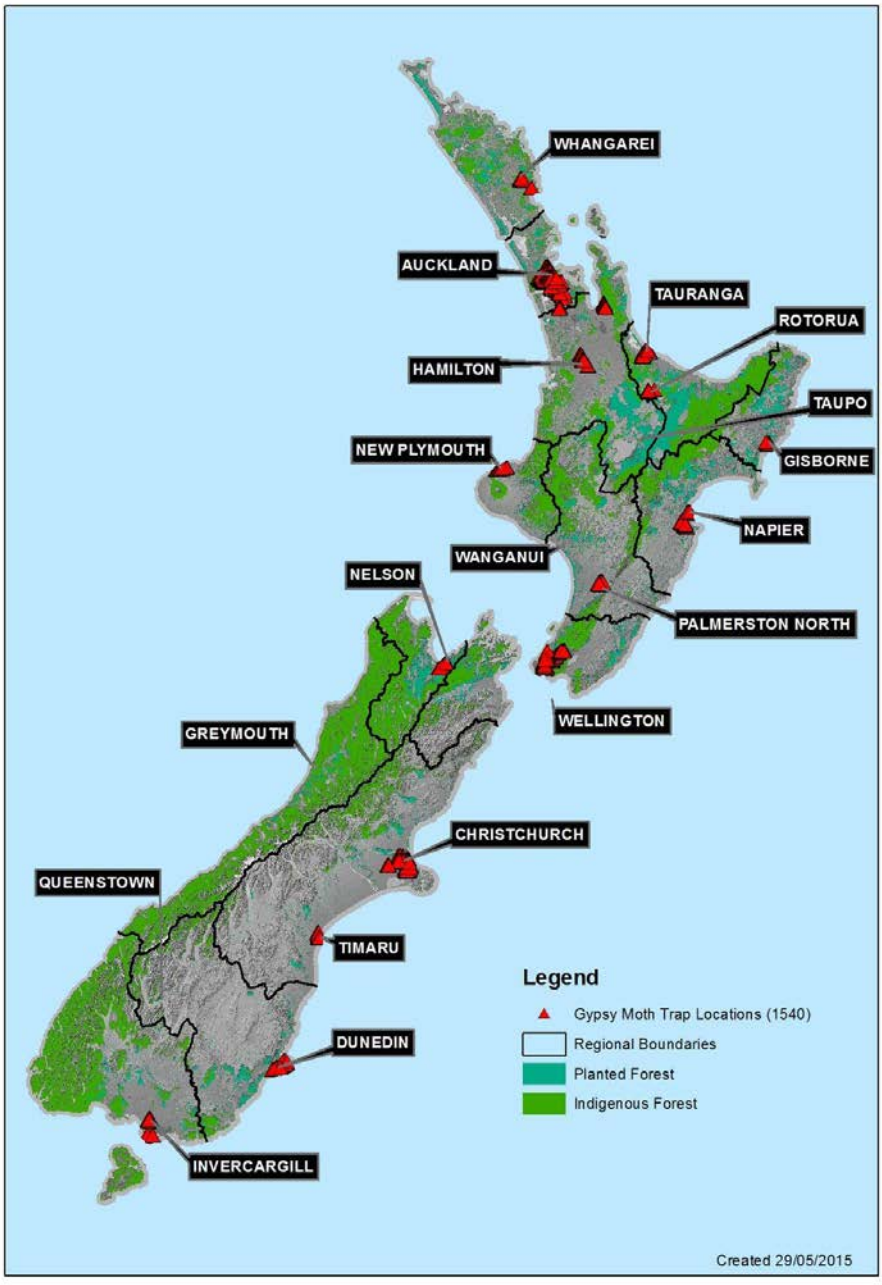

Figure 1: Distribution of trap sites for gypsy moth surveillance, 2014–2015

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

Trapping

The surveillance season runs from early November to early 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 zone 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 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.

