MAF BIOSECURITY NEW ZEALAND

Biosecurity Monitoring Group

Monitoring Research and Pathway Review: Sea Containers
July – September 2006
BMG 06-07/03

KEEPING WATCH
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1 Executive Summary

Overall assessment

The level of slippage in the pathway is the second-highest of all pathways surveyed to date, although the total risk in the pathway is moderate. The current clearance system is mitigating only 13% of the risk landing at New Zealand ports, and Accredited Persons are only reporting 8% of the internally contaminated containers.

Sea container pathway

Over half a million sea containers arrived in New Zealand in 2005-06, an increase of 54% since 2000-01. Containers arrive from diverse origins, with the majority coming via Australia and Asia. Those containers profiled as high risk for various contaminants are inspected by MAF, while containers deemed to be low risk are inspected by Accredited Persons.

Sea containers are a significant pathway for the potential entry of unwanted organisms, due to the high volume and diverse origins of arrivals. In addition, containers move to transitional facilities around the country, creating the potential for the widespread establishment of pests.

Survey

Between 1 July and 30 September 2006, MAF conducted a survey to measure contamination on containers. Surveys were conducted at three points, each of which represents a control point along this pathway: (1) leaving the wharf at Metroport and Ports of Auckland; (2) delivered to transitional facilities for devanning; and (3) arriving at storage and repair facilities in Auckland. Inspectors also interviewed Accredited Persons at transitional facilities and evaluated the competency of Accredited Persons checking containers for contamination.

Results

Risk arriving and slippage

The estimated risk arriving on the pathway is approximately 139,180 risk units per month, of which 64% is associated with loaded and 36% with empty containers. The monthly slippage is estimated to be approximately 121,624 risk units, of which 70% is associated with loaded containers. Approximately one-third of the slippage is due to external contamination, and another third due to internal contamination in loaded containers. The level of risk in the pathway is comparable to used vehicles (188,511 risk units per month) and international mail (128,378 risk units per month), but lower than the risk loading in the air passenger pathway (387,880 risk units per month). The slippage is second only to used vehicles (146,831 risk units per month) of the pathways surveyed to date.

Contamination

Both loaded and empty containers arriving at New Zealand ports have high rates of internal and external contamination. Approximately 14% of loaded and 24% of empty containers had external contamination, most of which was found on the underside or lower ledges. Loaded containers were much more highly contaminated at Ports of Auckland (17%) than at Metroport (8%).

On arrival at transitional facilities, loaded containers were found to have relatively high rates of internal contamination in the form of hitchhiker organisms, plant material, seeds and soil. Of the loaded containers surveyed, 18% were internally contaminated, while 7% contained contaminated wood packaging.

When the unloaded containers arrived at storage facilities, 15% had internal contamination present, although some of these may have been local organisms. At least 12% of containers imported loaded were contaminated with exotic organisms or other contaminants (soil, cargo residues) that should have been found during unpacking at the transitional facilities. In addition, 15% of containers imported empty were found to harbour internal contaminants on arrival at the storage facilities, predominantly hitchhiker organisms. Of the surveyed empty containers that had been internally washed at the port of arrival, only 1% were found to be internally contaminated. In contrast, 25% of the unwashed empty containers had internal contamination.

System Efficacy

Overall, approximately 13% of the risk in the pathway is being managed by the current systems. The efficacy of on-wharf systems is extremely low, at 2% for loaded containers, and 4% for empty containers. This is because the on-wharf systems do not routinely inspect the undersides of containers, where a high proportion of contaminants were found.

Accredited Persons at transitional facilities are only reporting approximately 8% of the internally contaminated containers. The Accredited Persons may be removing but not reporting some contamination. However, results of this survey indicate that at least 12% of loaded containers remain contaminated after biosecurity clearance is granted – approximately 64% of the total contaminated containers arriving. As many of these containers would be cleaned prior to export, some additional risk is being managed after biosecurity clearance is issued.

Organisms found

Environmental contaminants (soil, plant material, seeds and feathers) were the most common contaminants found externally, affecting 15% of loaded and 18% of empty containers. The most common contaminants inside containers were live hitchhiker organisms, found in 10.1% of loaded and 10% of empty containers. Spiders were the most frequently intercepted organisms found inside containers.

Of 467 organisms sent for identification, 94 were of species known to occur in New Zealand, 127 were of organisms not known to occur in New Zealand, while the rest could not be identified to species level. Of those known not to occur in New Zealand, 98 arrived alive. The most significant interception was a dead larva of the Asian gypsy moth (*Lymantria dispar*), found underneath a container from Sydney. The find illustrates the limitations of risk profiling: Australia does not have Asian gypsy moth, and Australian containers are not profiled as high risk; however, containers may carry pests from previous voyages and other sources.

Cost implications

The rate of internal contamination in loaded containers is relatively high at 18%, meaning that full implementation of audit inspections will generate a large number of non-compliance inspections. Undertaking all the follow-up inspections for non-compliant containers is expected to require at least 12 FTEs.

Approximately 79 times as much soil arrives on containers as on contaminated footwear in passenger baggage, and most is not detected at the border. However, considerably more effort is spent inspecting and cleaning contaminated footwear than checking underneath containers.

Recommendations

MAF has established a sea container project team to consider the outcomes of this survey in their discussions with the sea container industry advisory group. A list of recommendations based on the survey results has been provided to this team, who will establish new risk management requirements for this pathway.

2 Terminology

Approved	Approved by the Director-General MAF, or delegate, for the intended purpose.
Accredited person (AP)	A person who has attended and passed a course in basic biosecurity awareness associated with imported sea containers and sea container checking, and has been approved to conduct certain checks under the Import Health Standard for Sea Containers (MAF Biosecurity Authority 2003). An Accredited Person may be the operator or staff member of a transitional facility, a stevedore, port company staff or a private contractor.
Biosecurity Risk Analysis Group	Biosecurity New Zealand group that analyses the risk to New Zealand of imported goods and organisms.
Biosecurity clearance	A clearance issued by an inspector under section 26 of the Biosecurity Act 1993.
Biosecurity Monitoring Group (BMG)	Biosecurity New Zealand group that monitors biosecurity risk in entry pathways.
Biosecurity Standards Group	Biosecurity New Zealand group that develops import health standards to mitigate and manage the risks associated with imported goods and organisms.
Confidence interval (CI)	The range that encompasses the likely value of a number (generally a percentage) based on sample results; a 95% confidence interval indicates that there is a 95% probability that the true value of the estimated number falls within the specified range.
Container	A sea freight container built to specifications promulgated by the International Organisation for Standardisation (ISO), or a similar structure (MAF Biosecurity Authority 2003).
Contaminant	Animals, insects or other invertebrates (alive or dead, in any life cycle stage, including egg casings or rafts), or any organic material of animal origin (including blood, bones, hair, flesh, secretions, excretions); viable or inviable plants or plant products (including fruit, seeds, leaves, twigs, roots, bark); or other organic material, including fungi; or soil or water; where such products are not the manifested cargo being imported (MAF Biosecurity Authority 2003).
Devan	The process of fully unpacking a container's contents.

Dunnage	Wood packaging material (see definition) used to secure or support a commodity but which does not remain associated with the commodity (IPPC 2006).
Efficacy	The proportion of estimated risk loading (see definition) that is detected and mitigated by a particular process.
Equivalence	The situation where, for a specified pest risk, different phytosanitary measures achieve a contracting party/s appropriate level of protection (IPPC 2006).
FAK	Freight of all kinds – goods for multiple consignees within a single container, usually devanned (see definition) at an off-wharf facility.
FCL	Full container load – generally a container with goods for a single consignee.
Germination testing	A viability test for seeds; a known number of seeds are planted and the resultant germination noted after two weeks.
Hitchhiker	An animal that is found in association with a commodity or item with which is has no biological host relationship.
Import health standard (IHS)	The formal document that sets out the conditions for entry of specific risk goods into New Zealand.
Inspector	A person appointed as an inspector under section 103 of the Biosecurity Act 1993. For the purposes of this report "inspector" may indicate either BMG surveyors or MAF Quarantine Officers.
LCL	Limited container load – a container with goods consolidated for multiple consignees (see also FAK).
Loaded container	Container imported with goods. Includes FCL and LCL/FAK containers.
MAF	Ministry of Agriculture and Forestry, New Zealand.
MAF Biosecurity Authority	Predecessor of Biosecurity New Zealand; this name was in use between 1999 and 2004.
MAF IDC PEL	MAF Investigation and Diagnostics Centre, Plant and Environment Laboratory; the Biosecurity New Zealand group that provides organism identification and investigation services.

MAF Quarantine Service (MAF QS)	The group of MAF that implements biosecurity risk management processes, including inspection and clearance of risk goods, at the border.
Manifest	A document describing the contents of a container (cargo and packaging), the importer and/or agent, vessel and port of arrival, and in some cases, certification or treatments that have been applied to the container.
NZCS	New Zealand Customs Service.
Phytosanitary measure	Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of regulated organisms, or to limit the economic impact of regulated organisms (based on IPPC 2006).
Port of loading	The port where a container was loaded onto the vessel that delivers it to New Zealand.
Process procedure (PP)	Internal MAF QS instructions to standardise the delivery of specific processes.
Regulated organism	An organism for which biosecurity action would be required if intercepted at the New Zealand border (regulated under the Biosecurity Act 1993 and/or the HSNO Act 1996).
Residual risk	The amount of biosecurity risk (expressed in risk units) left in a pathway after biosecurity risk management has taken place.
Risk	The chance of something happening that will have an impact upon objectives, considered in terms of likelihood and consequences (Standards Association of Australia 1999).
Risk good	Any organism, organic material, substance or other thing that it is reasonable to suspect constitutes, harbours or contains an organism that may cause unwanted harm to natural and physical resources or human health in New Zealand; or that may interfere with the diagnosis, management, or treatment, in New Zealand, of pests or unwanted organisms (Biosecurity Act 1993).
Risk loading	The amount of biosecurity risk (expressed in risk units) arriving at New Zealand's borders before any risk mitigation measures have been taken.

Risk profile	A description of characteristics that identify the presumptive risk status of an item (such as a sea container), based on a statistical association between those characteristics and particular risks.
Risk unit	A comparative unit which defines the estimated biosecurity risk posed by a given quantity of a given item, used purely for the purpose of comparing risk levels between different seizures, pathways, and periods of time.
Seizure	A risk good that does not immediately, on arrival, comply with an import health standard, and is either treated, destroyed, reshipped or held for further documentation or investigation.
Slippage	The entry of biosecurity risk goods into New Zealand that do not meet the conditions for entry as specified in the relevant import health standard.
Soil	Organic soil that may be considered a risk good (see definition). Excludes inorganic mineral material, sand and gravel.
Survey	An inspection of a container carried out by a BMG surveyor in accordance with the project terms of reference, survey instructions, and the BMG process procedure on sea container inspection.
Surveyor	A member of the BMG survey team, warranted as an Inspector under the Biosecurity Act 1993, who is responsible for inspecting risk goods selected for survey for the presence of contaminants and other risk goods, and recording details of any risks found.
Tetrazolium testing	A viability test for seeds; a dilute solution of 2,3,5-triphenyltetrazolium chloride will change colour in the presence of hydrogen ions (a by-product of seed respiration).
Transitional Facility (TF)	For the purposes of this document, a place approved as a transitional facility in accordance with section 39 of the Biosecurity Act 1993 for the purpose of inspection, storage, treatment, quarantine or holding of containers.
Wood packaging material	Wood or wood products (excluding paper products) used in supporting, protecting or carrying a commodity (includes dunnage) (IPPC 2002).

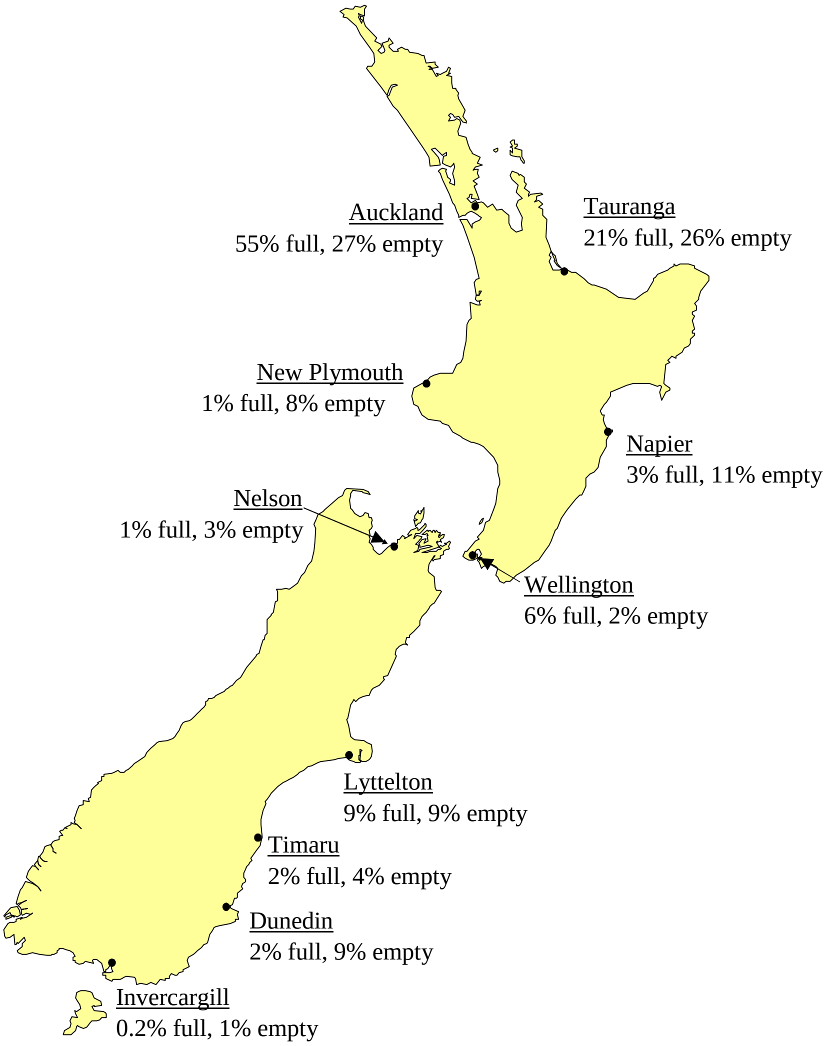
3 Introduction

3.1 Sea container pathway

Fifty years after the first shipment on 26 April 1956, sea containers transport approximately 90% of cargo world-wide (POAL 2006b). Containers provide a re-useable, robust, and secure packaging unit for transporting large quantities of cargo from point to point, and reduce the time taken to load and unload vessels, trains and trucks. The increasing demand for timely and efficient movement of freight has led to containers replacing bulk cargo shipments for most types of goods.

Over 550,000 sea containers arrived in New Zealand during 2005-06; this is 54% more than in 2000-01, although 2% fewer than in 2004-05. The quantity of goods imported in containers has grown even more, with 40ft-containers now replacing 20-ft containers. Just over half of the loaded imported containers arrive at Auckland, with 21% arriving at Tauranga, 9% at Lyttelton, and the remainder at the other seven cargo ports (Figure 3.1). Approximately 33% of arriving sea containers were imported empty last year: of these, 27% of arrived in Auckland, 26% in Tauranga, 11% in Napier and 9% each in Lyttelton and Dunedin.

Figure 3.1: Percentage of containers imported by port, 2005-06

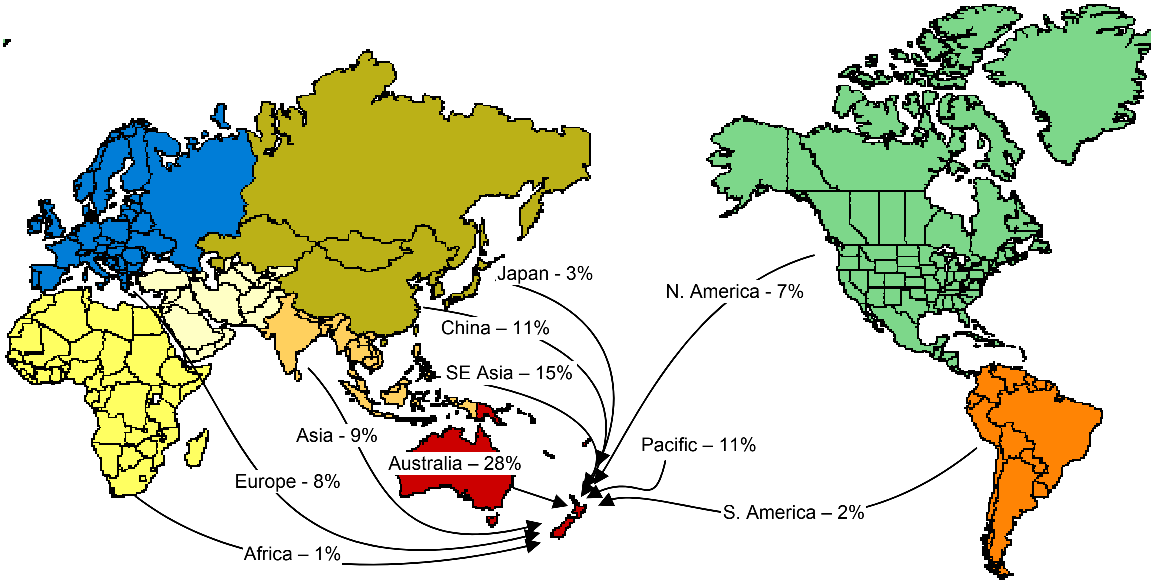


3.2 Origins of New Zealand containers

Approximately 30% of New Zealand's loaded containers arrive from Australia, with 22% from northern Asia (mainly China) and 15% from south-east Asia. The port of loading, however, does not always indicate the origin of the container's contents or where it was packed. Containers shipped from Hong Kong and Singapore frequently originate from other parts of the world, and are transhipped through these ports to be loaded onto a vessel travelling to New Zealand.

The south Pacific region, particularly French Polynesia and Fiji, accounts for almost 40% of New Zealand's empty container imports. Figure 3.2 shows the percentage of New Zealand containers arriving from various regions, based on port of loading (approximately 5% of container origins are not recorded).

Figure 3.2: Percentage of loaded sea container arrivals by region of port of loading



3.3 Risks associated with sea containers

An unintended consequence of world-wide transport is that sea containers carry exotic organisms to new places (e.g. BMG 2003). For New Zealand, with substantial world trade but no land borders, sea containers represent a significant pathway for the potential entry of organisms. Containers not only bring risks to New Zealand's ports, but they also facilite movements of these organisms inland to importers' and exporters' premises. While the risks associated with the commercial goods themselves (e.g. fresh produce, timber, stored products) are generally well-known under their Import health standards, it is more difficult to identify and manage the risk of contaminants and hitchhiker organisms that occur in, or on, sea containers, particularly if the organism is not directly associated with the commodity.

Much of the difficulty in managing the risk is due to the wide range of potential contaminants associated with each container load. Problems such as untreated wood packaging, spilled food cargoes and soil may occur infrequently but provide suitable habitat or food for organisms nearby at the time of loading. The risk may be exacerbated at the border due to the large numbers of containers arriving, the logistics involved in inspecting containers, and the difficulty in searching laden containers for contaminants and hitchhikers that are often small, cryptic in nature or unpredictable in occurrence. Organisms present in a container may have been picked up on previous voyages or from previous cargoes, and thus are not necessarily predictable based on the current voyage, port of origin or type of cargo.

Empty containers are also a potential vector for the establishment of potentially harmful organisms in New Zealand. Empty containers from the Pacific region are much more frequently contaminated with soil and live arthropods than containers from elsewhere in the world (Mavengere and Knight, 2006). Empty containers have been associated with a number of post-border detections, particularly ants from islands in the South Pacific (Thompson, 2006).

3.4 Sea container survey in 2001-02

In early 2000, MAF intercepted several sea containers with live snakes, triggering a review of the biosecurity risks associated with sea containers. From July 2001 – June 2002, MAF surveyed 11,265 sea containers in order to determine the prevalence of contamination and the effectiveness of sea container risk management processes (BMG, 2003).

The 2001-02 survey showed that approximately 24% of loaded and 19% of empty containers were contaminated with soil, seeds, live arthropods, plant material or other risk material. Internal contamination affected 21% of loaded and 18% of empty containers. Wood packaging, a potential vector for timber pests and diseases, was found in nearly half the loaded containers, and unmanifested wood packaging was found in 33%. External contamination was associated with 4% of loaded and 2% of empty containers. However, the survey was not able to inspect all six sides of the containers: the undersides of containers are more likely to be contaminated than are the four visible sides, so the rate of external contamination may have been greater than reported.

The survey found that the efficacy of the on-wharf inspection[1] process was relatively high for determining the presence of wood packaging and finding external soil (85% and 72%, respectively), but low at distinguishing contaminated from uncontaminated wood packaging, or detecting live organisms (15% and 4%, respectively). Approximately 6% of loaded and 1.5% of empty containers were estimated to contain live or viable regulated organisms after passing through the inspection process, including insects and fungi associated with wood packaging material.