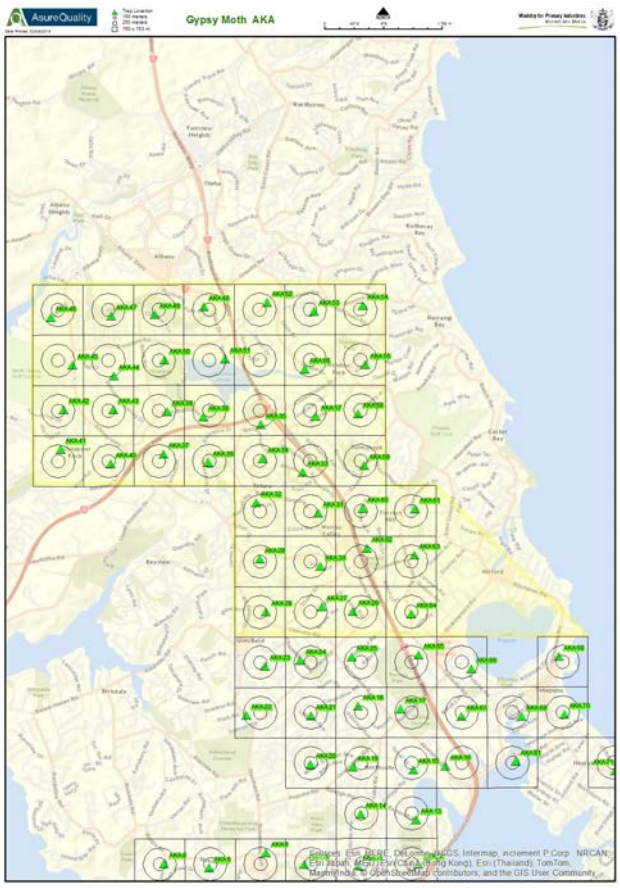

Figure 2: Example of a trapping grid overlying a topographical map, North Shore, Auckland. Each cell within the grid measures 750 x 750 metres.

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

Results

The gypsy moth trapping season ran from 3 November 2014 to 8 May 2015. The number of traps per run ranged from 11 to 81 (mean = 43), with a total deployment of 1 525 traps. A trap run is a series of traps within a defined geographic area that are serviced by one trapper, and the number of traps in a trap run varied from 11 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 20 647 trap servicing/inspection events.

In total there were 196 suspect moths submitted. The lower North Island recorded the highest number of submission events (43, or 33 percent of the total) and the highest number of suspect moths (67, or 34 percent) (**Table 1**).

The largest fraction of submissions (43 percent) was made during November and December (**Figure 4; Table 1**).

The relative percentage of sample submission events made per month during the trapping season is shown in **Figure 4**. The majority of submissions were received from November to January, with about 60 percent of the total in those three months. The number of samples submitted diminishes in autumn (April and May).

Table 1 shows the number submitted each month by region. The lower North Island and Auckland appear to consistently provide the most submissions in almost every month. Moths collected during May in the lower North Island and Auckland regions were mainly marked specimens intentionally placed in traps for auditing purposes.

No gypsy moths were found during the entire season. Moth specimens submitted were mainly (62 percent) of the family Noctuidae. Other moth families normally represented in the samples collected annually, with this season's figures in parentheses, include: Tortricidae (< 2 percent), Geometridae (9 percent), Oecophoridae (2 percent), Crambidae (8 percent), Tineidae (0 percent), Arctiidae (1.5 percent), Pyralidae (0 percent) and Hepialidae (3 percent). Miscellaneous moth families made up the remaining 12 percent.

Hatching *Lymantria* larvae were found during a quarantine inspection of a used vehicle at the Port of Auckland in March, and the vehicle was immediately treated. Subsequently MPI decided, in consultation with Scion and AsureQuality, to leave 44 gypsy moth traps in the port area from May to November, to mitigate the risk posed by larvae that might have ballooned and been able to spread prior to the inspection. These traps will be replaced when gypsy moth surveillance resumes in November 2015.

The 2014–2015 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 determination and the samples were obtained by a scientifically robust sampling process.

Table 1: Numbers of submission events and suspect samples submitted during the 2014–2015 surveillance season, by region

		Number of samples submitted per month							
Region	Number of submission events	November 2014	December	January 2015	February	March	April	May	Total
Auckland/ Northland	41	2014	15	13	6	9	3	2	58
Waikato/Bay of Plenty	21	10	3	1	5	5	10	0	31
Lower North Island	43	7	11	17	15	5	3	2	67
South Island	26	14	10	3	6	1	5	0	40
Total	**131**	**15**	**39**	**34**	**32**	**20**	**21**	**4**	**196**

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

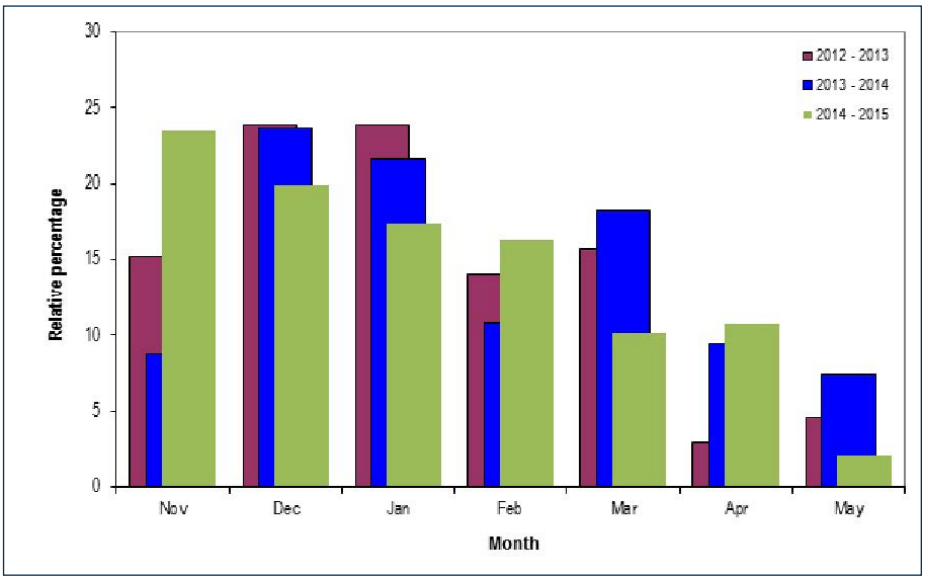

Figure 4: Percentage of gypsy moth sample submission events by month

Acknowledgements

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

Rory MacLellan
Senior Adviser
Surveillance and Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries.
Rory.MacLellan@mpi.govt.nz

Kerry King
Surveillance Coordinator
AsureQuality Ltd
Kerry.King@Asurequality.com

Plants and environment investigation report

The Ministry for Primary Industries' (MPI) Incursion Investigation (Plants & Environment) and Plant Health Environment Laboratory teams investigate and diagnose suspected exotic pests and diseases in the plant and environment sectors. Investigators and scientists are based in Auckland and Christchurch. These teams provide field investigation, diagnostic testing and technical expertise with regard to new pests and diseases affecting plants and the environment. They also have surveillance and response functions and carry out research and development to support surveillance and incursion response activities.

Redback spider establishment prevented

A single redback spider (*Latrodectus hasseltii*) was found and captured from the underside of a barbecue imported among personal effects when a family was relocating from Australia. MPI Quarantine Officers searched the property and re-inspected imported goods for further redback spiders but none were found. Risk items were treated with permethrin insecticide as a precaution.

Staff at a Transitional Facility contacted MPI when a live female redback spider and egg sac were found on a wooden pallet holding a consignment of crumb rubber recently imported from Australia. The egg sac contained dozens of spiderlings that dispersed when disturbed. The apparently sole adult female was sprayed with domestic fly spray and killed, and the spiderlings were also sprayed. MPI staff visited the facility after notification but no more spiders were found. The surrounding area was treated with permethrin insecticide as a precaution.

Establishment of wood borers prevented

Forty bamboo panels in a consignment imported from Indonesia were thought to possibly contain live borer larvae. Apparently fresh borer frass and exit holes were seen after the panels had been in storage for 11 months, but were thought to have been absent when the panels were imported. Borer galleries and dead borer beetle adults were found when one panel was destructively sampled. The beetles were identified as *Dinoderus nitidus* (a species not present in New Zealand) and *Tribolium castaneum* (present in NZ). Although consignment information showed the goods had been treated with methyl bromide prior to shipment, the goods were transported to an appropriate facility and fumigated again as a precaution.