3.5 Review of the Import Health Standard

The results of the 2001-02 survey and subsequent consultation with stakeholders led to substantial changes in MAF's sea container risk management. MAF extensively revised the sea container Import Health Standard (IHS), the document specifying the conditions that imported sea containers must meet. A key provision of the revised standard was a requirement for all containers to go to approved transitional facilities for checking, whereas previously containers had no biosecurity restrictions on where they went after leaving the ports. Containers deemed high risk by MAF (based on factors such as the country of origin or commodities imported) would continue to be inspected by MAF Quarantine Officers,

[1] The on-wharf inspection involved opening the doors of the container on the wharf and examining what could be seen of the interior ("door inspection") for signs of contamination, infestation, contaminated wood packaging or biosecurity risk cargo. The cargo was not removed from the container, and the ability of the inspector to see into the container varied substantially with the type and volume of cargo. External (4-sided) inspection was usually conducted at the same time.

while low-risk containers would be checked by biosecurity-trained and APs at the transitional facilities. Once MAF or an AP had reported the container as clean, or taken appropriate action if risk material was present, the containers would be given biosecurity clearance.

Additional provisions of the new standard included the replacement of old cleaning certificates with signed Quarantine Declarations made by the packer or exporter of the container and subject to regular audit, and external checks of low-risk containers by APs at ports. In addition, the container audit programme made provision for exporters of contaminated containers to face more frequent audits, and thus higher compliance costs.

3.6 Implementation of new requirements

The new standard was implemented on 1 January 2004, accompanied by biosecurity awareness and training programmes for APs and transitional facility operators. In October of 2004, an electronic sea container risk profiling system was introduced. This system harmonised MAF and Customs processes for import container declarations, and allowed MAF to electronically profile high-risk loaded containers for inspection by Quarantine Officers, replacing a manual manifest screening system.

Partial auditing of the container pathway began in October 2005, with 1% documentation checked. This process compared the information provided in the electronic entry with the actual Quarantine Declaration; agents who had made an incorrect declaration had additional consignments stopped for a documentation audit, until compliance was demonstrated. These inspections were expected to drive compliance by placing increased inspection costs on containers from overseas exporters who had failed to ensure their containers met New Zealand's requirements. Without these inspections, the new system had little ability to measure or increase industry compliance. Full internal and external inspections of audit containers were not carried out due to resource constraints.

In July 2006, MAF also implemented an international standard for wood packaging material, known as ISPM-15 (IPPC, 2002), designed to reduce the world-wide spread of timber pests and diseases through wood packaging.

3.7 Evaluation of the current system

A recent audit by the Office of the Auditor-General determined that MAF needed to better enforce the provisions of the sea container IHS (OAG, 2006). In particular, not all importers of sea containers were declaring the approved facility destination for the container, reducing MAF's ability to track container imports and risks. Another key recommendation was that MAF implement the full container audit programme, with random external and internal inspections of containers to verify the information supplied on the Quarantine Declaration.

The IHS for sea containers was designed around a systems approach with facilitation incentives for compliance and sanctions for non-compliance. The almost three years delay in implementing the auditing has meant that the intended sanctions have not been applied, leading to wide-spread non-conformance. A sustained effort will be required to redress this situation.

A new survey was undertaken as a joint project involving the Biosecurity Monitoring Group of Biosecurity New Zealand and MAF Quarantine Service between July-September 2006. The 2006 survey was designed to evaluate the performance of the 2004 IHS, and identify the level and causes of slippage in the pathway, as well as generate information on the likely costs of fully implementing the container audit programme. This report evaluates the effectiveness of MAF's programmes for managing biosecurity risks associated with sea containers, and makes recommendations for improving risk management.

3.8 2006 survey objectives

The objectives of the 2006 survey were to assess the following:

- level of residual external contamination associated with containers leaving the wharf;
- level of residual external and internal contamination associated with containers after devanning and biosecurity clearance;
- level of residual contamination associated with wood packaging in sea containers;
- relative efficacy of four- and six-sided external container inspections;
- accuracy of recording for manifested cargo;
- effectiveness of the BNZ sea container biosecurity awareness and training programmes for accredited persons (APs).

The survey occurred in four phases:

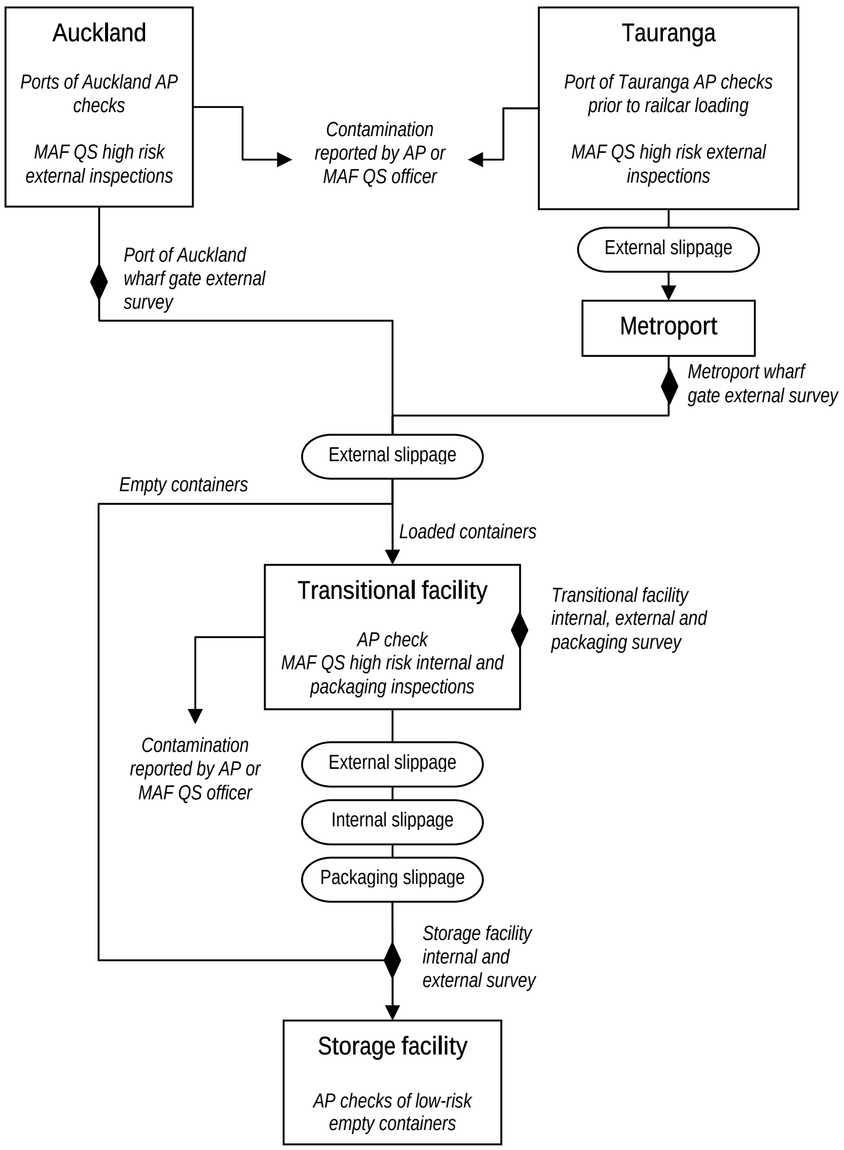
- external inspection of containers leaving the wharf gates;
- external and internal inspection of loaded containers as they were unpacked at transitional facilities;
- external and internal inspection of empty containers arriving at storage and repair facilities;
- interviews of APs working at transitional facilities.

4 Methodology

4.1 Slippage in the sea container pathway

Slippage occurs at two key points in the container pathway: slippage of external contaminants when the containers are in transit between the wharves and the transitional facilities, and slippage of external, internal and wood packaging contaminants at the transitional facilities. The survey measured the contamination rate of containers before and after these points, to determine the level of slippage (Figure 4.1).

Figure 4.1: Sea container pathway showing locations of routine inspections and surveys



4.2 Wharf gate survey

Exiting containers were surveyed at the Bledisloe and Fergusson container terminals at Ports of Auckland, and the Metroport container facility belonging to the Port of Tauranga, located in Onehunga, Auckland. These facilities handle the majority of containers imported into Auckland and Tauranga, or approximately 70% of New Zealand's imported sea containers. The survey ran for two weeks from 4th of September through to 17th September, and was carried out in conjunction with MAF QS (Auckland Wharf) inspectors.

Checkpoints were set up at each gate and, where possible, all departing container trucks were stopped and directed to an inspection area. All visible and accessible sides of the container were inspected for contamination, including the roof and underside, where possible, the fork lift slots, and twist-lock lugs. Containers with no contaminants were released.

Inspectors either removed contaminants at the checkpoint or directed the containers for cleaning at the nearest approved container wash facility. Samples of contaminants were sent to the appropriate laboratory for testing (see section 4.5).

The height of truck-borne containers, particularly high-top containers, created difficulties inspecting container tops even when using mirrors on poles. Metroport had a platform available to directly inspect container tops, but nothing similar was available at Ports of Auckland. Most containers were driven away on skeleton trucks, enabling inspection of the undersides of the containers. Consequently a limited number of containers received a full 6-sided inspection at Ports of Auckland, with the majority having a five-sided inspection, including the underside.

4.3 Transitional facility survey

The internal and external inspections of randomly selected containers at transitional facilities ran from 3rd of July to 1st September 2006. During this time, approximately 1% of all consignments of loaded containers arriving into New Zealand were selected for survey nationwide. The consignments were randomly selected using the MAF AUDIT alert in the NZ Customs Service CusMod system, and one container was surveyed for every 10 in the consignment. The survey/audit containers devanned in the Auckland area were inspected by the BMG survey team, while those devanned in the rest of the country were inspected by MAF QS officers.

On arrival at the transitional facility, the inspector ascertained that an AP was present for the devanning, that all of the required quarantine equipment (bin, broom, bug spray, etc) was present, and that the container seal was still intact. If the inspector determined everything to be in order, the container was devanned. Inspectors issued a corrective action request if any non-conformances with the requirements for devanning containers were found.[2] Corrective action requests were followed up by MAF QS.

The surveyed containers were inspected externally for the presence of contamination, and then opened. During devanning, inspectors checked for signs of insects, plant material or any other form of contamination. Inspectors either removed contamination or directed the container for the appropriate treatment. Samples of contaminants were sent to the appropriate laboratory for identification and testing (see section 4.5).

All wood packaging seen during devanning was inspected to make sure that it bore an appropriate ISPM-15 mark (IPPC 2002), as well as being free of bark, fungi and signs of

[2] Including not having an AP or facility operator present, containers being placed too close to vegetation, lack of MAF-approved operating procedures and required quarantine equipment not present.

insect activity. If non-compliant wood packaging was found, it was directed for treatment. Once the container was devanned, swept, and free from contamination, the inspector issued a biosecurity clearance.

During the devanning of the containers, the Auckland-based inspectors observed the actions of the APs, in terms of the types of checks carried out and actions when contaminants were found. These observations were used to generate an overall assessment of AP competency. As the assessment was subjective, this part of the survey took place only in Auckland, so that the inspectors could standardise their approach.

4.4 Storage facility survey

Sea containers are normally owned by shipping companies and leased by importers for the duration of the overseas packing, delivery voyage and devanning phases of a cargo consignment. After loaded containers have been devanned at transitional facilities, they are transported to facilities for cleaning, storage and any physical repairs, prior to being hired out for export. Storage facilities may also act as transitional facilities for empty containers, with APs on site who check the containers for contamination.

The storage facility survey determined the level of contamination still present on and in containers after biosecurity clearance had been issued. This provided a measure of slippage through the system. On arrival at the storage facilities, loaded containers should have had two external checks, by wharf APs and by transitional facility APs, and one internal check by transitional facility APs. Empty containers should have had one external check by wharf APs, prior to arrival at the storage facilities.

The survey of containers at the storage facilities ran from 18th September through to 27th September. Containers were surveyed at four MAF-approved facilities in south Auckland having a high turnover of containers: Container Repair and Storage, Specialised Container Services, United Container Storage and Panmure Container Park.

For logistical reasons, the BMG surveyors inspected containers as they arrived at the facilities, prior to the facility's own inspections. For empty containers, this meant that the rate of internal contamination arriving in New Zealand could be estimated, but not the amount of residual contamination left after the storage facility checks. The surveyors inspected all visible external surfaces, as well as the interior walls, ceiling and floor. In most cases, only the four sides could be inspected externally, due to difficulties in viewing the roof and underside at the storage facilities. Surveyors removed contaminants where possible; otherwise, contaminated containers were cleaned at the facility. All contaminants removed were sent to the appropriate laboratory for testing (see section 4.5).

4.5 Contamination and Diagnostics

For all three surveys, contaminants were removed (where possible) and sent to the appropriate laboratory for identification. Live organisms, intact dead organisms and any substantial clumps of soil were sent to the MAF Investigation and Diagnostics Centre Plant and Environment Laboratory (MAF IDC PEL) for analysis and identification. Plant material was inspected in the BMG laboratory with a dissecting microscope for signs of fungal disease. If infection was suspected, specimens were sent to the MAF IDC PEL. Seed contaminants were sent to AgriQuality Ltd for identification and germination testing. If no germination occurred after 7-10 days but the seed remained in good condition, tetrazolium testing was carried out to assess viability.

4.6 AP interviews

Inspectors interviewed APs working at transitional facilities where containers were surveyed, using the questionnaire in Appendix 14.3. To avoid duplication of responses, an individual AP was only asked to complete this questionnaire once even if multiple containers were surveyed at the same site. The interviewers verbally asked the questions and then filled in the questionnaires on behalf of the APs. In situations where two or more APs were present at a facility, the AP responsible for devanning the survey container was interviewed.

5 Wharf gate survey

5.1 Survey population

MAF stopped 2232 containers leaving Axis Bledisloe and Axis Fergusson Container Terminals (Auckland) and Metroport (Tauranga), and inspected all available external surfaces. A total of 2147 loaded containers and 85 empty containers were inspected (Tables 5.1 and 5.2) over 10 days between 4th of September and the 17th of September, 2006.

Loaded containers at Metroport had much lower levels of contamination than containers leaving Axis Bledisloe Container Terminal and Axis Fergusson Container Terminal. Only two empty containers were inspected at Metroport, as relatively few empty containers are shipped from Tauranga to Metroport.

Table 5.1: External inspection results for loaded containers.

Gate	Containers	Number of sides inspected					Total
		4	4 + roof	4 + underside	6	not recorded[3]	
Bledisloe	Surveyed	36	3	694	54	45	832
	Contaminated	4	3	124	11	18	160
	% contam	11.1%	100.0%	17.9%	20.4%	40.0%	19.2%
	(95% CI)	4.5 - 25.4%	39.8 - 99.4%	15.2 - 20.9%	11.8 - 33.0%	27.0 - 54.6%	16.7 - 22.0%
Fergusson	Surveyed	28	0	548	9	23	608
	Contaminated	3	0	83	3	5	94
	% contam	10.7%		15.1%	33.3%	21.7%	15.5%
	(95% CI)	3.9 - 27.4%	2.5 - 97.5%	12.4 - 18.4%	12.2 - 65.2%	9.8 - 42.2%	12.8 - 18.6%
Metroport	Surveyed	6	27	204	467	8	712
	Contaminated	0	5	5	39	4	53
	% contam	0.0%	18.5%	2.5%	8.4%	50.0%	7.4%
	(95% CI)	0.4 - 41.0%	8.3 - 36.9%	1.1 - 5.6%	6.2 - 11.2%	21.2 - 78.8%	5.7 - 9.6%

Table 5.2: External inspection results for empty containers.

Gate	Containers	Number of sides inspected					Total
		4	4 + roof	4 + underside	6	not recorded	
Bledisloe	Surveyed	4	0	22	1	2	29
	Contaminated	1		8	0	1	10
	% contam	25.0%		36.4%	0.0%	50.0%	34.5%
	95% CI	5.3 - 71.6%	2.5 - 97.5%	19.7 - 57.3%	1.3 - 84.2%	9.4 - 90.6%	19.9 - 52.8%
Fergusson	Surveyed	1	0	39	4	2	46
	Contaminated			6	1	0	7
	% contam			15.4%	25.0%	0.0%	15.2%
	95% CI			7.3 - 29.8%	5.3 - 71.6%	0.8 - 70.8%	7.6 - 28.3%
Metroport	Surveyed	0	1	0	1	0	2
	Contaminated	0	1	0	0	0	1
	% contam		100.0%		0.0%		50.0%
	95% CI		15.8 - 98.7%		1.3 - 84.2%		9.4 - 90.6%

[3] Not recorded: some inspected containers did not have records of which sides were inspected

Containers at Axis Bledisloe Container Terminal and Axis Fergusson Container Terminal had similar levels of contamination. Because of this, the data from these two sites have been combined and analysed as a single site (Ports of Auckland) for the rest of this section (Table 5.3).

Table 5.3: Combined external inspection results for Ports of Auckland containers.

Container type	Container	Number of sides inspected					Total
		4	4 + roof	4 + underside	6	not recorded	
Loaded	Surveyed	64	3	1242	63	68	1440
	Contaminated	7	3	207	14	23	254
	% contam	10.9%	100.0%	16.7%	22.2%	33.8%	17.6%
	(95% CI)	5.5 - 20.9%	39.8 - 99.4%	14.7 - 18.8%	13.8 - 34.0%	23.7 - 45.7%	15.8 - 19.7%
Empty	Surveyed	5	0	61	5	4	75
	Contaminated	1	0	14	1	1	17
	% contam	20.0%		23.0%	20.0%	25.0%	22.7%
	(95% CI)	4.3 - 64.1%		14.2 - 35.0%	4.3 - 64.1%	5.3 - 71.6%	14.7 - 33.4%

Individual ports have their own systems for complying with the requirement of the container Import Health Standard, which states that all sea containers must be checked by an AP for external contamination during discharge and handling at the port of arrival. The check may be conducted in conjunction with routine unloading and handling processes. APs check containers destined for Metroport as the containers are loaded onto rail transport at Tauranga, while containers arriving at Auckland are checked externally by APs during discharge and handling. In either case, contaminated containers are stopped, sent for cleaning and/or referred to MAF QS. The difference in the two systems does not appear to be responsible for the difference in external contamination levels; between July and September 2006 only 22 (0.1%) of the 19,614 loaded containers imported into Tauranga were rejected by APs. Since 1 September, additional emphasis has been put on reporting contaminated containers found during the rail loading process; however, the additional level of reporting would not make up the difference observed between Ports of Auckland and Metroport.

It is also unlikely that differences in the origin of containers surveyed at Metroport and Ports of Auckland are responsible for the different contamination levels. A higher proportion of containers imported from Australia and China were contaminated at Ports of Auckland than at Metroport, as were containers from all other countries grouped together (Table 5.4).

Table 5.4: Percentage of loaded containers with external contamination by origin

Origin (Port of loading)	Auckland			Metroport		
	Total	Contaminated	Mean% (95% CI)	Total	Contaminated	Mean % (95% CI)
Australia	571	109	19.1% (16.1% - 22.5%)	224	12	5.4% (3.1% - 9.1%)
China	165	17	10.3% (6.6% - 15.9%)	119	3	2.5% (0.9% - 7.1%)
Rest of world	569	92	16.2% (13.4% - 19.4%)	327	29	8.9% (6.3% - 12.5%)

Differences in exporters, cargo and importers may be responsible for some of the differences between Auckland and Metroport, although there were not enough data to show any patterns at this level of detail. Another possibility is that external contaminants were dislodged during the rail journey from Tauranga to Auckland. The journey is made on flat-bed (not skeleton) rail cars, so if this is the case, most dislodged contaminants should still be present on the rail car bed at unloading. Rail car beds were not inspected during this survey.

5.2 Contaminant location

Table 5.5 shows the number of containers with contaminants in various locations and the percentage of contaminants in those locations. At all three sites, contamination was found principally on the underside of the containers and along the lower ledges at the exterior junction of the walls and base. This may indicate incomplete, 5-sided, cleaning prior to loading the container, storage on an unpaved site, or scraping along the substrate. It is likely that a moderate amount of contamination wedged in the external lower ledge rail groove or floor joists would not attract attention at some offshore departure points.

Table 5.5: Location of contaminants at each site and % of contaminants by location

Location of Contaminants	Bledisloe	% of contaminants	Fergusson	% of contaminants	Metroport	% of contaminants
Underside	71	32.6%	60	48.0%	53	71.6%
Lower ledges	73	33.5%	29	23.2%	11	14.9%
Forkhoist slots	20	9.2%	6	4.8%	1	1.4%
Sides	24	11.0%	12	9.6%	3	4.1%
Door	16	7.3%	7	5.6%	1	1.4%
Twist lock holes	8	3.7%	2	1.6%	0	0.0%
Roof	6	2.8%	8	6.4%	5	6.8%
Reefer power unit	0	0.0%	1	0.8%	0	0.0%
Total contaminants[4]	218		125		74	
Total containers in sample	862		654		714	

The frequent presence of spiders on the container undersides, along with egg sacs, suggests that some containers have been stored long enough for a transitory community to develop.

The high levels of contamination found in association with the underside and lower edges of the container indicate that estimates of external contamination level should only include containers inspected on the underside, and exclude results for containers for which the underside was not inspected.

5.3 External contamination level

Inspectors examined 94% of containers on at least the four lateral sides and the underside at Metroport, and 90% at the Ports of Auckland. At the Ports of Auckland the contamination rates were not significantly different for loaded containers inspected on five sides including the underside (16.5%) or all six sides (20.6%): the roof does not appear to be a significant source of biosecurity risk. These rates were greater than the rate found for containers inspected on only the four lateral sides (10.9%) although the difference was not statistically significant due to the relatively small number of 4-sided inspections.

The number of sides inspected was not recorded for 72 containers at Auckland and 8 at Metroport (Tables 5.1 and 5.2). These containers had relatively high rates of contamination compared with those known to have been inspected on the underside (e.g. 33.8% vs 16.7% - 22%, Table 5.3). This means that the contamination level for the entire sample is greater than

[4] Multiple contaminants could occur on a single container

the level for containers inspected on the undersides. Therefore, a conservative approach was taken and the contamination level for the combined sample used for each port.