Borer frass was noticed in the drawers of two bedside tables purchased together with a TV cabinet about six months previously. Although no adult borer were initially found, dead beetles were later found in the drawers after domestic insecticide was applied. Specimens were identified as *Lyctus brunneus*, commonly known as the powder post beetle, a common wood borer worldwide that is already established in New Zealand.

Active wood-boring insect damage was seen in a buffet unit imported from Java and purchased in 2012. The owner contacted first the importer (via the retailer), then MPI, by which time the cupboard had been collected for fumigation by the importer. However, live adult beetles were subsequently found in another cupboard drawer and identified as *Minthea rugicollis* (Coleoptera: Bostrichidae), a species not present in New Zealand. The importer confirmed that five other units were imported in the same consignment. Of these, two had been sold to persons unknown. Only one of the remaining three units was able to be traced. It showed no sign of infestation, and the owner promised to notify MPI if they saw any signs of borer. Fumigation and inspection of two units addressed the known risk. No further action was feasible.

Establishment of high-risk ants prevented

Specimens were sent to MPI after live ants were found in a shed, near furniture that had recently been shipped back from Australia. However, these were identified as *Monomorium antarcticum*, a common native species and no biosecurity risk.

An unusual-looking ant found at a Transitional Facility was identified by MPI as a trap-jaw ant (*Odontomachus* sp. cf. *simillimus*), an exotic species not currently present in New Zealand, but known to have a painful bite. The ant was also determined to be a de-alate queen, meaning it had already mated, which increased the biosecurity risk. MPI visited the site and determined that the facility staff had recently killed two similar ants. There was no obvious association to link the ant to any particular imported goods, but a search of the area where containers of bananas were stored resulted in two further ant finds. These were identified as *Iridomyrmex* sp. and *Nylanderia* sp., both established in New Zealand and not a biosecurity risk. However, ant specialists were contracted to survey the risk area and eradicate any exotic ant colonies found. Visual searching found no exotic ants. Similarly, pitfall traps left for seven days caught no ants. Pitfall traps were considered the appropriate surveillance option as *Odontomachus* is a predatory species and less likely to be attracted to the food baits typically used. As no further specimens of this species were found it was concluded that the collected specimen was most likely a solitary individual not associated with a colony.

Mango leaf hopper found

A live insect found in a new caravan imported from Australia the previous month was sent to MPI and identified as a mango hopper, *Idioscopus nitidulus* (Hemiptera: Cicadellidae), a major mango pest present in Australia but not New Zealand. This solitary hitchhiker was considered to pose a negligible biosecurity risk owing to the virtual absence of fruiting mango trees in NZ.

Potato wart disease ruled out

Potato samples from Invercargill were sent to Environment Southland because they were suspected to be infected with potato wart fungus (*Synchytrium endobioticum*), an unwanted organism that causes a serious potato disease overseas. Samples provided to MPI were determined to have powdery scab caused by *Spongospora subterranea*, a species already present in New Zealand.

New palm mealybug ruled out

An entomologist found an unusual mealybug on an exotic palm growing in the grounds of the Auckland University Law School and considered it a possible new to New Zealand species. However, specimens received by MPI were identified as *Laminicoccus flandersi* (Hemiptera: Pseudococcidae), a species already present in New Zealand. It is currently unclear whether this notification represents a new host association record.

Insects found in fish feed

A consignment of imported fish feed was found to be infested with insects, despite having a zoosanitary certificate stating that it had been heat-treated (to 80°C) before shipping. Methyl bromide fumigation was arranged for the consignment, and the insects were subsequently identified as *Ctenolepisma longicaudata* (a silverfish species already established in New Zealand) and *Dermestes ater*, the black larder beetle, a species not recorded as present here. *D. ater* is known as a globally widespread pest of stored products, and is often found in fishmeal. It is also a host of parasitic tapeworms that infect poultry. The MPI border intelligence team was advised and will more carefully inspect future fishmeal consignments to ensure heat treatment has been sufficient to kill any insects present.

Illegal seed import intercepted

An English gardening magazine posted to New Zealand was found to contain four packets of seeds (sweetcorn, courgette, squash and mixed lettuce). This method of seed importation by-passed MPI's border system, including the inspection process. The magazine purchaser destroyed the seeds by burning and advised MPI that the magazine stated the next issue would include eight more packets of seeds. MPI sent an email to the UK publisher, who immediately replied and advised there were only three New Zealand subscribers, and they had updated their instructions to the printer to ensure no further seeds would be sent to the NZ subscribers. While the publisher was unwilling to provide the NZ subscribers' contact details, they offered to write to them with a message of our choice. A suitable message was provided and subsequently received by the New Zealand subscriber. This was considered a good outcome when dealing with an international company to address a biosecurity risk pathway.

Rose seeds ordered on-line from a New Zealand website arrived with documentation showing they had been sourced directly from China, labelled as "jewellery" and imported as a "gift". Noting that this appeared to be an attempt to avoid New Zealand border scrutiny, the buyer contacted MPI. Investigation revealed that the seeds were only temporarily advertised on the website, and the goods were of a different type from the other (mostly electronic) goods advertised. An email was sent to the owner of the web retailer, outlining the issues and appropriate future actions to ensure that customers comply with NZ border requirements. It was concluded that further seeds were unlikely to be listed. Safe destruction of the rose seeds was arranged by MPI and the border intelligence team was advised to ensure future imports from this Chinese source will be flagged for inspection.

Hairy beetle excluded

A recently purchased packet of dried pig-trotter dog food was found to be contaminated with live insects. Specimens were identified as *Dermestes frischii* (Coleoptera: Dermestidae), dermestid or hairy beetle, a serious pest considered to be absent from New Zealand and known to feed primarily on products of animal origin. Investigation revealed that the pig trotters were distributed to New Zealand retail stores by an Australian company. Importation of the consignment included a declaration that the goods had been heat-treated (cooked), so it is likely that the infestation occurred afterwards. In all, 307 packets were traced, immediately withdrawn from sale and subsequently frozen to mitigate the biosecurity risk. The Australian supplier was advised that the product quality was unacceptable, and MPI border intelligence was notified to ensure increased compliance monitoring of this entry pathway.

Causal agent of brome grass disease reclassified

The causative agent of a brome grass disease (bacterial wilt of turfgrass) has been renamed after analysis using modern molecular diagnostics. What was previously known as *Xanthomonas campestris* pv. graminis has been reclassified as *X. bromi*. This bacterium was first identified in New Zealand in 1978 as *X. campestris* pv. *graminis* on brome grasses, based on International Collection of Microorganisms from Plants (ICMP) records. This has now been confirmed as a misidentification and isolates in the ICMP have been renamed accordingly. MPI's analysis of the literature, observations of photographed and documented symptoms, and available DNA sequences, have validated this identification, which was made by Landcare Research. The information will be added to MPI's database to update background knowledge on this pathogen. This is not a new organism under the Hazardous Substances and New Organisms Act 1996

as records show it was previously present. *X. campestris* pv. *graminis* is reported on other hosts and is therefore still considered present in New Zealand.

New aphid parasitoid found

An Auckland entomologist reported via MPI's new organism email address the detection of a new to New Zealand braconid wasp collected in central Auckland. The entomologist took photographs of the insect and sent them to an overseas taxonomist with expertise in the Braconidae family of parasitic wasps. From these, *Betuloxys compressicornis* (Hymenoptera: Braconidae) was identified. An MPI entomologist has examined the photographs and believes the identification is consistent with *B. compressicornis*. However, this diagnosis cannot be validated as the single collected specimen was disposed of before the notifier realised its significance. Published information suggests the wasp is a parasite of the birch aphids *Calaphis flava* and *Euceraphis betulae*, both species present in New Zealand.

Chicken dung fly found

An Auckland entomologist reported a new to New Zealand species that he tentatively identified as the chicken dung fly, *Fannia pusio* (Diptera: Fanniidae), a determination subsequently validated by MPI. Although adults were common when collected at the University of Auckland Tamaki campus, its hosts there remain unknown. As its common name implies, it can be abundant in poultry facilities, but the larvae also feed on other organic material including decaying vegetation, excrement, fungi and carrion. Investigators concluded this species will likely be of no greater concern than any other adventive fly species present in New Zealand.