The actions applied at the port also influence the contamination level of containers leaving the port. Few containers are inspected and/or cleaned on the underside, relative to the number receiving 4-sided external inspections (loaded) or 4-sided external and internal inspections (empty). In addition, a large number of empty containers are cleaned externally (4 sides) and internally on arrival. For some shipping companies, this cleaning is done in lieu of providing a quarantine declaration for empty containers. In other cases, the empty containers are cleaned at on-port facilities prior to being sent for export. Empty containers are subject to the same requirements as loaded containers in terms of requiring container declarations and being inspected by MAF or checked by APs for contamination. However, in some cases the shipping company importing empty containers is unable to provide Quarantine Declarations, and the containers are given 4-sided inspections as an alternative. At some ports, empty containers are checked and cleaned at facilities on the port, while at other ports, empty containers are sent to storage and repair facilities, where APs check the containers and clean those found to be contaminated.

None of the containers from the survey had been 6-sided inspected, and very few had been cleaned on port, but a number had been 4-sided inspected. This did appear to influence the level of contamination remaining when containers left the port, with slightly higher levels of contamination found on uninspected containers (Table 5.6). However, differences are not statistically significant, as indicated by the overlap in confidence intervals, and the total rates have been used as the estimates of external contamination level.

The wharf gate survey clearly shows that a four-sided external inspection is inadequate to determine the external cleanliness of a container, with up to 21% of inspected containers still contaminated (Table 5.6). This suggests that a 4-sided external inspection for containers without quarantine declarations does not provide adequate protection against contaminants carried on empty containers.

Table 5.6: External contamination levels by on-wharf inspection status

		Loaded			Empty[5]		
		4-sided insp on wharf	Not insp on wharf	Total[6]	4-sided insp on wharf	Not insp on wharf	Total
Auckland	Surveyed	28	1412	1440	37	38	75
	Contaminated	4	250	254	8	10	18
	% contam	14.3%	17.7%	17.6%	21.6%	26.3%	24.0%
	(95% CI)	(5.8-31.7%)	(15.8-19.8%)	(15.8-19.7%)	(11.4-37.3%)	(15.0-42.1%)	(15.8-34.8%)
Metroport	Surveyed	56	655	711			
	Contaminated	2	51	53			
	% contam	3.6%	7.8%	7.5%			
	(95% CI)	(1.1-12.1%)	(6.0-10.1%)	(5.7-9.6%)			

The overall weighted[7] estimate of external contamination on loaded containers leaving the wharf is 14.3%. This is much greater than the 4.4% found in the 2001-02 survey. Much of

[5] Data for Auckland (74 empty containers) and Metroport (1 empty container) combined
[6] Note: on-wharf inspection status could not be determined for 1 loaded container at Metroport, 1 empty container at Metroport and 1 empty container at Auckland; thus, these totals differ slightly from those in earlier tables.

the difference between the two surveys is due to the number of sides inspected: in the 2001-02 survey only the four lateral sides of the containers were inspected in most cases, whereas over 90% of those surveyed in 2006 were inspected underneath, and the underside is the most heavily contaminated region.

5.4 Efficacy of on-wharf inspection processes

High-risk containers are profiled for MAF QS external inspection at the port of arrival. APs located at ports play a role in monitoring external contamination on arriving containers and reporting contaminated containers to MAF. As with APs at private TFs, port APs submit contamination records on log sheets to be recorded in QuanCargo. Table 5.7 shows the number of contaminated loaded containers reported by MAF QS and APs at Ports of Auckland, Tauranga and the rest of the country during the study period (1 July – 30 September 2006). Also shown is the estimated number of contaminated containers leaving each port, based on the results of this survey, and thus the efficacy of the on-wharf systems for detecting external contaminants.

Table 5.7: Detection and slippage of externally contaminated loaded containers

Number of containers	Auckland	Tauranga	Rest of NZ
Found contaminated by MAF QS / APs	97	55	54
Estimated contaminated leaving port	8440	1635	3367
Efficacy of external contaminant detection	1.1%	3.6%	1.6%

The current on-wharf systems are extremely ineffective at managing external contamination. This is most likely because they do not allow close inspection of the underside of the container. The on-wharf AP checks take place during routine container logistics work: health and safety considerations involved in moving containers do not allow for close inspections. The AP inspections at the Port of Tauranga are also mainly 4-sided, as it is not possible to examine the undersides during the rail loading process. While it appears that the large number of 4-sided inspections done at Tauranga before transport to Metroport results in this system being marginally more effective than that at Ports of Auckland, the results show that 4-sided inspections only deal with a small proportion of external contamination.

It is difficult to make the same calculations for empty containers. At many of the smaller ports, empty containers are all 4-sided inspected and cleaned if necessary under a compliance agreement. However, the number of containers found with contamination is not often reported back to MAF. It is clear, however, from these survey results that the same problems exist for empty containers with regards to external contamination.

5.5 Efficacy of Quarantine Declarations

Quarantine declarations (QDs) are provided by the overseas exporters to indicate whether containers have been inspected and found free of contamination and whether they contain certain types of packaging material. Of the 2232 containers examined in the wharf gate study, 1977 (88.6%) had data about the QD (or that no QD was submitted) in Quancargo (Table 5.8). The other 11.4% had no QD information available – most of these were empty or Freight of All Kind (FAK) containers. Nearly all (99.8%) of the containers with QD

[7] Weighted by the total number of loaded containers arriving at the ports of Auckland and Tauranga

information submitted indicated that the container had been inspected for contamination and found to be clean.

Table 5.8: Accuracy of quarantine declarations for cleanliness

Number of containers	Clean	Percent (95% CI)	Contaminated	Percent (95%CI)
QD = Clean*	1673	85.0% (83.4% - 86.5%)	295	15.0% (13.5% - 16.6%)
QD=Not clean	3	100.0% (39.8% - 99.4%)	0	0.0% (0.6% - 60.2%)
No QD submitted	6	100.0% (59.0% - 99.6%)	0	0.0% (0.4% - 41.0%)
No QD details available**	222	87.0% (82.3% - 90.6%)	33	13.0% (9.4% - 17.7%)
Total	1904		328	

*Mainly electronic entries ** Mainly manual entries (FAK, Empty)

Of the containers with QDs indicating they were clean, 15% had external contamination present. These results indicate that a QD indicating the container is clean is not a guarantee of external cleanliness. This may be because most external contamination is associated with the underside or lower ledges, forklift slots and twist-lock holes. Overseas suppliers would rarely, if ever, inspect the underside of a container, although substantial contaminants on the four lateral sides may be detected and removed.

5.6 Managing risks of external contaminants

Risk profiling can manage predictable risks (e.g. those associated with a particular characteristic, such as container origin). The results of this survey show that external contamination is relatively frequent (e.g. 17.6% of loaded containers leaving Ports of Auckland), even for containers from countries considered to have a high level of biosecurity awareness (e.g. Australia). Much of this contamination is unpredictable based on information currently available. Better prediction will require wider information about each arriving container, particularly the places previously visited, contents, sources and suppliers. However, risk profiling alone is unlikely to ever be able to identify all contaminated containers, particularly when the level of contamination is as high as at present.

An option for MAF's container project team to consider is inspecting containers externally as they leave the wharf. During the survey, inspectors were able to examine the undersides of a high proportion of containers leaving the wharf, due to the use of skeleton-bed trucks. This gives an opportunity to examine the undersides of containers for contamination prior to the container leaving the wharf, without incurring additional port movement costs for clean containers. This measure has already been implemented in Australia, where all containers are transported on skeleton trucks and externally inspected as they leave the ports.

The container roof was not a significant source of contamination during the survey, although giant African snails have been found on the tops of containers where they have fallen from containers stacked above. Containers potentially contaminated with giant African snail (based on port of loading) are already subject to a specific risk profile and receive a 6-sided inspection on the wharf.

Another option to consider is external (including underside) washing as an alternative to inspection prior to leaving the port. Equivalent systems could also be developed to ensure containers arrive without external contamination. In the future, technologies such as microwaves could also be developed for use in container decontamination.

6 Transitional facility survey

A total of 339 containers were surveyed at transitional facilities, with 204 (60%) of survey inspections performed in the Auckland region.

6.1 External contamination

The majority of external inspections at the transitional facilities were of either four or five sides of the container. Auckland inspections were carried out by BMG surveyors, while inspections elsewhere in New Zealand were carried out by MQS officers. The BMG surveyors were provided with pole-mounted mirrors that enabled them to inspect the top of the container. As a result, the majority of inspections carried out in Auckland (58%) were of the four lateral sides and the roof.

Only 16 containers were inspected on the underside during the survey at transitional facilities. Underside inspections require special container frames, which are difficult to obtain at short notice. Very few transitional facilities have the time or facilities to carry out underside inspections. The current Import Health Standard does not require six-sided inspections to be carried out at transitional facilities where containers are being devanned.

Three (18.8%) of the containers surveyed underneath were externally contaminated (Table 6.1). Because the sample size is small, this rate is not significantly different from the rate found for containers inspected on only the sides, or sides and roof. The external contamination rate for containers inspected on the underside at transitional facilities was not significantly different than the rate found when leaving the wharf gate (17.6%).

Table 6.1: External contamination level of containers at transitional facilities

Sides[8] inspected	Sides only	Sides+roof	Sides+underside or 6	not recorded	Total
Surveyed	161	160	16	2	339
Contaminated	9	12	3	0	24
Percentage	5.6%	7.5%	18.8%	0.0%	7.1%
95% CI	3.0% - 10.3%	4.4% - 12.7%	6.8% - 43.4%	0.8% - 70.8%	4.8% - 10.3%

Soil was the most common external contaminant found, occurring on 13 of the 24 externally contaminated containers. Most soil was found around the base of the container. Two of the contaminated containers inspected on the underside had plant material present on the underside (see section 9.3 for detailed information on environmental contaminants).

6.2 Internal Contamination

Loaded containers were surveyed internally for contamination, wood packaging compliance and manifest accuracy during and after devanning at transitional facilities.

Of the 337 containers surveyed internally, 62 were contaminated (18.4%), excluding wood packaging contaminants. The contamination rates were similar between Auckland and other ports of arrival (Table 6.2). The internal contamination level is not significantly different

[8] The 4 lateral sides were inspected for most containers, but a few had only 2 or 3 sides inspected, due to the container placement

from the 21% of containers found internally contaminated in the 2001-02 survey (BMG, 2003).

Table 6.2: Number and percentage of containers with internal contamination

Port of Arrival	Surveyed	Contaminated	% contaminated	(95% CI)
Auckland	200	39	19.5%	(14.6%-25.6%)
Other ports	137	23	16.8%	(11.5%-24.0%)
Total	337	62	18.4%	(14.6%-22.9%)

Live hitchhiker organisms were the most frequent internal contaminants, found in 34 (10.1%) of containers (see section 9.2).

Of the 337 containers surveyed, 333 (98.8%) had quarantine declarations stating that they had been inspected and found clean, prior to export. Of these, 61 (18.3%) were contaminated internally. Of the remaining four containers, one had no quarantine declaration (it was clean) and three had quarantine declarations indicating that they had not been inspected (two were clean). While some types of live hitchhiker organisms could have entered the container on the goods or packaging, contaminants such as seeds or dried plant material on the floor of the container should have been detected by the overseas inspection. All of the containers found with these types of contaminants inside were certified as being clean by the exporter. This demonstrates the ongoing need for the container audit programme, which imposes increased inspections on containers from non-compliant exporters.

6.3 Wood Packaging

6.3.1 Incidence of wood packaging

All wood packaging imported into New Zealand must be declared. Most declarations are made electronically through the NZCS Cusmod system. During the transitional facility survey, containers were inspected for wood packaging and dunnage. Contaminants associated with wood packaging have been considered separately from other internal contamination, because packaging contaminants are often pests of the wood, rather than hitchhikers, and so pose a different type of biosecurity risk. In addition, wood packaging is subject to both national and international regulations (BNZ 2006, IPPC 2002).

Just over 40% of the containers surveyed internally contained wood packaging (Table 6.3), with similar rates found for containers arriving in Auckland and those in other ports.

Table 6.3: Incidence of wood packaging in containers

Number of containers	Surveyed	With wood packaging	% of containers with wood
Auckland	202	87	43.1% (36.4% - 50.0%)
Other ports	135	49	36.3% (28.7% - 44.7%)
Total	337	136	40.4% (35.3% - 45.7%)

Wood packaging was correctly declared for the majority (93%) of containers (Table 6.4). Nearly 5% of containers contained undeclared wood, while 2% contained no wood, but had wood packaging declared.

Table 6.4: Declaration of wood packaging in containers

Wood packaging	Wood declared	Wood not declared	Total
Present	120 (35.6%)	16 (4.7%)	136
Absent	6 (1.8%)	195 (57.9%)	201
Total	126	211	337

6.3.2 ISPM-15 compliance

New regulations regarding wood packaging associated with goods for entry into New Zealand came into force in July 2006. From this date all wood packaging materials are required to be treated and marked according to the guidelines set out in the international standard ISPM-15 (IPPC, 2002).

Of the 136 surveyed containers with wood packaging, 96 (70.6%) contained only ISPM-15 marked wood. A number of containers contained both marked and unmarked wood packaging. Containers with undeclared wood packaging were significantly more likely to have non-compliant wood (Table 6.5). A total of 62.5% of the containers with undeclared wood packaging had unmarked wood, compared with just 25% of the containers with declared wood.

Table 6.5: ISPM-15 marking of wood packaging in containers

Number of containers	Total with wood	With unmarked wood	% with unmarked wood	95% CI
With wood declared	120	30	25.0%	(18.1%-33.5%)
With wood undeclared	16	10	62.5%	(38.3%-81.6%)
Total with wood	136	40	29.4%	(22.4%-37.6%)

Containers with wood from Australia were most likely to contain unmarked wood (38.5%) while containers from south-east Asia were least likely (17.6%), but the differences were not statistically significant.

6.3.3 Wood packaging contamination

Twenty-four of the 337 containers surveyed were found with contaminated wood packaging. This equates to 17.6% of the containers with wood packaging, and 7.1% of all containers surveyed internally (Table 6.6). This is considerably less than the contamination rate recorded in the 2001-02 survey (BMG, 2003), where 15.6% of containers inspected at devanning had contaminated wood packaging. This improvement may be due to the development of the ISPM-15 standard and a greater awareness of wood packaging as a vector for contaminants. Bark was the most frequent contaminant found on wood packaging (see section 9.5).

Table 6.6: Incidence of containers with contaminated wood packaging (WP)

	Number of containers	% of containers with wood	% of containers surveyed
Contaminated WP	24	17.6%	7.1%
Clean WP	112	82.3%	33.2%
No WP	201	n/a	59.6%
Total	337		100%

Wood packaging without ISPM15 markings was more frequently contaminated than wood with ISPM15 marks (Table 6.7), although the difference was not statistically significant as shown by the overlap in the 95% confidence intervals.

Table 6.7: Contamination of wood with and without ISPM-15 marks

Number of containers	With ISPM15 marks	Without marks	Total
With uncontaminated wood	82	30	112
With contaminated wood	14	10	24
Percentage contaminated (95% CI)	14.6% (8.9-23.0%)	25% (14.2-40.3%)	17.6% (12.1-24.9%)

The aim of the ISPM-15 standard is to reduce the risk of introduction and/or spread of quarantine pests associated with wood packaging material (IPPC, 2002). Wood must be treated by one of two approved methods (heat treatment or methyl bromide fumigation) and then appropriately marked. Debarking is not specifically required for treated and marked wood, although the standard does suggest that dunnage, if not treated and marked, should at minimum be made from bark-free wood. Of the 14 containers with contaminated ISPM-15 marked wood packaging, one had fungi (*Trichoderma viride*), one had live insects (*Ahasverus advena* and *Ectopsocus cryptomeriae*), one had pallets with substantial webbing and live spiders, one had insect damage and the rest had bark.

The spiders and inspects found are hitchhiker organisms, and while they were associated with the wood packaging, they are not the type of contaminant managed by the IPSM-15 standard. MAF will undertake a further, specific survey of wood packaging risks in the 2007-08 year.

6.4 Contents/manifest accuracy

When containers are declared electronically, a description is lodged with MAF, via the NZCS Cusmod system. To assess the accuracy of these declarations, the contents of the container were verified during the internal survey and compared with the manifest declaration of the contents.

A total of 14 out of 337 containers had contents that were not accurately or completely described by the manifest declaration. This equates to 4.5% of containers surveyed where both the manifest description and actual contents were known and recorded (the actual contents of 22 containers were not recorded). The manifest declaration of contents and the actual contents of these containers are listed in Appendix 14.1. The percentage of containers with unmanifested cargo was less than that recorded in the 2001-02 survey (BMG, 2003), which found 7.4% of containers to contain unmanifested cargo. However, this difference is not statistically significant.

The manifest declaration of the contents of 7 of these containers could be described as ‘loosely’ matching the manifested contents; for example, PS2 consoles manifested as electronic TV/DVDs, and toilets described as ‘sanitary goods’. Four more containers contained goods that were correctly manifested, but had other items added that were not included in the manifest declaration. For example, one container was manifested as containing ‘blankets’, but was found to contain both blankets and mattresses.

Four containers (1.3% of containers surveyed) had incorrectly declared contents of potential interest to MAF. These were: spare parts listed as grease, oil, and lubricants; a used oil well drill that was declared as new; a consignment of ride-on mowers, bikes, and hedge trimmers (new or used not specified); and wooden brooms that were included in a container of plastic brush-ware and buckets. The 2001-02 survey (BMG, 2003) found a similar level (1.7% of containers) of unmanifested biosecurity risk goods.

7 Storage facility survey

7.1 External contamination

A total of 1784 containers were inspected at the storage facilities, 1620 (91%) of which had been imported as loaded containers. Only 1% of containers were externally inspected on the underside at storage facilities (Table 7.1). Again, the external contamination rates for containers inspected underneath were greater than the rates for other containers.

Table 7.1: External contamination levels for containers at storage facilities

Mode of import		2 or not recorded	4	4+ roof	4 + underside or 6
Loaded	Surveyed	3	1495	104	18
	Contaminated	0	17	1	2
	Percentage	0.0%	1.1%	1.0%	11.1%
	95% CI	0.6 - 60.2%	0.7 - 1.8%	0.2 - 5.2%	3.4 - 33.1%
Empty	Surveyed	0	151	10	3
	Contaminated	--	3	0	1
	Percentage		2.0%	0.0%	33.3%
	95% CI		0.7 - 5.7%	0.2 - 28.5%	6.8 - 80.6%

The number of containers inspected underneath was too small to show any significant difference in contamination level between the wharf gate and the storage facility. However, the results for loaded containers, taken together with those from the wharf gate and transitional facility surveys, suggest that a large proportion of containers are still externally contaminated, mainly on the underside, at the time when biosecurity clearance is issued.

Of interest is the comparatively low proportion of containers with soil found on the lower ledges of the exterior sides compared with the wharf gate survey results (6.5% at the wharf gate, compared with 0.7% at the storage facilities). Possible explanations for this include:

- losses during loading and truck transport;
- washing off by rain while awaiting devanning at transitional facilities;
- removal by TF personnel without a log sheet notification to MAF;
- variation in container origins or other factors between the two surveys.

7.2 Internal contamination

When the containers were opened at the storage facilities, 14.9% of the containers imported loaded and 14.6% of those imported empty were internally contaminated (Table 7.2). The proportion of empty containers with internal contamination was 1.4% for those that had been cleaned at the port of arrival, but 25% for those that had not been cleaned.

Table 7.2: Internal contamination of containers arriving at storage facilities

Mode of import	Loaded		Empty	
		Cleaned at port	Not cleaned	Total
Surveyed	1621	24	92	163
Contaminated	242	1	23	24
Percentage	14.9%	1.4%	25%	14.7%
95% CI	13.3% - 16.7%	0.3% - 7.5%	17.3% - 34.8%	10.1% - 21.0%

As at the transitional facilities, live organisms, mainly spiders, were the most frequent type of internal contaminant, but soil, seeds, plant material and a live lizard were also found (see section 9).

Under the provisions of the current import health standard, all loaded containers should be checked by APs or inspected by MAF after devanning, and any contaminants removed. The containers imported loaded should have had no contaminants remaining inside when they arrived at the storage facilities. 4.5% of the containers were contaminated with live organisms that were identified as species, genera or families[9] that occur in New Zealand. It is possible that some of these organisms entered the containers while the containers were opened at the transitional facilities. However, it is considered more likely that organisms would leave a container during the bustle of unpacking, rather than enter it. If a container was allowed to sit in the yard with the doors open after unpacking, organisms could enter it seeking shelter. Again, this is not considered likely, although it may occur from time to time.

Some contaminants may have been tracked in or blown in during unloading, such as seeds, leaves and soil. These types of contaminants were found in approximately 3% of the containers imported as loaded.

Exotic hitchhiker organisms, pieces of bark and residues of previous cargoes were found in 8.8% of containers imported as loaded. All of these contaminants would have come with the containers from overseas. If the soil, weed seeds and leaves are included, the estimate of contamination would be 11.7%. If organisms already established in New Zealand are included, the estimate of internal contamination is 14.9%, (Table 7.2). This has been used as the estimate of internal contamination remaining in the loaded container pathway after biosecurity clearance is given; it is noted that this may be a slight over-estimate if some of the contaminant organisms entered the containers in New Zealand.