Tenebrionid beetle found

MPI received notification from border staff that a large tenebrionid beetle had been found in a cleared shipment of wallboard from Australia. The specimen was identified as Blaps polychresta (Coleoptera: Tenebrionidae) or Egyptian beetle, a species present in Australia but not New Zealand. Further inspection of the consignment failed to yield additional specimens, suggesting the beetle was a solitary hitchhiker. Egyptian beetles are detritivores and information suggests they feed mainly on rat droppings.

Spotlight on grain importation process

It was reported to MPI that a consignment of maize (about 36 000 tonnes) contained weed seeds that might provide an entry pathway for grain diseases not present in New Zealand. The consignment had been imported six months previously from Bulgaria and offloaded at the Port of Tauranga, where most of it was stored in silos near the wharf and the balance in an overflow Transitional Facility. The maize was imported under the Grain Import System (GIS) to be processed for chicken feed. The GIS allows imported grain to contain weed seeds up to certain thresholds, provided that it is processed into feed pellets and not used for seed. Investigations revealed the suggested biosecurity issue related to the storage and transportation of the grain for processing (particularly spillage during transit and cleaning the trucks afterwards). It was during these activities that the reporter considered there was a risk of weed seeds becoming established. The required GIS processes were reviewed against what had actually occurred in the recent past and it was concluded that there was no evidence of a weed incursion, and that the grain had been handled in accordance with the GIS. Nevertheless, the report led to a review of MPI's procedures to monitor compliance with the GIS, and additional precautions and inspection will be implemented during secondary movement. This will increase our confidence that there are no unwanted sprouting weeds in stored imported grain, and that trucks and drivers comply with GIS during secondary movement of the grain.

New mangeao dieback disease ruled out

A QEII National Trust member reported increasing foliar and branch dieback among Waikato plantings of the endemic mangeao (*Litsea calicaris*) tree, and suspected a previously unreported exotic disease. A web search found numerous references to dieback in mangeao, and revealed that most cases were attributed to environmental factors. A plant disease specialist who visited the site and examined two particularly affected trees concluded that the observed damage was most likely the result of adverse climatic and environmental conditions and damage from possums. Soil and root samples were collected as a precaution but no pathogens were found in microbial culture that might explain the observed symptoms. Once again the symptoms were considered likely to have been caused by environmental factors.

Minor banana disease reported

A horticulture tutor from Whangarei found a fungus causing stem damage on cultivated ladyfinger banana trees. Although the specimen submitted to MPI was only mildly attacked, there were reports of other trees with broken stems. The fungus was identified as *Ceratocystis musarum* (Microascales: Ceratocystidaceae) by molecular diagnostic techniques. This species has previously been erroneously recorded as present in New Zealand when in fact the single sample found was from a border interception and not from an established population. However, this latest case shows the fungus really is established here and has likely been present for some years. As the disease is host-specific to banana, its impacts will be confined to non-commercial gardeners who cultivate banana plants, and are likely to be only a low-level nuisance.

Swallowtail butterfly reported

A swallowtail butterfly photographed in a Napier garden during January 2014 appeared to be a species not considered

established in New Zealand. The butterfly flew away before it could be collected. This information was passed to MPI only recently by a media entomologist. The photograph shows a butterfly that was probably *Papilio polytes cyrus* (Lepidoptera: Papilionidae), though this cannot be confirmed without a specimen. This species is an unwanted organism. It is found from Southeast Asia to Japan and throughout China and India. It is regarded as tropical, possibly subtropical. On the Malay Peninsula, the *cyrus* form is mostly found on the plains rather than at cooler, higher elevations. It is abundant in its home range and is common in butterfly houses. There appears to be no literature on the temperature limits of this species but it is unlikely that the Napier winter climate would be suit its establishment. The larvae of *P. polytes* feed on plants of the Rutaceae, particularly *Citrus* spp. There are three native plant species in this family but their suitability as hosts is unknown. Pupae are found hanging bare on stems, attached to a stem by two silk strands. Introduction to New Zealand as pupae on risk goods is a possibility, but the pupae are likely to be easily damaged. As *P. polytes* is not present in Australia it is unlikely that this specimen was carried on the wind; also it was in very good condition, suggesting it had recently emerged. Although seen at Westshore it could have flown there from anywhere in Napier. There is no butterfly house in Napier, but there are three elsewhere in New Zealand. It is possible, though unlikely, that some person took the insect from one of those houses. It is also possible that the specimen was imported illegally (e.g., from an overseas supply house as eggs or pupae), but there is no evidence. The source of the butterfly remains unknown. The butterfly is very striking and has large, distinctive larvae, yet only one specimen has been seen in Napier in the past 15 months. It therefore seems highly unlikely that a population exists there. MPI's High Risk Site Surveillance team has been informed, and will look for butterflies in Napier next summer. The investigation has been closed.

New solitary bee mite found

A bee nest found on a window frame was sent to MPI and identified as a nest of the wool carder bee, *Anthidium manicatum* (Hymenoptera: Megachilidae), an exotic solitary bee species present in New Zealand. A mite species, *Sennertionyx manicati* (Sarcoptiformes: Acaridae) was also present in the nest. *S. manicati* has never previously been reported from NZ, but is present in Belgium, the Netherlands, Spain, Italy, Greece, Russia, Georgia, Armenia, , Kazakhstan, North America, and likely elsewhere. Little is known about the mite except that its deutonymph (second larval stage) has a close relationship with solitary bees of the Megachilidae family. This appears to be the first time all life stages of *S. manicati* have been found. A possible explanation for its presence in New Zealand is that it was present on the wool carder bee when the latter became established here. The mite is very small and has likely been overlooked because of its size. *S. manicati* is considered unlikely to present a significant biosecurity risk as it is not a known parasite or disease vector.

Possible new powdery mildew tamarillo disease

Leaf damage was reported on tamarillo plants in Mt Maunganui residential gardens over several seasons. Symptoms were described as progressive yellowing, then browning and finally curling. Whether the cause was insects or disease was unclear. Samples were sent to MPI and a powdery mildew disease was diagnosed. Molecular identification confirmed that the fungus was *Euoidium longipes* (syn. *Oidium longipes*) (Erysiphales: Erysiphaceae). Known hosts include *Nicotiana* sp, *Petunia* x *hybrida* and *Solanum melongena*, and it has been reported from Europe and North America. This is the first record of *E. longipes* in New Zealand and the first case ever on tamarillo. Additional studies of powdery mildews on solanaceous hosts in New Zealand are needed to determine the distribution and host range of *E. longipes*. While several powdery mildews are recorded from tamarillo in New Zealand, phylogenetic analysis has confirmed that samples collected in this investigation are different. Hence *E. longipes* is currently considered a new to New Zealand species. However, further molecular studies are needed to verify whether NZ morphology-based identifications of powdery mildews on tamarillo are accurate, and to rule out the possibility that *E. longipes* may actually be one of the morphologically described powdery mildews already present in New Zealand.

New mite found

A new to New Zealand mite species was identified from litter/pollen/mite samples collected by a bee and pollination expert from stored honeybee combs in Christchurch. MPI considers the mite not to be a high-priority pest, but one of the many mite species, exotic and endemic, present in New Zealand though not previously recorded or taxonomically described. Three species were found: *Tyrophagus savasi*, *Blattisocius tarsalis* and *Melichares agilis*. The first two are recorded as present in NZ, but *M. agilis* has not previously been recorded. *M. agilis* has a reasonably cosmopolitan distribution and is associated with stored food, residential dwellings and natural habitats, where it is known as a predatory mite feeding on other mites. It has been reported in association with *T. savasi* on stored beehive combs. *M. agilis* is not considered to be of environmental and economic significance. The sample collector was advised and the insignificance of this newly identified mite has been explained to the beekeeping industry.