Empty containers are checked by APs at the storage facilities for contamination – these containers have not been opened previously in New Zealand, so all contaminants found, including organisms present in New Zealand, have come with the container from overseas.

[9] Not all organisms could be identified to species; for those organisms only identified to genus or family, the presence of that genus or family in New Zealand was assessed.

8 System Effectiveness and Residual Risk

8.1 Sea container process efficacy

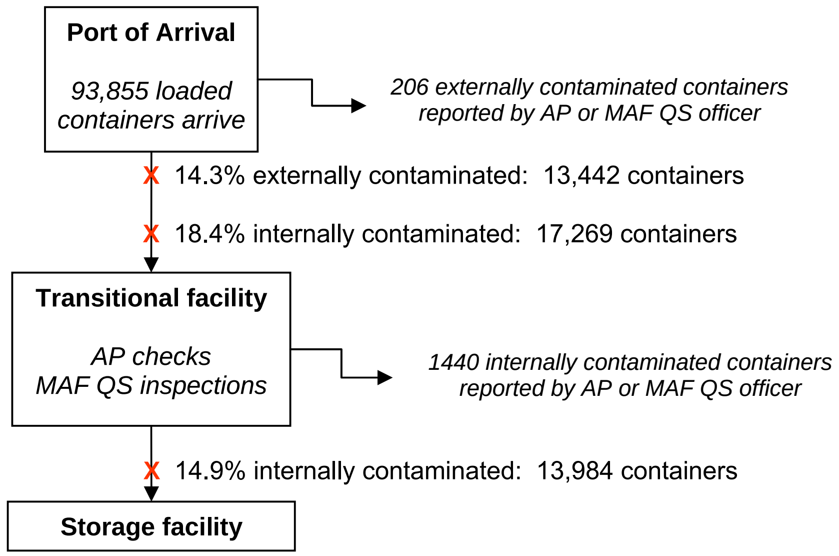
Contamination on sea containers is mainly managed at two key points within the system. The main opportunity to deal with external contamination is at the port of arrival, particularly for contaminants located on the undersides of containers. Once the container leaves the port, external contamination may drop off the container, and the logistics of the pathway are such that very few containers can be inspected on the underside later in the system.

The main point for detecting and dealing with contamination inside containers is at the transitional facilities where the containers are first opened. For loaded containers these are the facilities where the containers are unpacked. For containers imported empty, these are the storage and repair facilities where they empty containers are taken for inspection and/or cleaning, prior to being hired out for export.

8.1.1 Loaded containers

Between 1 July and 30 September, 93,885 loaded containers arrived in New Zealand. Based on the results of the wharf gate surveys at Auckland and Metroport, approximately 14.3% of these had external contamination when they left the port of arrival (Figure 8.1). This translates into approximately 13,422 loaded containers with external contamination entering New Zealand during this three-month period. This contamination is not managed elsewhere in the system, as it is not possible to see the undersides of containers at transitional facilities, and undersides are rarely washed at the storage facilities. The APs working at ports, and MAF QS officers inspecting profiled high-risk containers, reported 206 externally contaminated containers during the period. Adding this to the estimated 13,442 containers with slippage gives a total of approximately 13,628 externally contaminated containers arriving, and an on-wharf efficacy of approximately 1.5%.

Figure 8.1: Slippage of contaminated loaded containers



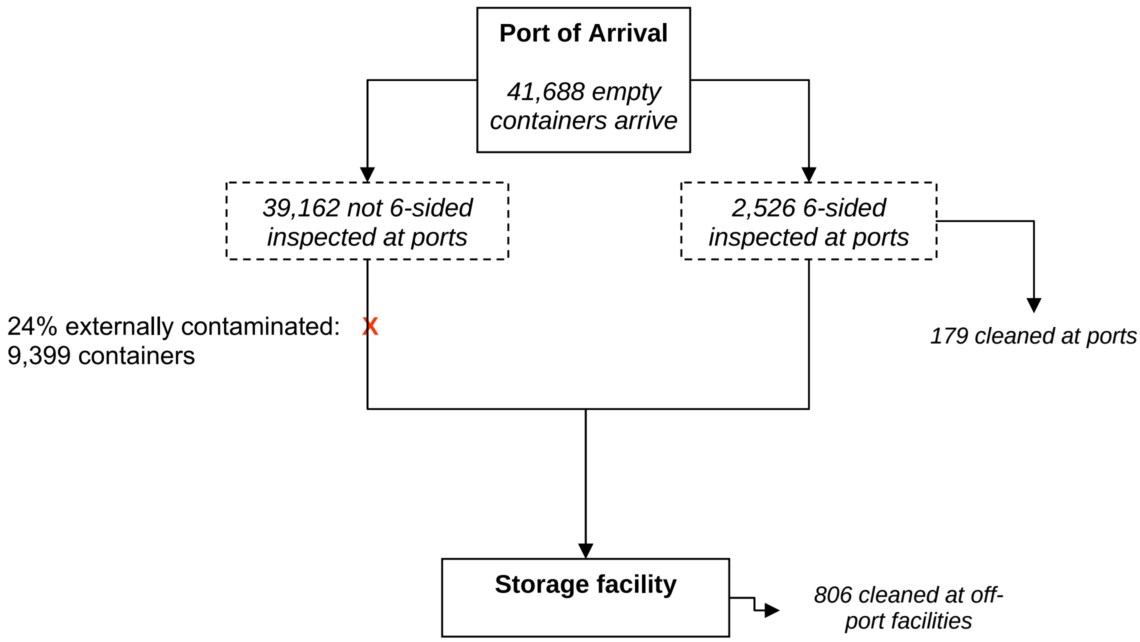
The transitional facility survey indicated that 18.4% of loaded containers (17,269) arrived with internal contamination during the survey period. The storage facility survey found 14.9% of containers to be internally contaminated, equivalent to 13,984 containers during the survey period. This suggests that 3,285 containers were cleaned as a result of the transitional facility process (an efficacy of approximately 19%). However, log sheets of AP checks and MAF QS high-risk container inspections reported only 1440 internally contaminated containers at transitional facilities: 44% of the total estimated to have been cleaned. This corresponds with the findings from the AP questionnaire (section 10), which indicated that many contaminated containers are not reported to MAF, even if contamination is found.

8.1.2 Empty containers

The picture is less clear for empty containers. During the survey period, approximately 41,688 empty containers arrived in New Zealand. Systems for processing empty containers vary considerably among ports in New Zealand. At Timaru, Nelson and Invercargill, all empty containers are washed at the port, prior to leaving. Empty containers arriving at other ports are inspected by APs at facilities located either on or off the port; containers found contaminated are cleaned. The number of empty containers found with biosecurity contamination is not recorded when the entire shipment is sent for cleaning as part of a compliance agreement; this makes it difficult to estimate the number of empty containers arriving with contamination.

As discussed in section 5.3, the external contamination level did not differ significantly for containers given a 4-sided inspection at the ports, compared with those that were not. A small number of containers were inspected on all 6 sides, which would have detected and removed any underside contamination (Figure 8.2).

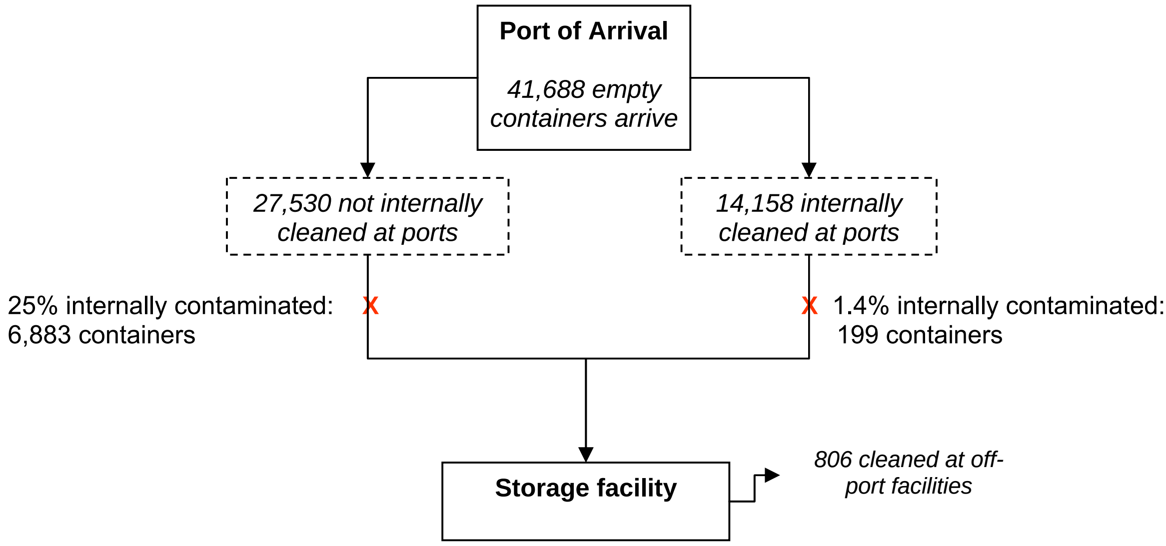
Figure 8.2: Slippage of contaminated empty containers (external)



The efficacy of the current on-wharf systems for managing external contamination on empty containers is calculated as 179/(179+9399), or approximately 1.9%. As found with loaded containers, this is because the current system does not target the undersides of containers. MAF records indicate that 806 containers were cleaned at storage facilities; however, this would rarely, if ever, include the underside.

The internal contamination level was significantly lower for empty containers cleaned at the ports of arrival (section 7.2); therefore, in presenting the results the empty containers have been split by those internally cleaned and those that were not (Figure 8.3).

Figure 8.3: Slippage of contaminated empty containers (internal)



Approximately 7,082 (25% of the 27,530 not cleaned, plus 1.4% of the 14,158 that were internally cleaned) empty containers were internally contaminated on arrival at the storage facilities. Assuming the containers cleaned at the ports had the same rate of internal contamination prior to cleaning as the rest of the containers, approximately 10,422 contaminated empty containers would have arrived during this three-month time period. MAF has records of 806 containers being cleaned for biosecurity purposes at the storage facilities, although it is likely that many more would have been cleaned internally but without official paperwork prior to packing for export. This means that while the calculated efficacy for the system is approximately 40%, a higher proportion of containers with internal contamination would have been dealt with prior to reshipment.

Currently, MAF is undertaking a review of the whole pathway for empty sea containers. This review will place particular emphasis on the operational requirements of transitional facilites that inspect and wash empty containers. MAF will also examine the current certification requirements associated with empty containers, and ascertain why incidents of biosecurity contamination are not always recorded.

8.2 Risk loading and residual risk

Risk unit values were calculated for external and internal contamination based on the types and frequencies of contaminants present. Containers received a value of 6 risk units for external contamination, and 9 risk units for internal contamination[10]. Wood packaging contamination was also 6 risk units on average per container, although this could vary considerably depending on the quantity of contaminated wood packaging present.

[10] See Appendix 15.6 for how risk unit values were calculated

Table 8.1 shows the numbers of loaded and empty containers estimated to have arrived with different types of contamination during the survey, and the quantity of risk units for each (risk loading). Also shown are the numbers of containers estimated to have entered New Zealand as slippage during the survey – the risk units associated with these containers represents the residual risk in the pathway.

Table 8.1: Estimated number of contaminated containers arriving and detected

	Loaded		Empty		Total	
	Containers	Risk units	Containers	Risk units	Containers	Risk units
Arriving						
With external contamination	13,778	82,668	9,578	57,468	23,356	140,136 (32.8%)[11]
With internal contamination	16,989	152,901	10,422	93,798	27,411	246,699 (57.8%)
With wood pkg contamination	6,664	39,984			6,664	39,984 (9.4%)
Total risk loading						426,819
Risk loading per month						139,180
Detected						
With external contamination	206	1,236	179	1,074	385	2,310 (0.5%)
With internal contamination	1,440	12,960	4,146	37,314	5,586	50,274 (11.8%)
With wood pkg contamination	209	1,254			209	1,254 (0.3%)
Slippage						
With external contamination	13,572	81,432	9,399	56,394	22,971	137,826 (32.3%)
With internal contamination	15,549	139,941	6,276	56,484	21,825	196,425 (46.0%)
With wood pkg contamination	6,455	38,730			6,455	38,730 (9.1%)
Total residual risk						372,981
Residual risk per month						121,624

Of the risk loading in the pathway, approximately 33% is associated with external contamination, 58% is associated with internal contamination, and 9% is associated with wood packaging contamination. Approximately 65% of the risk loading is associated with loaded containers, and 35% with empty containers. Overall, approximately 13% of the risk units are detected.

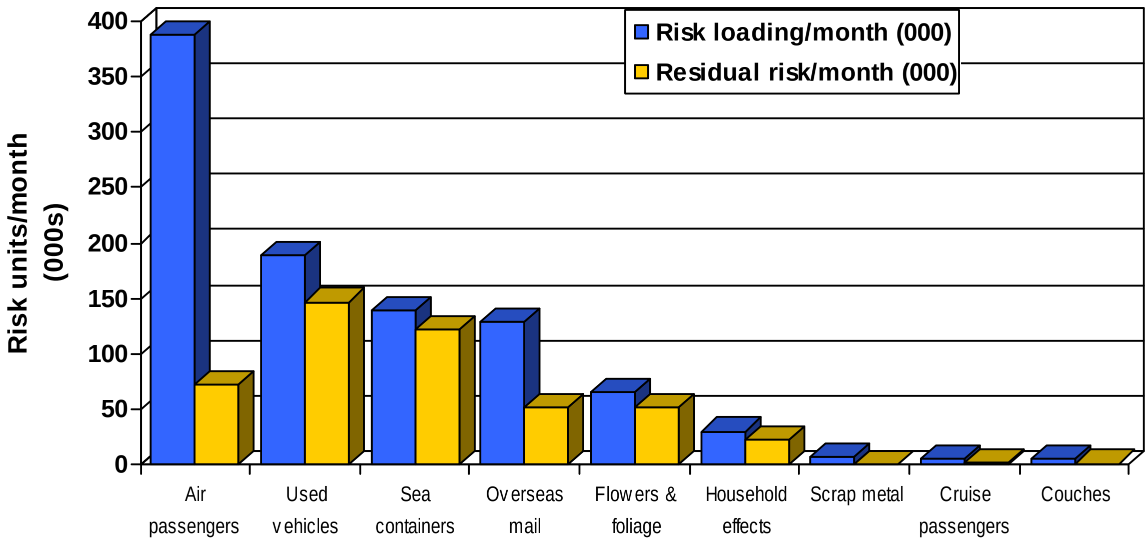
Of the residual risk, 38% is associated with internal contamination of loaded containers. Managing this risk is possible at two points in the current system, both with the overseas inspections for the QD and the checks at the transitional facilities by APs. However, stronger measures and incentives are required to ensure that these parts of the system perform properly.

8.3 Comparisons with other pathways

The monthly risk loading in the sea container pathway is moderate relative to other pathways surveyed, between the used vehicle pathway (188,511 risk units) and mail pathway (128,378 risk units). However, as the overall efficacy is only 13%, sea containers have a relatively high level of residual risk, second only to the used vehicle pathway (Figure 8.4).

[11] Percentage of risk loading

Figure 8.4: Risk loading and residual risk by pathway



9 Contamination

9.1 Summary of contamination

Container contaminants fall into four general groups: environmental contaminants, hitchhikers, cargo residues, and wood packaging contaminants (Table 9.1). Environmental contaminants include soil, plant material, seeds and other material. This type of contaminant either adheres externally to the container during movement or storage, or is blown, tracked or otherwise brought inside the container during packing or devanning. Hitchhikers are live organisms that are not a pest of the cargo being carried. Wood packaging contaminants include bark, timber insects and fungi that specifically infest wooden packaging materials.

Table 9.1: Contaminant groups

Contaminant Category	Sub-category	Details
Environmental contaminants	Soil	Excludes all inorganic mineral material, e.g. clay, sand, silt, road-splash and gravel
	Plant material	Including twigs, leaves, flowers and empty seed heads
	Seeds	Excludes seeds present as residues of previous cargoes
	Feathers	
Hitchhiker organisms	Eggs	Eggs, egg sacs, egg masses, egg capsules
	Arthropods	Insects, insect larvae, pupae and spiders, excluding insect pests in packaging
	Snails	
Cargo residues		Often stored products or grain, including wheat, rice, coffee beans, nuts
Wood packaging		Bark, timber insects and fungi associated with wood packaging material

Environmental contaminants were the most frequent external contaminant, affecting 14.6% of loaded and 17.8% of empty containers (Table 9.2 and Table 9.3). Live hitchhikers were the most frequent internal contaminant, found in 10.1% of loaded and 10.4% of empty containers. This is slightly different to the results of the 2001-02 container survey (BMG, 2003), which found live organisms in 14.8% of loaded and 6.5% of empty containers.

Live hitchhikers are attracted to areas with shelter and reduced light; therefore they are more likely to be found inside, than outside, a container. The exterior of the container is more likely to come into direct contact with the ground, so environmental contaminants such as soil are more likely to be found on the outside. Cargo residues present on the outsides of containers were generally associated with leakage from loaded containers of grain.

Table 9.2: Frequency of different contaminant groups for loaded containers

Contaminant group	External[12]		Internal[13]	
	Number	% (95% CI)	Number	% (95% CI)
Live hitchhikers	26	2.0% (1.4 - 2.9%)	34	10.1% (7.3 - 13.8%)
Environmental contaminants	190	14.6% (12.8 - 16.7%)	24	7.1% (4.8 - 10.4%)
Cargo residues	10	0.8% (0.4 - 1.4%)	13	3.9% (2.3 - 6.5%)
Wood packaging	n/a		25	7.4% (5.1 - 10.7%)
Total containers surveyed	1299		337	
Total containers contaminated[14]	219	16.9% (14.9 - 19.0%)	78	23.1% (19.0 - 27.9%)

[12] Based on wharf gate survey at Auckland for containers surveyed on the underside
[13] Based on transitional facility survey
[14] Some containers had multiple contaminants; therefore the sum of the containers with different types of contaminants exceeds the total number of contaminated containers

Table 9.3: Frequency of different contaminant groups for empty containers

Contaminant group	External[15]		Internal[16]	
	Number	% (95% CI)	Number	% (95% CI)
Live hitchhiker organisms	2	2.7% (0.8 - 9.4%)	17	10.4% (6.6 - 16.0%)
Environmental contaminants	13	17.8% (10.7 - 28.2%)	5	3.0% (1.3 - 6.9%)
Cargo residues	0	Less than 4.0%[17]	2	1.2% (0.4 - 4.3%)
Dead hitchhiker organisms[18]	1	1.4% (0.3 - 7.3%)	1	0.6% (0.1 - 3.3%)
Total containers surveyed	73		164	
Total containers contaminated	15	20.5% (12.9 - 31.2%)	24	14.6% (10.1 - 20.9%)

9.2 Hitchhiker organisms

9.2.1 Hitchhiker frequency

Spiders were the most frequently intercepted hitchhikers, both externally and internally (Table 9.4 and Table 9.5). Likewise, spiders were the most common hitchhikers found as slippage in the personal effects (Chirnside *et al*, 2006) and scrap metal pathways (Chirnside and Prasad, 2007). Most spiders were free-living inside or outside the container, although a few were associated with wooden packaging materials. A full list of organism identification results is provided in Appendix 14.2.

Table 9.4: Frequency of hitchhikers for loaded containers

Hitchhiker group	External[19]		Internal[20]	
	Number	% (95% CI)	Number	% (95% CI)
Live spiders	16	1.2% (0.8 - 2.0%)	30	8.9% (6.3 - 12.4%)
Live insects	5	0.4% (0.2 - 0.9%)	25	7.4% (5.1 - 10.7%)
Live eggs	7	0.5% (0.3 - 1.1%)		
Live snails	2	0.2% (0.0 - 0.6%)		
Total containers surveyed	1299		337	
Total containers with live hitchhikers[21]	26	2.0% (1.4 - 2.9%)	55	16.3% (12.8 – 20.6)

Table 9.5: Frequency of hitchhikers for empty containers

Hitchhiker group	External[13]		Internal[14]	
	Number	% (95% CI)	Number	% (95% CI)
Live spiders	2	2.7% (0.8 - 9.4%)	12	7.3% (4.3 - 12.4%)
Live insects	0	Less than 4.0%[15]	5	3.0% (1.3 - 6.9%)
Live eggs	0	Less than 4.0%	1	0.6% (0.1 - 3.3%)
Total containers surveyed	73		164	
Total containers with live hitchhikers[19]	2	2.7% (0.8 - 9.4%)	17	10.4% (6.6 - 16.0%)

[15] Based on wharf gate survey at Auckland and Metroport for containers surveyed on the underside
[16] Based on storage facility survey
[17] Where no contaminants of a particular type were found, the upper 95% confidence limit has been calculated: the contamination rate is unlikely to be greater than this, but no more precise estimate can be given
[18] Containers with only dead hitchhikers are not included in the total contaminated containers
[19] Based on wharf gate survey at Auckland for containers surveyed on the underside
[20] Based on transitional facility survey
[21] Some containers had multiple contaminants, so the sum of the containers with different types of contaminants may exceed the total number of contaminated containers

62% of arthropods and 85% of eggs found on the outside of containers were found on the underside where the cooler more protected conditions provided a suitable habitat.

In a few instances, inspectors found live organisms in a container, sent the container for fumigation, and found additional dead organisms when the fumigated container was unpacked. Some of these organisms were in good condition, and it is possible that they were alive prior to fumigation. These organisms have been treated as live for the analysis; the specific instances where this occurred are noted in Appendix 14.2.

9.2.2 Organism identification

81% of spiders and 74% of insects were either regulated or of unknown status (Table 9.6). Unknown status applies to organisms that could not be identified to species level, and some species in that genus or family are present in New Zealand and some are not. Specimens were not identified for all contaminants found during the survey, and in some cases more than one specimen was found in a given container. Therefore, these numbers should only be used as a guide and should not be used to estimate the proportion of containers with regulated organisms.

Table 9.6: Summary of live organisms sent for identification[22]

Hitchhiker group	Identified	Regulated	Unknown	Present
Spiders	338	101 (30%)	174 (51%)	63 (19%)
Insects	144	83 (57%)	24 (17%)	37 (26%)
Snails	4	3 (75%)		1 (25%)
Reptiles	1	1 (100%)		

The proportion of spiders that were either regulated or of unknown status was similar to that found as slippage in the personal effects (Chirnside *et al*, 2006) and scrap metal pathways (Chirnside and Prasad, 2007). However, the proportion of regulated insects was much greater for the container than scrap metal or personal effects pathways. The values from the personal effects and scrap metal surveys were based on estimates of total quantities of organisms, rather than proportions of items infested; therefore these results may not be fully comparable.

Two live spiders of the genus *Latrodectus* (Araneae: Theridiidae) were found in the survey, both in containers originating from the USA. *Latrodectus* spiders are venomous and therefore of human health significance. One was *L. geometricus*, the brown widow spider, while the other was only identified to species level. However, as no *Latrodectus* species present in the USA are present in New Zealand, it was by definition a regulated organism.

Live organisms that could not be identified to species level included three species of the mosquito genus *Culex* (Diptera: Culicidae), an ant of the genus *Rhytidoponera* (Hymenoptera: Formicidae), and a parasitoid wasp (Hymenoptera: Braconidae: Opiinae). Some members of the *Culex* genus pose a public health risk. *Rhytidoponera* is an Australasian genus of ants with over 100 described species, including some with powerful stings capable of causing allergic reactions to venom. Only two species of this genus are present in New Zealand. The parasitoid wasps of the Opiinae subfamily are all hosted by cyclorrhaphous Diptera, including some important fruit fly and leafminer pest species.

[22] Includes organisms where the viability was unknown and dead organisms found in containers that had been fumigated.

A number of dead regulated insects and spiders were also found in containers. While dead insects and spiders are not a biosecurity risk, in different circumstances and different conditions these insects may have survived and posed a biosecurity risk. Specific specimens of interest included the Asian gypsy moth, *Lymantria dispar* (Lepidoptera: Lymantriidae), which is discussed in the following section, and the Singapore ant *Monomorium destructor* (Hymenoptera: Formicidae).

Monomorium destructor is widely distributed throughout the tropical zones of the world. It is being increasingly spread into the temperate zones of the world where it can survive in heated buildings. The species was one of the ten top-ranking invasive ant species in the 2005 Landcare Ant PRA.

Asian gypsy moth

A dead mature larva of the Asian gypsy moth (AGM), *Lymantria dispar* (Lepidoptera: Lymantriidae), was found on the underside of a loaded container leaving the Ports of Auckland in the wharf gate survey. The larva was dead and desiccated, but intact, still brightly coloured with a shiny clean cuticle, and had not been attacked by any of the numerous arthropods sheltering underneath containers. This suggests that this larva was from the 2006 breeding season.

The container was loaded in Sydney on 7 September 2006 with packages of high density polyethylene, and arrived in Auckland 12 September, destined for devanning at an ATF in Wiri, South Auckland. AGM is not present in Sydney, indicating that the larva must have originated from a previous voyage of the container.

The lessee of the container, Mediterranean Shipping Company (AUST) Pty Ltd, provided information on the container's movements during the two and a half years prior to the container's departure from Sydney. This date range was chosen in view of the apparent freshness of the larva. Assuming that the most likely origin of the larva would be from eastern Russia, Korea, northern/central China or Japan, four voyages stood out as possibilities (Table 9.7).

Table 9.7: Potential origins of AGM specimen

Discharge port	Arrival date	Loading port	Departure date	Days ashore
Busan	28/05/2004	Busan (transhipment)	3/06/2004	9
Shanghai	17/10/2005	Shanghai	3/11/2005	18
Chiwan	8/01/2006	Chiwan	13/02/2006	37
Yantian	25/06/2006	Yantian	24/07/2006	30

AGM eggs hatch during early May and larvae are present for up to two months in northern China. This happens slightly earlier in southern China, but overall timing varies with the local temperature (Melanie Newfield, pers comm). It is likely that this larva, being mature, would be prospecting for a pupation site towards the end of the two month larval growth window.

The most likely origin of this specimen is the Yantian region in southern China. Both the nine days at Busan in June 2004 and the 30 days at Yantian fit the time window. It is unlikely that the larva would have arrived in such excellent condition after two and a half years of exposure to the elements, decay and predation. The periods ashore at Shanghai and Chiwan, in November 2005 and February 2006 respectively, are when AGM are dormant as egg masses; live larvae would not be present to contaminate the container. The evidence suggests that the contamination originated in the Yantian region during June/July 2006.

9.3 Environmental contamination

9.3.1 Contamination levels

Soil was the most frequently intercepted environmental contaminant on the outside of containers, with 9% of loaded containers and 13% of empty containers found with soil (Table 9.8 and Table 9.9). The majority of the external soil was found on the lower ledge of the containers at the junction of the walls and base of the container. Soil was also regularly found underneath the container in the floor joists, fork hoist slots and the twist lock holes, due to containers being pushed sideways across soft ground. Large quantities of soil were found on the undersides of containers. The majority of plant material, seed and feather contaminants were associated with soil. The majority of environmental contamination on the inside of containers was found on the floor or in the lower corners.

Table 9.8: Frequency of environmental contamination for loaded containers

Contaminant group	External[23]		Internal[24]	
	Number	% (95% CI)	Number	% (95% CI)
Soil	175	8.9% (7.7-10.2%)	11	3.3% (1.8-5.7%)
Plant material	53	2.7% (2.1-3.5%)	8	2.4% (1.2-4.6%)
Seeds	23	1.2% (0.8-1.7%)	4	1.2% (0.5-3.0%)
Feathers	17	0.9% (0.5-1.4%)	0	Less than 0.9%[25]
Total containers surveyed	1975		337	
Total with contamination[26]	232	11.7% (10.4-13.2%)	18	5.3% (3.4-8.3%)

Table 9.9: Frequency of environmental contamination for empty containers

Contaminant group	External[27]		Internal[28]	
	Number	% (95% CI)	Number	% (95% CI)
Soil	9	13.4% (7.3-23.6%)	2	1.2% (0.4-4.3%)
Plant material	3	4.5% (1.6-12.4%)	3	1.8% (0.7-5.2%)
Seeds	0	Less than 4.3%[23]	3	1.8% (0.7-5.2%)
Feathers	1	1.5% (0.4-7.9%)	0	Less than 1.8%[23]
Total containers surveyed	67		164	
Total with contamination[24]	12	17.9% (10.6-28.8%)	5	3.0% (1.3-6.9%)

[23] Based on wharf gate survey at Auckland and Metroport for containers surveyed on the underside
[24] Based on transitional facility survey
[25] Where no contaminants of a particular type were found, the upper 95% confidence limit has been calculated: the contamination rate is unlikely to be greater than this, but no more precise estimate can be given
[26] Some containers had multiple contaminants, so the sum of the containers with different types of contaminants may exceed the total number of contaminated containers
[27] Based on wharf gate survey at Auckland and Metroport for containers surveyed on the underside
[28] Based on storage facility survey

9.3.2 Organism identification

Approximately 30% of soil samples that were sent for nematode extraction were found with nematodes or other live organisms in them (Table 9.10). This proportion was almost identical for external and internal soil contamination. These proportions are comparable to other surveys: 50% of soil samples from personal effects and 25% of soil samples from scrap metal were found with live nematodes, although in each of these surveys only eight samples were examined. None of the nematodes found could be identified to species level. Two species of tardigrade were found; one was present in New Zealand, while the other, *Macrobiotus* sp., is a regulated genus.

Table 9.10: Summary of identifications from soil samples

	Number of samples
Sent for identification	63
Organism found at identification	19
% of soil samples with viable organisms	30%

64% of seeds sent for identification and viability testing were found to be viable. This is much greater than the level of seed viability in used vehicles (16% in air filters and 41% elsewhere in the vehicle) and personal effects (18%). 75% of the viable seeds were either regulated or were of unknown status as they could not be identified to species level.

Table 9.11: Summary of identification and viability testing of seed samples[29]

	Viable	Non-viable
Regulated	10 (22%)	2 (8%)
Unknown	24 (53%)	11 (44%)
Present	11 (25%)	12 (48%)
Total	45	25

The majority of plant material was either food plants, or weeds commonly found in waste areas, both in New Zealand and overseas. Seeds of food crops are commonly cargo residues; some weed seeds would be introduced with the crop seeds, while others are presumably introduced during container shipment and storage. Some of the food crop seeds are important crops in New Zealand, and thus have specific import requirements to prevent the entry of disease. Therefore, while they may be present in New Zealand, their entry is of concern as they may carry pests.

Plant material contamination was inspected for visible signs of fungal lesions. All items of plant material with visible signs of fungal attack were then sent to the MAF IDC PEL for identification of fungi. Of 71 plant material contaminants, 10 were sent to the lab and 4 (5.6%) had fungi found.

9.4 Cargo residue

There was a significant difference between the levels of cargo residue contamination found in loaded and empty containers (Table 9.12). 38% of empty containers were found with some form of cargo residue, while only 5% of loaded containers were found with cargo residues. This may be because containers shipped loaded are often given a degree of cleaning prior to loading, while empty containers might not have the same requirements. The majority of

[29] Includes cargo residues

cargo residues found in containers were seeds, and also food products such as coffee beans, rice and peanuts. There were also a number of instances of wood chips being found in empty containers. In one instance viable fungi were found infesting wheat residue inside a loaded container.

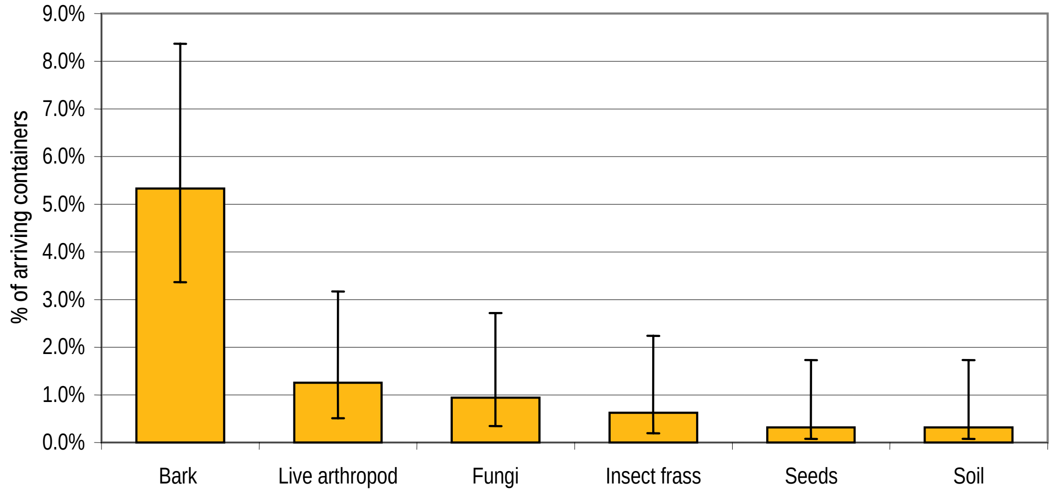
Table 9.12: Cargo residue inside containers

	Loaded	Empty
Containers surveyed	337	164
Containers with cargo residue	17	63
% with cargo residue	5.0%	38.4%
95% confidence interval	(3.2-7.9%)	(31.3-46.1%)

9.5 Wood packaging contaminants

In total, nine containers had contaminated wood packaging, or 6.8% of containers that contained wood packaging. Wood packaging contaminants included bark, live arthropods, fungi, insect frass, seeds and soil. Bark was the most common wood packaging contaminant, and was found in 5.3% of all containers arriving (Figure 9.1), or 13.4% of all containers with wood. Live arthropods (spiders and insects) were found on wood packaging in 1.3% of containers, or 3.1% of containers with wood packaging. The remainder of contaminants were associated with wood packaging in less than 1% of containers, or less than 3% of containers with wood packaging.

Figure 9.1: Frequency of wood packaging contaminants



Four containers with contaminated wood packaging had organisms sent for identification. Three of the four containers were contaminated with live organisms. Several organisms were intercepted from 2 of the containers, resulting in 18 identifications. Most of these organisms were hitchhikers rather than actual pests of wood. One fungus found on the wood, *Trichoderma viride*, is already found in New Zealand.

10 AP survey

Inspectors interviewed 284 APs during the transitional facility survey. A copy of the questionnaire is found in Appendix 14.3. Of the respondents, 192 (68%) were from facilities in the Auckland region, and 92 (32%) were from other regions. This roughly corresponds with the distribution of loaded containers, approximately 70% of which are destined for the Auckland region. Approximately 18,000 people are currently accredited to check containers in New Zealand.

10.1 Training adequacy

The AP training programme started in the last months of 2003, just prior to the introduction of the revised IHS for sea containers in January 2004. Just over half (56 %) of the APs questioned in this survey received their training in 2004.

Most (72%) of the respondents received classroom training (Table 10.1). Classroom-based training was provided by MAF in 2003 and 2004: since then, this has been offered by an approved supplier. In 2004, on-line tutorials were also available in order to train a large number of APs quickly. On-line training was used by 43% of those trained in 2004, but this option was withdrawn in 2005 once the majority of APs had been trained. APs outside of Auckland were more likely to have done classroom training rather than on-line training.

Table 10.1: AP training by method and year

Year trained	Training method			Percentage
	Classroom	On-line	Total	classroom trained
2003	42	2	44	95%
2004	90	69	159	57%
2005	40	7	47	85%
2006	29		29	100%
Unknown	4	1	5	80%
Total	205	79	284	72%

The majority (93%) of APs that were questioned found their training adequate regardless of whether it was classroom based or through online tutorials (Table 10.2). The small number of APs who felt that their online training was inadequate indicated that classroom-based training would have been better for their learning style.

Table 10.2: Adequacy of training by method

Training method	Response			Total	% who found training adequate (95% CI)
	Adequate	Inadequate	Did not respond		
Classroom	193	10	1	204	95% (90.6 – 96.9%)
On-line	70	6	4	80	88% (78.5 – 93%)
Total	263	16	5	284	93% (89.0 – 95.1%)

A number of APs made suggestions about how training could be improved. The two predominant themes were:

- training should include a practical container devanning session;
- refresher training should be offered. This was considered important by many of the respondents who were trained in 2004, and could be incorporated into the regular container audits.

10.2 Contaminant reporting

Most APs (73%) said that they had found some type of contaminant in containers (Table 10.3.). The types of contaminants mentioned included live organisms, plant material, soil, wood packaging and spider webs[30]. Insects and spiders were the contaminants most commonly mentioned as found by APs. Reptiles and snails were the least commonly-mentioned contaminants. 76 respondents (27%) said that they had never found contaminants in containers.

Table 10.3: Contaminants mentioned as commonly found in containers by APs

Contaminant Types	No. of respondents
Live insects/spiders	76
Dust/dirt[31]	47
Seed	44
Dead insects/spiders	22
Plant material	20
Wood packaging/residual cargo	16
Spider webs	16
Fungi/mould	15
Bark	14
Soil	13
Reptiles	4
Snails	1
None	76

[30] While spider webs are a potential indicator of spiders and should trigger additional inspection, they are not considered contaminants requiring biosecurity action.
[31] These are small volumes of floor sweepings that would not be defined as biosecurity contaminants by MAF, but would be still disposed of in a biosecurity bin

Similar proportions of APs trained in the classroom and online indicated that they had reported contaminants either never, or between 1 and 5 times (Table 10.4). This is consistent with the results in Table 10.2 indicating little difference in adequacy of training between the two groups.

Table 10.4: Relationship between training method and contaminant reports

Training method	Number of times contaminants reported						
	0	1	2	3	4	5	Total
Classroom trained APs	54	84	45	15	6	1	205
% of classroom trained APs	26%	41%	22%	7.5%	3%	0.5%	100%
(95% CI)	(21-43)	(34-48%)	(17-28%)	(5-12%)	(5-12%)	(0-3%)	
Online trained APs	25	32	18	1	3	0	79
% of online trained APs	32%	40%	23%	1%	4%	0%	100%
(95% CI)	(22-43%)	(30-52%)	(15-33%)	(0-7%)	(1-11%)	(0-97%)	
Total	79	116	63	16	9	1	284
% of all APs finding contaminants	28%	41%	22%	5.6%	3%	0.4%	100%

41% of respondents reported having only ever found 1 contaminant, and only 9% reported having found 3 or more contaminants (Table 10.4 above). The proportion of respondents that reported finding contaminants did not differ significantly based on:

- types of cargo handled at the transitional facility;
- number of containers inspected per week;
- origins of containers received at the transitional facility.

These results are consistent with the results of section 9, showing both under-detection of contaminants and under-reporting of those that are detected.

10.3 MAF's response to AP calls

41% of the respondents indicated that they had never called MAF to report contamination (despite only 28% saying they had never found contamination). 26% called MAF about once a year, while 18% called MAF twice a year. Six respondents indicated that they called MAF more than once a week (Table 10.5).

Table 10.5: Number of AP calls to MAF per year

MAF calls per year	No. of respondents	% of respondents
Never called	116	41%
Once or less times per year	74	26%
2 to 3 times per year	50	18%
5 to10 times per year	18	6%
Monthly	11	4%
Fortnightly	9	3%
Once a week or more	6	2%
Total	284	100%

73% of the respondents who had called MAF at least once rated MAF's response to call-outs as excellent or very good, with only 7% rating them as poor or very poor (Table 10.6). APs outside of Auckland gave MAF an average score of 4.3 (very good to excellent), while those within Auckland gave MAF an average score of 3.8 (good to very good).

Table 10.6: Ratings of MAF's response to call-outs

Rating	No. in Auckland (%)	No. outside Auckland (%)	Total	Percent (95% CI)
Excellent (5)	33 (27%)	34 (48%)	67	35% (28-42%)
Very Good (4)	48 (39%)	26 (37%)	74	38% (32-45%)
Good (3)	29 (24%)	10 (14%)	39	20% (15-26%)
Poor (2)	10 (8%)	1 (1%)	11	6% (3-9%)
Very Poor (1)	2 (2%)	0 (0%)	2	1% (0-4%)
Total	122	71	193	100%
Average score	3.8	4.3	4.0	

Those who rated MAF's response as poor said that that MAF should respond to call-outs in a timely manner. APs suggested that MAF should hire more staff, with slow response times attributed to insufficient Quarantine Officers to respond to call-outs.

10.4 Method of sending log sheets to MAF

The majority of respondents (69%) said that they personally faxed their log sheets to MAF (Table 10.7). Most of the remaining respondents indicated that their office handled the log sheets. Less than 1% of APs lodged them via the website, although 61% of respondents indicated that they were aware they could lodge their log sheets on the MAF website.

Table 10.7: Methods used by respondents for sending log sheets

Method of sending log sheets	Total	Percentage
Personally fax	195	69%
Office[32]	65	23%
Office faxes	18	6%
No response	4	1%
By both fax and website	2	<1%
Total	284	

The majority (84%) of the APs did not respond to the question about the user-friendliness of the website (Q15 in Appendix 14.3). 14% (41) of respondents said that they found the AP log sheet website user-friendly, while the remaining 2% (7) of respondents said that they did not consider the website user-friendly. Some of the reasons mentioned for this were:

- too much scrolling down in order to enter the data;
- too difficult to enter multiple containers;
- too time consuming.

Only 2 respondents said that they actually used the website to lodge their log sheets (Table 10.7). This means that the 39 of the 41 APs who considered the website to be user-friendly still preferred to fax their log sheets to MAF.

[32] Method of sending to MAF not indicated.

On-line submission of log sheets has the potential to save MAF staff considerable time currently spent on data entry. APs' responses to the question about changes that would encourage them to use the website varied from "doing nothing" to "more training" (Table 10.8). 28% of the respondents indicated that they prefered faxing their sheets, while nearly 20% said that they did not have access to a computer. It appears that training in the use of the website and improvements in website design could encourage APs to lodge log sheets online, although the small number of respondents (43%) makes it difficult to reach definite conclusions.

Table 10.8: Actions that would encourage APs to use the website

Response	Number of respondents	% of respondents
Awareness and training on use of website	46	37%
Nothing, prefer faxing	34	28%
PC availability	23	19%
Improvement to design of website	16	13%
N/A (Office responsible for sending log sheets)	4	3%
Total	123	100%

10.5 Impact of container checks on AP workloads

The majority of respondents (62.3%) indicated that it took them approximately 1-2 hours to check and unpack a container (Table 10.9).

Table 10.9: Average checking and unpacking time for containers

Inspection Time (hours)	No of Respondents	Percentage
1	104	36.6%
2	73	25.7%
3	54	19.0%
4	27	9.5%
5	8	2.8%
6	1	0.4%
7	3	1.0%
8	7	2.5%
9	1	0.4%
10	6	2.1%
Total	284	100%

210 (74%) respondents said that checking containers did not have an impact on their workload. They felt that it was part of their job and could be easily done at the same time that they were personally devanning or supervising the devanning of containers. The remainder (26%) indicated that container devanning impacted on their workload. The main reasons for this were:

- it resulted in a significant increase in workload, especially when many containers arrived at once and/or there were staff shortages (50 respondents);
- it took them away from other work (10 respondents);
- it created more paper work (7 respondents).