New beneficial insect found

CRI staff examining the insect fauna of flax (*Phormium tenax*) growing at Mt Albert Research Centre (MARC), Auckland, found two adult coccinellid beetles among the mealybugs feeding on the flax. Working together, Landcare Research and MPI identified the beetle as *Rhyzobius lophanthae* (Coleoptera: Coccinellidae), a predator of scale insects. This is the first record of *R. lophanthae* in New Zealand. Native to Australia,

it has been introduced worldwide as a biological control agent against scale insects, and is produced commercially in several countries for mass release (usually in a single event) in glasshouses and among field crops. An Australian source suggests that this species was released in New Zealand in 1935–1936, but this cannot be confirmed from local sources. MARC is the only known site of *R. lophanthae* but its discovery there is likely to be related to high search effort rather than recent establishment. How widely this species is distributed in New Zealand is not known. A survey for mealybug parasitoids completed some years ago might have detected *R. lophanthae* if it was widespread and common, but no unexpected coccinellid species were found. How long it has been present here is also unknown, but the extent of the MARC population indicates it has been present at this site since at least the 2013–2014 summer. Its establishment would be welcomed by horticultural industries that have problems with scale insects, as *R. lophanthae* is considered an effective biological control agent overseas, and its life cycle and biology suggest it could complete three or more generations annually outdoors in northern New Zealand. The potential for adverse effects on native biota is uncertain: it is known to eat other prey but is generally regarded as a specialist scale predator. The additional biotic pressure of *R. lophanthae* on native scales might be limited as there appear to be 17 native *Rhyzobius* species already filling this role in New Zealand. Conversely, *R. lophanthae* might outcompete and displace these native predators. It is likely to occupy diverse habitats here. Although best known as a predator in orchards and glasshouses, *R. lophanthae* is active in natural forests in the US, and so could occupy native habitats here. Eradication was not considered a feasible option owing to the suburban location of the site, uncertainty about how long the species has been present, how far afield it occurs in the highly diverse habitats of residential Auckland, and ambiguity over the balance of environmental costs and economic benefits of this species.

Mark Bullians
Manager
Surveillance & Incursion Investigation (Plants and Environment)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Mark.bullians@mpi.govt.nz

Pest watch: 4 June – 10 August 2015

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

This information was collected from 4 June 2015 to 10 August 2015. The plant information is held in the MPI Plant Pest Information Network (PPIN) database. Wherever possible, common names have been included. Records in this format were previously published in the now discontinued magazine Biosecurity.

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

Validated new to New Zealand reports

Type	Organism	Host	Location	Submitted by	Comments
Fungus	*Ceratocystis musarum* no common name	*Musa* sp. banana	Northland	IDC & R (General Surveillance)	First record of this organism in New Zealand. Erroneously recorded previously as present in NZ following interception at the border in 1962.
Fungus	*Penicillium allii* no common name	*Allium sativum* garlic	Wanganui	IDC & R (General Surveillance)	Causes stunted plant growth, and decay of stored garlic.
Fungus	*Pestalotiopsis chamaeropis* no common name	*Sequoia sempervirens* Californian coastal redwood	Waikato	IDC & R (General Surveillance)	This fungus has only recently been described, in 2014.
Fungus	*Phaeosphaeria podocarpi* no common name	*Sequoia sempervirens* Californian coastal redwood	Waikato	IDC & R (General Surveillance)	Described in 2014. No information available on host range or habitat. Potential effects on redwood trees are unknown.
Fungus	*Plectosphaerella melonis* no common name	*Cucurbita maxima* squash	Hawke's Bay	IDC & R (General Surveillance)	A soil-borne pathogen that enters through the roots.
Fungus	*Phytopythium litorale* no common name	*Rhododendron* sp.	Bay of Plenty	Scion (High Risk Site Survey)	A record that dates back to 2010
Insect	*Fannia pusio* chicken dung fly	N/A.	Auckland	S. Thorpe (General Surveillance)	Observed flying around flowering *Olearia* bushes.

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

Veterinary Diagnostic Laboratories

gribbles veterinary pathology

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

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

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

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

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

NEW ZEALAND VETERINARY PATHOLOGY

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

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

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

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

0800 80 99 66

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

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

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

New Zealand Government

Ministry for Primary Industries
Manatū Ahu Matua