10.6 Accessibility and suitability of MAF awareness material

MAF publishes a (quarterly) 4-page newsletter, *Container Watch*, specifically to keep APs informed about trends in sea container biosecurity. Only 56% of the respondents had seen the *Container Watch* publication although it is sent to all registered transitional facilities. One respondent said that they had seen *Container Watch*, but had not read it because it was kept in the office and only seen by office staff.

The following reasons were also identified by the *Container Watch* editorial team for the limited circulation of the publication:

- Some facilities had not received a copy of *Container Watch* due to an outdated address list;
- Copies of *Container Watch* were not available on the BNZ website;
- Only one copy was sent to facilities with multiple APs.

Most of the respondents were very enthusiastic about the concept of having a publication like *Container Watch*. The following actions have been taken to result in improved access for most, if not all APs:

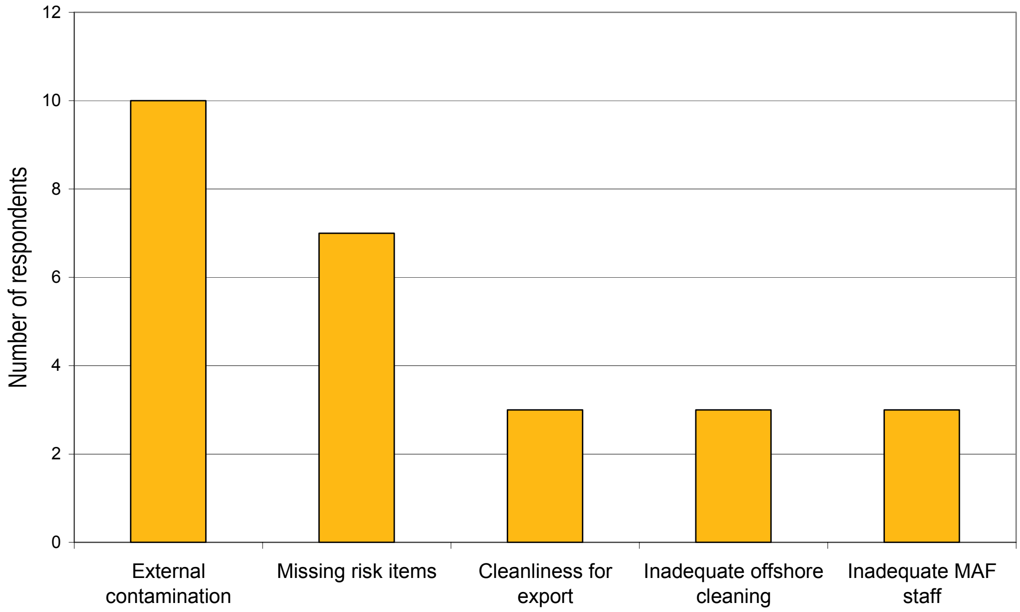
- More than one copy is sent to facilities that have more than one AP;
- Copies of each edition are available on the BNZ website;
- The transitional facility address list is regularly updated.

50% of the respondents said that they had seen other awareness material produced by MAF, such as *Know Your Enemy*. As some of these are available online, APs should be encouraged to access them. The MAF inspectors responsible for visiting transitional facilities should provide copies of *Container Watch* and other MAF awareness material to APs.

10.7 Concerns about sea container biosecurity

A total of 154 of the APs surveyed responded to the question about their concerns regarding sea container biosecurity (Q26 on the questionnaire, Appendix 14.4). Of these, 113 (73%) said that they did not have any concerns about sea container biosecurity. A further 41 (26%) of the APs had concerns about various aspects of sea container biosecurity, with the five greatest concerns external contamination, the possibility of missing risk items, cleanliness of containers prior to re-export, inadequate treatment offshore, inadequate MAF staff (Figure 10.1). A full list of concerns mentioned is given in Appendix 14.4.

Figure 10. 1: AP concerns about sea container biosecurity



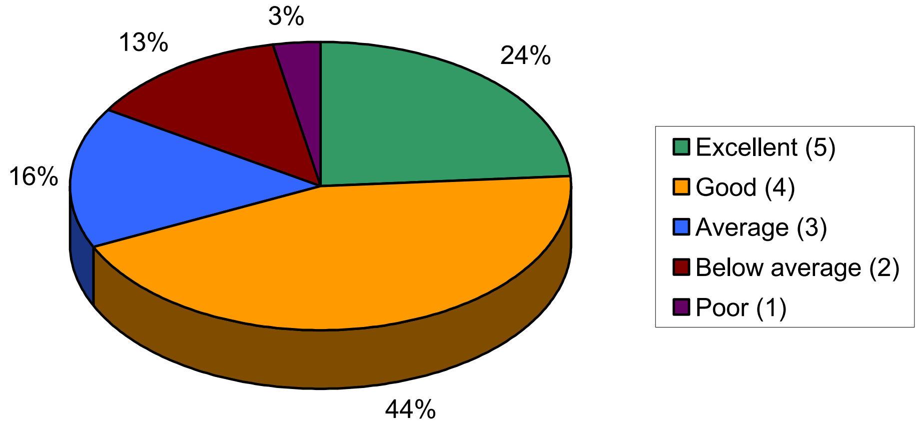
10.8 Evaluation of APs at Transitional Facilities

The Auckland-based surveyors did a subjective evaluation of 89 APs during the transitional facility survey. The survey team monitored each AP for the duration of the devanning, recording whether the AP completed the specific checks detailed in the AP training module 4, “How to check a container”. A copy of the evaluation sheet is in Appendix 14.5.

10.8.1 Overall competence

Overall competence was assessed based on the checks completed and attitude of the AP during devanning. On a 5-point scale, APs averaged 3.7 (above average to good) for overall competence. Approximately two-thirds (68%) of the APs were assessed as having good or excellent competence (Figure 10.2). Only 16% were found to have below average or poor competence. While this appears to be a good result, it is important to remember that APs may have undertaken more thorough biosecurity checks while being observed by monitoring surveyors than when they were not being observed. Further, the low reporting of contamination by APs outside the survey period and high percentage of containers with contamination still present at the storage facilities indicates that biosecurity checkes are not being performed to the level required.

Figure 10.2: Assessment of AP overall competence when inspecting sea containers



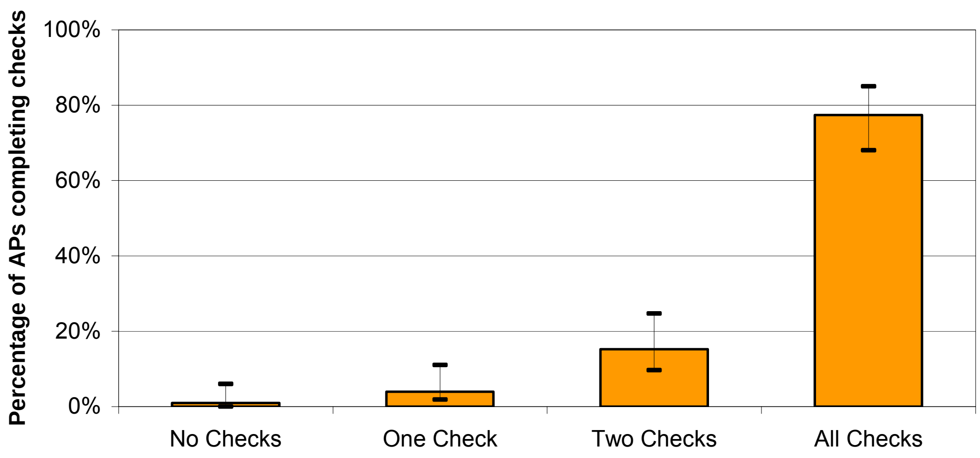
10.8.2 Opening containers

APs are required to complete three actions as part of the process of opening a container. These are:

1. examining the outside of the container for contamination,
2. ensuring that the door seal is intact, and
3. opening the door slowly to check for any contaminants that may escape.

Most (78%) of the APs completed all of the external observations on the sea containers prior to devanning[33]. One AP failed to do any external checks during the observation (Figure 10.3).

Figure 10.3: Percentage of external checks completed by APs when opening containers



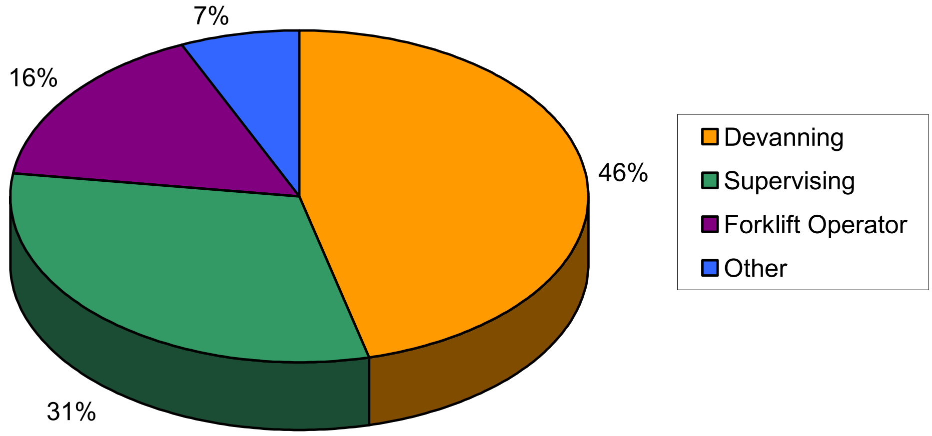
[33] In some cases, the containers arrived at night or the previous day and the AP had done the external checks prior to the surveyor's arrival. In these cases the AP was questioned about what they had done and their stated actions recorded.

10.8.3 Internal checks

A high percentage (82%) of APs checked the inside of containers for signs of contamination. When containers contained wood packaging, 70% of APs lifted pallets to check the undersides for signs of contaminants, and 78% of APs looked for an ISPM-15 mark. Once the container was devanned, 79% of APs completed the necessary internal check of the emptied container. Of the 89 APs observed, 70 found contaminants. When a contaminant was found, 93% of the APs collected the contaminant and/ or swept the floor of the container. Most (96%) of the APs who collected contamination disposed of the quarantine waste in the correct manner.

The time spent by APs at the container while it was being devanned varied considerably. This was due to the different roles the APs had during the devanning. Some APs had a solely supervisory role (31%), while others operated forklifts, sorted product lines, and loaded product onto pallets (Figure 10.4). The APs do not have to be present for the whole time the container is being devanned, but they are required to actively supervise the devanning by regularly inspecting the process. At some facilities the APs were also operating the forklift, so were not present the whole time at the container. One of the APs observed was supervising several devannings at the same time.

Figure 10.4: Role of APs during container devanning



Almost two thirds (65%) of APs had quarantine equipment (insect spray, quarantine bin, broom, and dust pan) present while the container was being devanned. If any of the required quarantine equipment was not available at the time of devanning, a corrective action request was issued. Eight requests were issued during the survey, and were followed up by MAF QS. In one case, a transitional facility that had been operating without APs present for 6 months was ordered to stop devanning containers until trained APs were present on site; however, in most cases non-compliant facilities are allowed to continue receiving containers. Preventing non-compliant facilities from devanning containers would provide a stronger incentive for compliance.

The standardised assessment of AP performance, although subjective, did allow for a more structured determination of competency than observation alone. It also enabled surveyors to highlight specific areas where APs required more knowledge or training. Currently the sea container audit programme does not have a specific section aimed at evaluating the performance of APs. An option for MAF's sea container project team to consider is incorporating the evaluation sheet, or something similar, into the regular audit programme to provide a structured means of assessing AP competency.

11 Conclusions and Cost Implications

11.1 Risk management

The 2004 import health standard was designed to move the contamination risk offshore by requiring quarantine declarations indicating cleanliness and packaging for all containers, and ensuring a series of overlapping checks and inspections later in the process. However, the success of this measure relied on the various parties involved (overseas exporters, shipping companies, port companies, APs and facility operators) to take the appropriate steps to reduce and report contamination. The survey results have shown that the QDs do not guarantee a clean container, nor do the subsequent steps guarantee that contaminated containers will be detected or reported.

Dealing with contamination offshore is still the ultimate objective for this pathway. However, the high levels of contamination currently in the pathway will likely require measures to be taken in New Zealand to bring contamination levels down.

11.2 External contamination

Containers leave the ports with a high level of external contamination (14% for loaded containers, 24% for empty containers). A large proportion of the external contaminants are located on the underside of the container, meaning that on-wharf 4-sided external inspections and cleaning have relatively little impact on this contamination. Once the containers leave the port of arrival, the opportunities to inspect the underside of the container are limited, and contamination may drop off with container movement. The main point in the system where external contamination on the underside can be detected is at the port, but this requires containers to be placed on a stable platform so that inspectors can safely examine the underside. This poses a number of logistical and cost issues, due to the time and expense of lifting containers on and off such a platform.

Soil represents a biosecurity risk because of its potential to harbour economically damaging pathogens and nematodes. Soil is considered a problem on a variety of pathways, including used vehicles, sea containers and air passenger footwear. In the air passenger pathway, contaminated footwear is the most common type of seizure (Waite 2006), but it is regarded as relatively low risk compared with items such as nursery stock, fresh produce and meat products. In spite of this, considerable time is spent inspecting and cleaning contaminated footwear at airports.

In contrast, relatively little effort is spent detecting external contamination on containers at the wharf, although considerably more soil is entering the country via the container than footwear pathway. Approximately 300 kg of soil would enter the country per year on footwear if monitoring ceased at the airport, while an estimated 23,390 kg (or 79 times as much soil) arrives on containers, most of which would not be currently detected at the border (Table 11.1).

Table 11.1: Estimated weight of soil arriving via contaminated footwear and containers

Pathway	Items (#/year)	Contaminated (%)	Average contamination (kg/unit)	Total weight of soil (kg/year)
Footwear	89,611[34]	100[35]	0.0033[36]	296
Containers	550,500	9.96	0.427[37]	23,390

The amount of effort spent on soil detection should be proportional to the risk in the pathway. Total cost of soil detection on footwear was assessed based on the time spent processing footwear. The time for processing footwear at airports is estimated at between 4 and 10 minutes per pair – a value of 8 minutes per pair, or 4 minutes per unit, has been used as an average. This time estimate consists of 7 minutes per pair for contaminated footwear, and includes another minute spent examining and releasing uncontaminated footwear – assuming that approximately half the footwear examined is contaminated. At an hourly rate of $88.44 per quarantine inspector (Jim McLaggan, pers. comm.), this equates to a cost of approximately $3.12 per item arriving.

The cost of inspecting containers externally for soil is estimated at $3 per container (based on the estimated cost of staffing wharf gates with inspectors to check containers as they leave, Jim McLaggan, pers. comm.). Note that this cost estimate would result in detections of other external contaminants as well as soil. The cost efficiency was determined as the total weight of soil entering the country (Table 11.1), divided by the total cost of maintaining inspections (Table 11.2).

The cost of monitoring soil on footwear is estimated at $947/kg, while monitoring soil on containers is estimated at $71/kg. This suggests that if soil contamination is considered a risk worth managing, considerably more effort should be expended on soil detection on the container pathway.

Table 11.2: Estimated cost efficiency of monitoring pathways for soil

Pathway	Time per unit (min)	Cost per unit ($)	Estimated total cost ($/year)	Cost efficiency ($/kg)
Footwear	4	3.12	280,025	947
Containers	2.03	3.00	1,650,000	71

The Australian Quarantine Inspection Service (AQIS) currently inspects all containers externally as they leave the port, and requires that skeleton trucks be used to transport containers, so that the underside is visible during the inspection. Only 1.5% of containers are turned around for cleaning (Charles Hatcher, pers. comm.), although more have small amounts of contamination brushed off. Different container origins and suppliers, as well as different standards for contamination, may account for at least some of the differences in the New Zealand and Australian external contamination rates. However, the full inspection system in Australia may also be resulting in a substantial amount of contamination being removed offshore.

[34] Estimated as 47,494 seizures (Waite 2006) plus 53% slippage (Wedde et al. 2005)
[35] Footwear is only seized if contaminated
[36] M. McNeill, pers. comm.
[37] From the wharf gate survey

Risk profiling is used to manage the risk of specific types of external contaminants (e.g. giant African snail and Asian gypsy moth) and where a high frequency of contamination is known to exist (e.g. Pacific-origin empty containers). However, profiling is not able to manage a high level of unpredictable risk not associated with specific risk factors such as origin or cargo types. In addition, contamination may remain with containers as they pass through multiple ports, and thus port of loading is not always a reliable indicator of biosecurity risk. Options for the container project team to consider include underside inspection or cleaning of all containers at the port of arrival (or an equivalent system) to make a substantial reduction in the level of externally contaminated containers entering New Zealand.

11.3 Internal contamination

A critical point in the system for dealing with internal contamination is at transitional facilities where containers are unpacked. The APs have the opportunity to see contaminants present in the containers that are not visible at any other point in the system; however, the effectiveness of this part of the system appears to be only reducing internal contamination by 33%, and even less reported to MAF. By strengthening compliance at transitional facilities, there is scope for substantially improving effectiveness through improved detection and reporting of contaminants.

11.4 Industry compliance

11.4.1 Improving compliance

Three key elements to improving industry compliance in the container pathway are communication, training, and monitoring with appropriate follow-up. Some options for the container project team to consider in these areas are suggested below.

More frequent, proactive and co-ordinated communication between MAF and the various industry groups dealing with sea containers could help keep industry participants informed about their role in biosecurity. The *Container Watch* publication is one vehicle for providing information about biosecurity risks and MAF requirements to APs and facility operators. Regular face-to-face contact between MAF inspectors, APs and facility operators would also help reinforce biosecurity messages and provide immediate feedback if problems are seen. MAF has also recently initiated a sea container industry advisory group as a quarterly forum for representatives of MAF and industry representatives to discuss issues of relevance to the container pathway.

Improved training for APs and facility operators could also assist these groups to comply. In the interviews, APs asked for more practical training, including how to inspect a container. Transitional facility operator training, a new addition to the draft Standard for General Facilities (BNZ 2007) will also give facility operators a more in-depth understanding and ownership of their responsibilities.

Regular monitoring could also help improve compliance, with timely and appropriate follow-up when non-compliance is detected. MAF has implemented audit systems for both transitional facilities and loaded sea containers. Failed facility audits are followed up with further audits until facilities comply, but facilities are not generally restricted from receiving containers during this time. Loaded containers are audited at a rate of 1% of import entries (approximately 0.7% of arriving containers, as only 10% of containers on a single entry are audited). The audit programme uses the same process as for the transitional facility survey, but overseas suppliers of contaminated containers are not currently targeted with the increased audit inspections specified in the sea container audit standard (BNZ 2005).

11.4.2 Resourcing container audits

The sea container audit standard specifies that when contamination is found, containers from that overseas supplier will be targeted at an increased frequency until a series of audits find no contamination. Approximately 350,000 loaded containers arrive during the year; approximately 0.7% (see above paragraph) of those would be selected for audit.

When a container is found contaminated, the audit standard requires 100% inspection of the exporters' containers, until a minimum of 5 inspections have found no contamination. At that point, the exporter drops to a 5% inspection regime, again until a minimum of 5 inspections have been passed. This means that each non-compliant exporter found in the 1% audit will generate a minimum of 10 additional container inspections, spread over a minimum of 105 containers. While it is not likely that each of the non-compliant exporters would ship another 105 containers to New Zealand in a year, it is still possible that at least half of the increased inspections would take place.

Potentially, the full audit programme could require resources to internally inspect approximately 4655[38] containers during the year, at least until non-compliance rates drop. The average time to fully audit a container during unloading is estimated at approximately 210 minutes (3.5 hours), and the average travel distance is 30 km. This means that one inspector could complete an average of 2 audits a day, depending on proximity and location. Around 12 inspector FTEs would be required to fully implement the audit programme requirements at the current rates of contamination (assuming approximately 200 days per FTE spent auditing 2 containers per day). At a cost of $88.44 per hour per inspector and $0.61 per km, the estimated cost per container would be approximately $328 per container inspected. The baseline audits would be paid for by the container levy, but the increased inspections would be charged to the importers. Based on the distribution of audit containers during the survey period, approximately 60% of the resource would have to be in Auckland.

In order for this programme to successfully increase compliance, New Zealand importers (who would be charged for inspections of non-compliant containers) would have to pass the costs back to their overseas suppliers, as it is the suppliers who are responsible for ensuring the containers are clean.

11.4.3 Facility audits

MAF is reviewing and updating standards for sea containers and container facilities. The draft Standard for General Facilities (BNZ 2007) makes provision for increasing audits and recovering costs associated with increased audits when non-compliance is detected. The standard for container audits also has this provision. Increased audit inspections (cost-recovered) and suspension of the ability to devan containers while facilities are non-compliant could act as disincentives and deter businesses from further non-compliance.

[38] Baseline audits would number approximately 350,000 x 0.007, or 2450, and 5 increased audits for each container with contamination found (18%) would number approximately + 350,000 x 0.007 x 0.18 x 5, or 2205.

Auditing all facilities at least once a year is expensive, particularly as a number of these facilities receive very few containers each year. Restricting the number of facilities to those handling a certain minimum number of containers each year could free up resources to conduct more frequent audits and concentrate on non-compliant facilities. It could also improve communication effectiveness by reducing the audience to facilities that deal with MAF on a relatively frequent basis. However, costs of increased audits may be less of a disincentive for larger facilities, as they can more readily pass these costs on to their clients. The full impact of such a move should be investigated by the container project team before changes are made restricting the number of transitional facilities.

11.4.4 Moving Forward

MAF appreciates the relationships that have developed with those involved in the container industry, and would like to acknowledge those shipping companies, ports, importers, APs and facility operators who are already working hard to protect New Zealand by complying with biosecurity regulations. Examples include the equivalent system for containers from certain Pacific ports, which has resulted in a notable reduction in exotic ant infestations, and compliance agreements for cleaning uncertified empty containers, which substantially reduce internal contamination.

Overall, however, the level of industry compliance and involvement could be much greater, particularly to manage the risks associated with loaded containers. Those transitional facilities operating without APs, approved procedures or proper equipment demonstrate a lack of appreciation of their role and responsibility in biosecurity. The results of this survey show that the container clearance system implemented in 2004, with a heavy reliance on industry cooperation, has not been effective in managing biosecurity risks in the pathway. A high proportion of containers certified to be free of contamination are still arriving contaminated, and a relatively low proportion of internal contamination is detected and reported by APs. To some degree this is because communication from MAF has been infrequent or un-coordinated, and little action has been taken when non-compliance has been found. More targeted and appropriate sanctions for non-compliance will help deter repeated non-compliance.

MAF’s sea container project team has a programme underway to review and strengthen risk management for sea containers arriving in New Zealand. With the level of risk in the pathway, on-going monitoring in the form of audits and specific in-depth surveys will be required to inform risk management decisions. MAF is willing to continue working with industry to improve systems for managing biosecurity risks, with the expectation that industry will take a much greater responsibility for complying with biosecurity requirements.

12 Acknowledgements

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- The MAF Quarantine Service inspectors who surveyed containers and interviewed Accredited Persons outside of Auckland;
- The identifiers at the MAF IDC-PE laboratory, Tamaki, and the AgriQuality Seed Testing Station, Levin;
- Management and staff at Panmure Container Park, United Container Storage Ltd, Container Repairs and Storage, and Specialised Container Services;
- Jim Howard at Ports of Auckland for moving 200 containers;
- Steve Rangi and David Knowles at Metroport.

13 References

Biosecurity New Zealand (BNZ). 2005. Requirements for the audit of sea containers, BMG-STD-SCADT. Ministry of Agriculture and Forestry, New Zealand. 11 pp.

Biosecurity New Zealand (BNZ). 2006. Import health standard for wood packaging material from all countries. Ministry of Agriculture and Forestry, New Zealand. 7 pp.

Biosecurity New Zealand (BNZ). 2007. General facilities for holding, inspection, processing or treatment of uncleared goods: requirements for facilities and operators (draft). Ministry of Agriculture and Forestry, New Zealand. 69 pp.

Border Management Group (BMG). 2003. Sea container review. MAF Discussion Paper No. 35. March 2003. ISBN 0-478-07744-0. 112 pp.

Chirnside, J. Hyde, N., and Mathew, G. 2006. Monitoring research and pathway review: Personal Effects, April-June 2006, Biosecurity New Zealand, BMG 05-06/11.

Chirnside, J. and Prasad, J. 2007. Monitoring research and pathway review: scrap metal, July-September 2006, Biosecurity New Zealand, BMG 06-07/01.

International Plant Protection Convention (IPPC). 2002. Guidelines for regulating wood packaging material in international trade. International Standard for Phytosanitary Measures No. 15. 11 pp.

International Plant Protection Convention (IPPC). 2006. Glossary of phytosanitary terms. International standard for Phytosanitary Measures No. 5. 23 pp.

MAF Biosecurity Authority. 2003. Import health standard for sea containers from all countries, BMG-STD-SEACO. Ministry of Agriculture and Forestry, New Zealand. 14 pp.

Mavengere, T. and Knight, G. 2006. Profiling strategy for sea containers from the Pacific Islands based on inspections by MAF Quarantine Service. Draft Biosecurity New Zealand high-risk sea container profile. 9 pp.

Office of the Auditor General (OAG). 2006. Ministry of Agriculture and Forestry: Managing biosecurity risks associated with high-risk sea containers. Report of a performance audit, May 2006. ISBN 0-478-18158-2. 47 pp.

Thompson, G. 2006. Sea containers as a pathway for ant introductions. Biosecurity Monitoring Group report, BMG 05-06/07. 33 pp.

Ports of Auckland Limited (POAL). 2006a. 2005 Annual Review. http://www.poal.co.nz/newsroom/publications.htm

Ports of Auckland Limited (POAL). 2006b. 50 years inside the box. 26 April 2006 press release. http://www.poal.co.nz/newsroom/ContainerAnn060421.htm

Standards Association of Australia. 1999. Risk management. Joint Australian / New Zealand Standard, AS/NZS 4360:1999. 46 pp.

Waite, C. 2006. Biosecurity Monitoring Group pathway analysis annual report 2005-06. Biosecurity Monitoring Group report, BMG 05-06/12. 51 pp.

14 Appendices

14.1 Incomplete or incorrectly manifested containers

Table 15.1: Details of incomplete or incorrectly manifested containers

QuanCargo reference	Container number	Manifest declaration	Actual contents
C2006/161611	NYKU2840730	Grease, lubricants, oil	Spare parts
C2006/179217	ECMU1082757	Oil	Oil and new mower engines
C2006/181306	TTNU3677164	Other plastic house hold articles	Magnesium oxide
C2006/159319	CRXU2348159	Rolls	Rolls of plastic
C2006/183918	KHLU1212168	Various surfactants	Mixture of hazardous and non-hazardous chemicals
C2006/168861	MOLU4104164	Oil well drill	Well drill pipe (used - declared as new)
C2006/164959	FESU2078676	Freight of all kinds	Bags
C2006/186432	CRXU1799693	Ride on mowers, hedge trimmer, bike, saw, floor compound, paint, tie downs, aluminium door and louvers.	Ride on mowers, tyres, push mowers, hedge trimmers
C2006/186551	TGHU2396367	Pallets	Cellstick (plastic product)
C2006/171595	GLDU2312246	Baby blankets	Blankets and mattresses
C2006/191247	PONU0378104	Electronic Television/DVD	PS2 consoles
C2006/193934	CRXU2839450	Other colouring matter	Titanium dioxide
C2006/205641	SUDU5764124	Plastic brush-ware and buckets	Plastic brush-ware and buckets, and wooden brooms
C2006/166812	PCIU9959423	Sanitary goods	Toilets

14.2 List of organisms identified

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Nematodes							
Adenophorea: Desmodorida: Cyatholaimidae	Identification not made	Alive	Unknown	Family Present[39]	CS06LC11	C2006/178941	Australia
Adenophorea: Dorylaimida: Dorylaimida	Identification not made	Alive	Juvenile	Family Present	CS06GM27	C2006/215872	South Africa
Adenophorea: Dorylaimida: Dorylaimida	Identification not made	Alive	Adult	Family Present	WG06LC19	C2006/215756	South Korea
Adenophorea: Dorylaimida: Dorylaimida	Identification not made	Alive	Adult	Family Present	WG06SE26	C2006/218190	Australia
Adenophorea: Dorylaimida: Dorylaimida	Identification not made	Alive	Adult	Family Present	WG06TT16	C2006/222110	USA
Adenophorea: Dorylaimida: Dorylaimida: Dorylaiminae	Identification not made	Alive	Adult	Sub-family Present	WG06SE29	C2006/219157	China
Adenophorea: Monhysterida: Monhysteridae	Identification not made	Unknown	Unknown	Family Present	CS06LC10	C2006/169777	Australia
Adenophorea: Monhysterida: Monhysteridae	Identification not made	Alive	Adult	Family Present	WG06SE29	C2006/219157	China
Secernentea: Rhabditida: Cephalobidae	Identification not made	Alive	Juvenile	Family Present	CS06GM27	C2006/215873	South Africa
Secernentea: Rhabditida: Cephalobidae	Identification not made	Alive	Adult	Family Present	WG06LC19	C2006/215756	South Korea
Secernentea: Rhabditida: Panagrolaimidae	Identification not made	Alive	Adult	Family Present	WG06JN03	C2006/219507	Australia
Secernentea: Rhabditida: Panagrolaimidae	Identification not made	Alive	Unknown	Family Present	WG06LC24	C2006/219230	American Samoa
Secernentea: Rhabditida: Panagrolaimidae	Identification not made	Alive	Adult	Family Present	WG06RR15	C2006/222184	Taiwan
Secernentea: Rhabditida: Panagrolaimidae	Identification not made	Alive	Adult	Family Present	WG06SE03	C2006/214234	Australia
Secernentea: Rhabditida: Panagrolaimidae	Identification not made	Alive	Adult	Family Present	WG06SE14	C2006/213965	Australia
Secernentea: Rhabditida: Rhabditidae	Identification not made	Alive	Juvenile	Family Present	CS06GM54	C2006/209658	Australia
Secernentea: Rhabditida: Rhabditidae	Identification not made	Alive	Unknown	Family Present	CS06JN20	C2006/193384	Spain
Secernentea: Rhabditida: Rhabditidae	Identification not made	Alive	Adult	Family Present	WG06TT05	C2006/210668	Australia
Secernentea: Rhabditida: Rhabditidae	Identification not made	Alive	Larva	Family Present	WG06TT05	C2006/210668	Australia
Secernentea: Rhabditida: Rhabitidae	Identification not made	Alive	Unknown	Family Present	CS06GM05	C2006/168812	China
Secernentea: Tylenchida: Tylenchidae	*Filenchus* sp.	Alive	Unknown	Genus Present	WG06SE21	C2006/209906	Australia
Secernentea: Tylenchida: Tylenchidae	Identification not made	Alive	Adult	Family Present	WG06RR19	C2006/217962	Australia
Secernentea: Tylenchida: Tylenchidae	Identification not made	Alive	Unknown	Family Present	WG06SE21	C2006/209906	Australia
Spiders, mites							
Arachnida: Acari	Identification not made	Alive	Adult	Order Present	CS06SE04	C2006/192086	Malaysia

[39] Many organisms could not be identified to species. Where this is the case, the Status indicates whether the organism belongs to a genus, family or order that is present in New Zealand, or if it belongs to a taxonomic group not known to occur in New Zealand. As many orders, families and genera are widespread, the presence of members of a particular taxonomic group in New Zealand does not indicate that the specimen intercepted is of a species present in New Zealand.

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae	Identification not made	Unknown	Egg Mass	Order Present	CS06GM36	C2006/222922	Hong Kong
Arachnida: Araneae	Identification not made	Unknown	Unknown	Order Present	CS06GM40	C2006/221945	Hong Kong
Arachnida: Araneae	Identification not made	Alive	Juvenile	Order Present	DH06JN34	C2006/228643	Singapore
Arachnida: Araneae	Identification not made	Dead	Egg Mass	Order Present	WG06SE32	C2006/223908	New Caledonia
Arachnida: Araneae:	Identification not made	Alive	Egg Mass	Order Present	CS06GM12	C2006/179581	Canada
Arachnida: Araneae:	Identification not made	Alive	Adult	Order Present	CS06JN01-05	C2006/155351	Malaysia
Arachnida: Araneae:	Identification not made	Alive	Egg Mass	Order Present	CS06JN15-16	C2006/176839	Italy
Arachnida: Araneae:	Identification not made	Alive	Juvenile	Order Present	DH06LC30	C2006/233136	Australia
Arachnida: Araneae:	Identification not made	Alive	Juvenile	Order Present	DH06SE09	C2006/225198	Australia
Arachnida: Araneae:	Identification not made	Unknown	Egg	Order Present	WG06SE04	C2006/210323	Australia
Arachnida: Araneae:	Identification not made	Dead	Cast- Skin/ Shell/ Case	Order Present	WG06LC05-07	C2006/219264	Samoa
Arachnida: Araneae:	Identification not made	Dead	Egg Mass	Order Present	WG06LC05-07	C2006/219264	Samoa
Arachnida: Araneae:	Identification not made	Dead	Juvenile	Order Present	WG06LC20-21	C2006/215756	South Korea
Arachnida: Araneae:	Identification not made	Unknown	Egg Mass	Order Present	WG06RR14	C2006/223309	South Korea
Arachnida: Araneae:	Identification not made	Unknown	Juvenile	Order Present	WG06RR14	C2006/223309	South Korea
Arachnida: Araneae:	Identification not made	Dead	Egg Mass	Order Present	WG06SE36	C2006/223174	Australia
Arachnida: Araneae:	Identification not made	Dead	Egg Mass	Order Present	WG06TT21	C2006/220936	USA
Arachnida: Araneae: Amaurobiidae	Identification not made	Alive	Immature	Family Present	DH06XL29	C2006/226769	Australia
Arachnida: Araneae: Araneidae	*Nuctenea patagiata*	Dead[40]	Adult	Not Present	CS06GM13	C2006/179581	Canada
Arachnida: Araneae: Araneidae	*Zygiella x- notata*	Alive	Juvenile	Not Present	DH06TT21-26	C2006/220522	Australia
Arachnida: Araneae: Araneidae	*Zygiella x- notata*	Alive	Adult	Not Present	DH06TT21-26	C2006/220522	Australia
Arachnida: Araneae: Corinnidae	*Supunna picta*	Alive	Adult	Present	DH06LC19	C2006/225919	Australia
Arachnida: Araneae: Dictynidae	*Cicurina* sp.	Dead	Adult	Not Present	CS06GM11	C2006/179581	Canada
Arachnida: Araneae: Lamponidae	*Lampona* sp.	Alive	Juvenile	Genus Present	DH06RR18	C2006/227176	Germany
Arachnida: Araneae: Linyphiidae	Identification not made	Alive	Adult	Family Present	DH06JN34	C2006/229759	Indonesia
Arachnida: Araneae: Linyphiidae	*Lepthyphantes* sp.	Alive	Adult	Genus Present	DH06TT47-48	C2006/228841	Singapore
Arachnida: Araneae: Lycosidae	*Anoteropsis* sp.	Alive	Unknown	Genus Present	CS06LC05	C2006/173314	Thailand
Arachnida: Araneae: Lycosidae	*Schizocosa* sp.	Unknown	Unknown	Genus Not Present	CS06JN10	C2006/180462	USA
Arachnida: Araneae: Oecobiidae	Identification not made	Alive	Adult	Family Present	CS06RR7	C2006/198514	Singapore
Arachnida: Araneae: Philodromidae	Identification not made	Alive	Adult	Family Present	CS06RR7	C2006/198514	Singapore

[40] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Pholcidae	*Artema atlanta*	Alive	Adult	Not Present	WG06RR13	C2006/214812	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	CS06JN01-05	C2006/155351	Malaysia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	CS06RR7	C2006/198514	Singapore
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06JN03	C2006/225829	Hong Kong
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06JN05	C2006/221223	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06JN13-14	C2006/224468	Taiwan
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06JN37	C2006/228767	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06LC03	C2006/225381	USA
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06LC08	C2006/222673	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06LC09	C2006/227841	France
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	DH06LC15	C2006/226814	USA
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06LC24	C2006/230283	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06RR08	C2006/215602	Japan
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	DH06SE02	C2006/225198	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06SE11	C2006/224890	Italy
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06SE14-15	C2006/227636	USA
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06TT14	C2006/216806	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Unknown	Not Present	DH06TT15	C2006/216007	Indonesia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06TT17-18	C2006/212410	Australia
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06TT27	C2006/219469	China
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06TT42	C2006/223679	Singapore
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	DH06XL06-08	C2006/217737	Singapore
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06XL06-08	C2006/217737	Singapore
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Juvenile	Not Present	DH06XL09	C2006/222526	Singapore
Arachnida: Araneae: Pholcidae	*Crossopriza lyoni*	Alive	Adult	Not Present	WG06SE35	C2006/219149	China
Arachnida: Araneae: Pholcidae	*Holocnemus pluchei*	Alive	Juvenile	Not Present	DH06SE25	C2006/232474	USA
Arachnida: Araneae: Pholcidae	Identification not made	Dead	Juvenile	Family Present	CS06RR3	C2006/194763	Taiwan
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	CS06TT7	C2006/190715	Singapore
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Immature	Family Present	CS06XL07-08	C2006/182830	Australia
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN12	C2006/214546	South Africa
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN13-14	C2006/224468	Taiwan
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN19	C2006/229902	Philippines

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN28-32	C2006/229776	Australia
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN34	C2006/228643	Singapore
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06JN41	C2006/228643	Singapore
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06TT04	C2006/220095	Australia
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06TT10	C2006/224979	Vietnam
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Unknown	Family Present	DH06TT16	C2006/226812	Taiwan
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	DH06TT19	C2006/220145	Australia
Arachnida: Araneae: Pholcidae	Identification not made	Alive	Juvenile	Family Present	WG06JN10	C2006/221779	China
Arachnida: Araneae: Pholcidae	Identification not made	Dead	Juvenile	Family Present	WG06TT27	C2006/218107	USA
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06JN26	C2006/218161	Singapore
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06JN27	C2006/220145	Australia
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06RR15	C2006/225521	China
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06SE05	C2006/225845	USA
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06TT40	C2006/225282	Taiwan
Arachnida: Araneae: Pholcidae	*Micropholcus fauroti*	Alive	Adult	Not Present	DH06TT41	C2006/223679	Singapore
Arachnida: Araneae: Pholcidae	*Pholcus manueli*	Dead	Adult	Not Present	CS06TT18	C2006/202255	USA
Arachnida: Araneae: Pholcidae	*Pholcus manueli*	Alive	Adult	Not Present	DH06JN28-32	C2006/229776	Australia
Arachnida: Araneae: Pholcidae	*Pholcus manueli*	Alive	Adult	Not Present	DH06JN28-32	C2006/229776	Australia
Arachnida: Araneae: Pholcidae	*Pholcus manueli*	Alive	Adult	Not Present	DH06JN34	C2006/228643	Singapore
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Dead	Adult	Present	CS06JN15-16	C2006/176839	Italy
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Dead[41]	Adult	Present	CS06LC03	C2006/173205	Australia
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Dead[39]	Adult	Present	CS06LC04	C2006/1733/3	China
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Alive	Unknown	Present	CS06LC08	C2006/154061	Australia
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Dead	Unknown	Present	CS06LC13	C2006/173341	Australia
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Dead	Adult	Present	CS06LW02	C2006/155437	USA
Arachnida: Araneae: Pholcidae	*Pholcus phalangioides*	Alive	Adult	Present	CS06XL01	C2006/172318	China
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Adult	Genus Present	CS06GM25	C2006/211570	Singapore
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Adult	Genus Present	CS06LC33	C2006/173348	Netherlands
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	CS06TT16-17	C2006/202255	USA
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Unknown	Genus Present	CS06XL04-06	C2006/178635	Italy

[41] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06LC04-06	C2006/228551	USA
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06LC16-18	C2006/222572	Italy
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06LC20-22	C2006/221126	USA
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06SE19	C2006/228304	USA
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06TT01	C2006/150739	Australia
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06TT13	C2006/229579	Japan
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06TT21-26	C2006/220522	Australia
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06TT31	C2006/226924	UK
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06TT46	C2006/225609	Australia
Arachnida: Araneae: Pholcidae	*Pholcus* sp.	Alive	Juvenile	Genus Present	DH06XL03	C2006/221876	Australia
Arachnida: Araneae: Pholcidae	*Physocyclus* sp.	Dead	Adult	Family Present	CS06JN13-14	C2006/176839	Italy
Arachnida: Araneae: Pholcidae	*Psilochorus* sp.	Alive	Unknown	Genus Not Present	CS06TT2	C2006/182249	China
Arachnida: Araneae: Pholcidae	*Smeringopus natalensis*	Alive	Adult	Not Present	DH06RR14	C2006/225605	Australia
Arachnida: Araneae: Pholcidae	*Smeringopus natalensis*	Alive	Adult	Not Present	DH06SE18	C2006/220393	Australia
Arachnida: Araneae: Pholcidae	*Smeringopus pallidus*	Alive	Adult	Not Present	CS06LC07	C2006/1773317	Australia
Arachnida: Araneae: Pholcidae	*Smeringopus pallidus*	Alive	Juvenile	Not Present	DH06LC07	C2006/215375	Hong Kong
Arachnida: Araneae: Pholcidae	*Smeringopus pallidus*	Alive	Adult	Not Present	WG06LC05-07	C2006/219264	Samoa
Arachnida: Araneae: Pholcidae	*Wugigarra* sp.	Alive	Adult	Not Present	DH06JN27	C2006/220145	Australia
Arachnida: Araneae: Pholicdae	Identification not made	Alive	Juvenile	Family Present	DH06JN39	C2006/218798	UK
Arachnida: Araneae: Pholicdae	Identification not made	Alive	Juvenile	Family Present	DH06TT47-48	C2006/228841	Singapore
Arachnida: Araneae: Salticidae	*Hypoblemum albovittatum*	Alive	Adult	Present	DH06JN02	C2006/221078	Singapore
Arachnida: Araneae: Salticidae	*Hypoblemum albovittatum*	Alive	Adult	Present	DH06SE17	C2006/221369	Australia
Arachnida: Araneae: Salticidae	*Hypoblemum* sp.	Alive	Adult	Genus Present	WG06LC04	C2006/219264	Samoa
Arachnida: Araneae: Salticidae	Identification not made	Alive	Adult	Family Present	DH06JN17	C2006/220826	Singapore
Arachnida: Araneae: Salticidae	Identification not made	Alive	Adult	Family Present	DH06TT28	C2006/222825	Indonesia
Arachnida: Araneae: Salticidae	Identification not made	Alive	Egg	Family Present	WG06TT01	C2006/211415	Malaysia
Arachnida: Araneae: Salticidae	Identification not made	Alive	Juvenile	Family Present	WG06TT01	C2006/211415	Malaysia
Arachnida: Araneae: Salticidae	Identification not made	Alive	Juvenile	Family Present	WG06TT03	C2006/210668	Australia
Arachnida: Araneae: Salticidae	*Plexippus petersi*	Alive	Adult	Not Present	DH06JN09	C2006/223251	Singapore
Arachnida: Araneae: Sicariidae	*Loxosceles* sp.	Alive	Juvenile	Genus Not Present	DH06TT17-18	C2006/212410	Australia
Arachnida: Araneae: Sparassidae	*Heteropoda* sp.	Alive	Juvenile	Not Present	DH06RR10	C2006/234500	Fiji
Arachnida: Araneae: Sparassidae	*Heteropoda venatoria*	Alive	Adult	Not Present	DH06JN11	C2006/228363	American Samoa

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Tetragnathidae	*Nephila clavipes*	Dead	Adult	Not Present	CS06RR07	C2006/157000	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea porteri*	Alive	Adult	Not Present	DH06XL34	C2006/223403	USA
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Dead	Adult	Genus Present	CS06JN15-16	C2006/176839	Italy
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Adult	Genus Present	CS06LC01	C2006/157106	France
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Unknown	Genus Present	CS06XL04-06	C2006/178635	Italy
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06LC01	C2006/223008	Belgium
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06LC04-06	C2006/228551	USA
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06LC10-11	C2006/229665	Hong Kong
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06SE01	C2006/224668	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06SE03	C2006/225823	USA
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Adult	Genus Present	DH06SE06	C2006/225845	USA
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06SE13	C2006/221049	Netherlands
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Juvenile	Genus Present	DH06TT32-33	C2006/247011	China
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Sub-Adult	Genus Present	DH06XL02	C2006/200961	Japan
Arachnida: Araneae: Theridiidae	*Achaearanea* sp.	Alive	Adult	Genus Present	WG06SE16	C2006/216189	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Dead[42]	Adult	Present	CS06GM13	C2006/179581	Canada
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Alive	Adult	Present	DH06JN28-32	C2006/229776	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Alive	Adult	Present	DH06TT32-33	C2006/247011	China
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Unknown	Adult	Present	WG06RR12	C2006/226137	USA
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Alive	Adult	Present	WG06SE04	C2006/210323	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea tepidariorum*	Alive	Adult	Present	WG06RR11	C2006/217701	Australia
Arachnida: Araneae: Theridiidae	*Achaearanea veruculata*	Alive	Adult	Present	WG06LC20-21	C2006/215756	South Korea
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Immature	Family Present	CS06JN01-05	C2006/155351	Malaysia
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	CS06LC14	C2006/201373	USA
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	CS06RR10	C2006/208769	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Dead	Juvenile	Family Present	CS06TT21	C2006/202255	USA
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	CS06XL09	C2006/193079	Italy
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06JN28-32	C2006/229776	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06JN36	C2006/238271	French Polynesia
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Adult	Family Present	DH06JN38	C2006/228643	Singapore

[42] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06LC26	C2006/233228	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06RR13	C2006/225759	Papua New Guinea
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06SE08	C2006/225681	USA
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06SE12	C2006/229665	Hong Kong
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	DH06TT30	C2006/230131	USA
Arachnida: Araneae: Theridiidae	Identification not made	Unknown	Egg	Family Present	WG06SE04	C2006/210323	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Unknown	Immature	Family Present	WG06LC22	C2006/212960	UK
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	WG06LC26	C2006/212594	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Alive	Juvenile	Family Present	WG06TT04	C2006/210668	Australia
Arachnida: Araneae: Theridiidae	Identification not made	Dead	Juvenile	Family Present	WG06TT31	C2006/226331	UK
Arachnida: Araneae: Theridiidae	Identification not made	Dead	Egg Mass	Family Present	WG06TT31	C2006/226331	UK
Arachnida: Araneae: Theridiidae	Identification not made	Unknown	Adult	Family Present	WG06TT33	C2006/221019	French Polynesia
Arachnida: Araneae: Theridiidae	*Latrodectus geometricus*	Dead	Egg Mass	Not Present	CS06XL23	C2006/214840	South Africa
Arachnida: Araneae: Theridiidae	*Latrodectus geometricus*	Dead	Egg Mass	Not Present	WG06JN05	C2006/223609	China
Arachnida: Araneae: Theridiidae	*Latrodectus geometricus*	Dead	Egg Mass	Not Present	WG06RR10	C2006/219226	Australia
Arachnida: Araneae: Theridiidae	*Latrodectus geometricus*	Alive	Adult	Not Present	WG06RR18	C2006/226137	USA
Arachnida: Araneae: Theridiidae	*Latrodectus geometricus*	Dead	Egg Mass	Not Present	WG06SE37	C2006/222788	Malaysia
Arachnida: Araneae: Theridiidae	*Latrodectus hasselti*	Alive	Adult	Restricted Distribution	WG06LC29-30	C2006/209204	Australia
Arachnida: Araneae: Theridiidae	*Latrodectus hasselti*	Alive	Egg Mass	Restricted Distribution	WG06LC29-30	C2006/209204	Australia
Arachnida: Araneae: Theridiidae	*Latrodectus hasselti*	Alive	Adult	Restricted Distribution	WG06LC29-30	C2006/209204	Australia
Arachnida: Araneae: Theridiidae	*Latrodectus* sp.	Alive	Juvenile	Not Present	WG06SE27	C2006/218898	USA
Arachnida: Araneae: Theridiidae	*Nesticodes rufipes*	Alive	Adult	Not Present	CS06RR7	C2006/198514	Singapore
Arachnida: Araneae: Theridiidae	*Steatoda grossa*	Alive	Adult	Present	DH06SE28	C2006/231002	Canada
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Immature	Genus Present	CS06JP01	C2006/205239	USA
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	CS06TT16-17	C2006/202255	USA
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	CS06XL04-06	C2006/178635	Italy
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	CS06XL10	C2006/200855	Italy
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06JN15-16	C2006/220826	Singapore
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06JN40	C2006/229678	Japan
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06LC16-18	C2006/222572	Italy
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06LC28	C2006/223400	Germany
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06SE10	C2006/220887	USA

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06SE20	C2006/228304	USA
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06SE22	C2006/228304	USA
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06TT12	C2006/217441	Hong Kong
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06TT34	C2006/229776	Australia
Arachnida: Araneae: Theridiidae	*Steatoda* sp.	Alive	Juvenile	Genus Present	DH06TT56	C2006/228756	Australia
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Dead	Adult	Not Present	CS06JN15-16	C2006/176839	Italy
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	DH06JN01	C2006/223401	Malaysia
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Juvenile	Not Present	DH06JN25	C2006/218161	Singapore
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	DH06LC04-06	C2006/228551	USA
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	DH06SE04	C2006/225845	USA
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	DH06TT02	C2006/220095	Australia
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	WG06SE33	C2006/219149	China
Arachnida: Araneae: Theridiidae	*Steatoda triangulosa*	Alive	Adult	Not Present	WG06SE34	C2006/218714	Malaysia
Arachnida: Araneae: Theridiidae	*Theridion* sp.	Alive	Unknown	Genus Present	CS06GM03	C2006/162209	China
Arachnida: Araneae: Theridiidae	*Theridion varians*	Alive	Adult	Not Present	CS06GM07	C2006/179581	Canada
Arachnida: Uropygi	Identification not made	Dead	Unknown	Not Present	DH06XL32	C2006/228394	Singapore
Fungi							
Ascomycetes: Eurotiales: Trichocomaceae	*Aspergillus fumigatus*	Alive	Unknown	Present	CS06JN12	C2006/184743	Singapore
Ascomycetes: Eurotiales: Trichocomaceae	*Aspergillus niger*	Unknown	Unknown	Present	DH06TT29	C2006/249623	China
Ascomycetes: Eurotiales: Trichocomaceae	*Byssochlamys varioti*	Alive	Unknown	Present	CS06JN12	C2006/184743	Singapore
Ascomycetes: Eurotiales: Trichocomaceae	*Paecilomyces variotii*	Alive	Unknown	Present	CS06GM37	C2006/222922	Hong Kong
Ascomycetes: Eurotiales: Trichocomaceae	*Penicillium* sp.	Unknown	Unknown	Genus Present	DH06TT29	C2006/249623	China
Ascomycetes: Hypocreales: Hypocreaceae	*Hypocrea koningii*	Alive	Unknown	Present	CS06GM31	C2006/215306	Vietnam
Ascomycetes: Hypocreales: Hypocreaceae	*Hypocrea koningii*	Alive	Unknown	Present	CS06GM37	C2006/222922	Hong Kong
Ascomycetes: Hypocreales: Hypocreaceae	*Trichoderma viride*	Alive	Unknown	Present	CS06GM02	C2006/16188	USA
Ascomycetes: Hypocreales: Hypocreaceae	*Trichoderma viride*	Unknown	Unknown	Present	CS06GM06	C2006/174054	China
Ascomycetes: Mycosphaerellales: Mycosphaerellaceae	*Cladosporium cladosporioides*	Alive	Unknown	Present	CS06JN12	C2006/184743	Singapore
Ascomycetes: Pleosporales: Incertae sedis	*Phoma* sp.	Alive	Unknown	Genus Present	CS06GM31	C2006/215306	Vietnam
Ascomycetes: Sordariales: Chaetomiaceae	*Chaetomium funicola*	Alive	Unknown	Present	CS06SE03	C2006/192086	Malaysia
Snails							
Gastropoda: Stylommatophora: Arionidae	Identification not made	Dead	Adult	Family Present	CS06JN13-14	C2006/176839	Italy
Gastropoda: Stylommatophora: Helicidae	*Ashfordia granulata*	Dead	Unknown	Not Present	DH06TT36	C2006/227549	Netherlands

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Gastropoda: Stylommatophora: Helicidae	*Cantareus aspersus*	Alive	Adult	Present	WG06TT23	C2006/215647	USA
Gastropoda: Stylommatophora: Helicidae	*Theba pisana*	Unknown	Unknown	Not Present	WG06LC25	C2006/214647	Australia
Gastropoda: Stylommatophora: Hygromiidae	*Cernuella virgata*	Unknown	Unknown	Not Present	WG06LC25	C2006/214647	Australia
Gastropoda: Stylommatophora: Hygromiidae	*Monacha cantiana*	Unknown	Unknown	Not Present	WG06LC25	C2006/214647	Australia
Insects							
Insecta: Araneae: Oecobiidae	*Oecobius navus*	Alive	Adult	Present	DH06TT11	C2006/202067	South Korea
Insecta: Blattodea: Blattellidae	Identification not made	Alive	Nymph	Family Present	DH06RR06	C2006/230376	American Samoa
Insecta: Coleoptera:	Identification not made	Dead	Unknown	Order Present	CS06LC06	C2006/160983	Australia
Insecta: Coleoptera: Bruchidae	*Callosobruchus maculatus*	Alive	Adult	Not Present	CS06RR04	C2006/198514	Singapore
Insecta: Coleoptera: Bruchidae	*Callosobruchus maculatus*	Unknown	Adult	Not Present	CS06RR5	C2006/198574	Singapore
Insecta: Coleoptera: Carabidae	*Laemostenus complanatus*	Dead	Adult	Present	CS06JN17-18	C2006/176839	Italy
Insecta: Coleoptera: Carabidae	*Stenolophus comma*	Unknown	Adult	Not Present	CS06RR5	C2006/198574	Singapore
Insecta: Coleoptera: Carabidae	*Stenolophus plebejus*	Dead[43]	Adult	Not present	CS06TT11	C2006/190715	Singapore
Insecta: Coleoptera: Carabidae: Harpalinae	Identification not made	Dead[41]	Adult	Sub-family Present	CS06TT14	C2006/190715	Singapore
Insecta: Coleoptera: Carabidae: Harpalinae	Identification not made	Dead[41]	Adult	Sub-family Present	CS06TT9	C2006/190715	Singapore
Insecta: Coleoptera: Cerambycidae: Cerambycinae	Identification not made	Dead	Unknown	Sub-family Present	CS06LC06	C2006/160983	Australia
Insecta: Coleoptera: Chrysomelidae	*Metriona* sp.	Dead[41]	Adult	Genus Not Present	CS06TT12	C2006/190715	Singapore
Insecta: Coleoptera: Coccinellinae	Identification not made	Dead[41]	Unknown	Sub-family Present	CS06TT12	C2006/190715	Singapore
Insecta: Coleoptera: Curculionidae	Identification not made	Alive	Larva	Family Present	DH06RR09	C2006/234500	Fiji
Insecta: Coleoptera: Dermestidae	*Anthrenus verbasci*	Dead	Adult	Present	CS06JN17-18	C2006/176839	Italy
Insecta: Coleoptera: Lathridiidae	*Lathridius pseudominutus*	Unknown	Unknown	Not Present	CS06LC33	C2006/173348	Netherlands
Insecta: Coleoptera: Mycetophagidae	*Typhaea* sp.	Dead	Unknown	Genus Present	CS06SE02	C2006/187294	China
Insecta: Coleoptera: Scarabaeidae	*Antitrogus parvulus*	Dead	Unknown	Not Present	DH06RR03	C2006/223269	USA
Insecta: Coleoptera: Scarabaeidae	*Heteronychus arator*	Dead	Adult	Present	CS06RR03	C2006/160983	Australia
Insecta: Coleoptera: Scarabaeidae	*Rhomborrhina* sp.	Dead	Unknown	Not Present	CS06JP02	C2006/200261	HONG KONG
Insecta: Coleoptera: Scarabaeidae	*Sericesthis* sp.	Dead	Unknown	Genus Not Present	CS06LC06	C2006/160983	Australia
Insecta: Coleoptera: Scaribaeidae: Cetoniinae	Identification not made	Dead	Unknown	Sub-family Present	DH06XL01	C2006/196153	Vietnam
Insecta: Coleoptera: Scolytidae	*Xyleborus* sp.	Dead	Unknown	Genus Present	CS06SE02	C2006/187294	China
Insecta: Coleoptera: Silvanidae	*Ahasverus advena*	Alive	Adult	Present	CS06JN21	C2006/201612	South Korea
Insecta: Coleoptera: Silvanidae	*Silvanus bidentatus*	Dead	Unknown	Present	CS06SE02	C2006/187294	China

[43] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Insecta: Coleoptera: Staphylinidae: Aleocharinae	Identification not made	Alive	Adult	Sub-family Present	DH06TT44	C2006/223679	Singapore
Insecta: Coleoptera: Syrphidae	*Platycheirus* sp.	Dead	Adult	Genus Present	CS06JN17-18	C2006/176839	Italy
Insecta: Coleoptera: Tenebrionidae	*Pterohelaeus* sp.	Dead	Adult	Genus Not Present	CS06RR03	C2006/160983	Australia
Insecta: Coleoptera: Tenebrionidae	*Tribolium castaneum*	Dead[44]	Adult	Present	CS06GM17	C2006/207253	Australia
Insecta: Dermaptera: Forficulidae	*Forficula auricularia*	Alive	Adult	Present	WG06RR01	C2006/217502	Belgium
Insecta: Dictyoptera: Blattidae	*Periplaneta americana*	Alive	Unknown	Present	CS06GM61	C2006/234089	Samoa
Insecta: Dictyoptera: Blattidae	*Periplaneta americana*	Alive	Unknown	Present	CS06GM62	C2006/234045	Samoa
Insecta: Diptera:	Identification not made	Dead	Unknown	Order Present	CS06LC06	C2006/160983	Australia
Insecta: Diptera: Anisopodidae	*Sylvicola dubius*	Alive	Unknown	Not Present	DH06JN23	C2006/219252	Singapore
Insecta: Diptera: Anisopodidae	*Sylvicola dubius*	Alive	Unknown	Not Present	DH06JN22	C2006/219252	Singapore
Insecta: Diptera: Anisopodidae	*Sylvicola dubius*	Alive	Unknown	Not Present	DH06LC14	C2006/227237	Australia
Insecta: Diptera: Anisopodidae	*Sylvicola notatus*	Alive	Unknown	Present	WG06SE18	C2006/208949	Australia
Insecta: Diptera: Calliphoridae	*Lucilia sericata*	Dead	Unknown	Present	DH06JN08	C2006/206526	China
Insecta: Diptera: Cecidomyiidae	Identification not made	Alive	Adult	Family Present	DH06XL28	C2006/226769	Australia
Insecta: Diptera: Cecidomyiidae	*Lestremia* sp.	Alive	Adult	Genus Present	DH06JN16	C2006/216204	China
Insecta: Diptera: Cecidomyiidae: Porricondylinae	Identification not made	Alive	Unknown	Sub-family Present	DH06XL25	C2006/222523	USA
Insecta: Diptera: Chironomidae: Chironominae	Identification not made	Alive	Unknown	Sub-family Present	DH06XL24	C2006/222523	USA
Insecta: Diptera: Chironomidae	Identification not made	Alive	Adult	Family Present	DH06JN18	C2006/229902	Philippines
Insecta: Diptera: Culicidae	*Aedes vittiger*	Dead	Unknown	Not Present	DH06RR03	C2006/223269	USA
Insecta: Diptera: Culicidae	*Culex quinquefasciatus*	Alive	Adult	Present	DH06TT37	C2006/228312	Singapore
Insecta: Diptera: Culicidae	*Culex quinquefasciatus*	Alive	Adult	Present	DH06XL26	C2006/226769	Australia
Insecta: Diptera: Culicidae	*Culex* sp.	Alive	Unknown	Genus Present	DH06JN20	C2006/225563	Japan
Insecta: Diptera: Culicidae	*Culex* sp.	Alive	Adult	Genus Present	DH06LC12	C2006/228406	Australia
Insecta: Diptera: Culicidae	*Culex* sp.	Alive	Adult	Genus Present	DH06SE21	C2006/228304	USA
Insecta: Diptera: Drosophilidae	*Drosophila* sp.	Unknown	Unknown	Genus Present	CS06JP01	C2006/205239	USA
Insecta: Diptera: Drosophilidae	Identification not made	Dead	Pupa	Family Present	DH06TT20	C2006/220145	Australia
Insecta: Diptera: Muscidae	*Musca domestica*	Dead	Unknown	Present	CS06RR6	C2006/198514	Singapore
Insecta: Diptera: Mycetophilidae	*Mycetophila propria*	Alive	Adult	Not Present	CS06JN06	C2006/166277	Australia
Insecta: Diptera: Mycetophilidae	*Mycetophila* sp.	Alive	Adult	Genus Present	CS06RR3	C2006/169142	China
Insecta: Diptera: Mycetophilidae	*Mycetophila* sp.	Alive	Adult	Genus Present	DH06TT57	C2006/228756	Australia

[44] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Insecta: Diptera: Phoridae	*Megaselia* sp.	Alive	Unknown	Genus Present	CS06LC13	C2006/173341	Australia
Insecta: Diptera: Phoridae	*Megaselia* sp.	Alive	Adult	Genus Present	CS06XL20	C2006/212951	Singapore
Insecta: Diptera: Phoridae	*Megaselia variana*	Dead	Unknown	Not Present	CS06LC13	C2006/173341	Australia
Insecta: Diptera: Psychodida	*Atrichobrunnettia alternata*	Alive	Adult	Not Present	CS06JN07	C2006/166277	Australia
Insecta: Diptera: Psychodidae	*Psychoda* sp.	Alive	Unknown	Genus Present	CS06JN07	C2006/166277	Australia
Insecta: Diptera: Psychodidae	*Psychoda* sp.	Alive	Unknown	Genus Present	CS06TT15	C2006/190715	Singapore
Insecta: Diptera: Psychodidae	*Psychoda* sp.	Alive	Unknown	Genus Present	DH06JN21	C2006/219252	Singapore
Insecta: Diptera: Psychodidae	*Psychoda* sp.	Alive	Adult	Genus Present	DH06JN40	C2006/228643	Singapore
Insecta: Diptera: Psychodidae	*Psychoda* sp.	Alive	Adult	Genus Present	DH06TT37	C2006/228312	Singapore
Insecta: Diptera: Psychodidae: Psychodinae	Identification not made	Alive	Adult	Sub-family Present	DH06JN07	C2006/206526	China
Insecta: Diptera: Simuliidae	Identification not made	Alive	Unknown	Family Present	CS06XL07-08	C2006/182830	Australia
Insecta: Diptera: Simuliidae	*Simulium* sp.	Alive	Unknown	Genus Not Present	CS06XL07-08	C2006/182830	Australia
Insecta: Diptera: Tipulidae	*Limonia* sp.	Alive	Unknown	Genus Present	DH06LC32	C2006/233149	Australia
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL10	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL11	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL12	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL13	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL14	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Dead	Adult	Genus Present	DH06XL15	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Alive	Unknown	Genus Present	DH06XL16	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Alive	Unknown	Genus Present	DH06XL17	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Alive	Adult	Genus Present	DH06XL22	C2006/222523	USA
Insecta: Diptera: Tipulidae	*Limonia* sp.	Alive	Adult	Genus Present	DH06XL23	C2006/222523	USA
Insecta: Diptera: Tipulidae: Limoniinae: Eriopterini	Identification not made	Alive	Adult	Tribe Present	DH06LC13	C2006/228406	Australia
Insecta: Diptera: Tipulidae: Limoniinae: Limoniini	Identification not made	Alive	Adult	Tribe Present	DH06SE07	C2006/225845	USA
Insecta: Diptera: Tipulidae: Limoniinae: Limoniini	Identification not made	Alive	Adult	Tribe Present	DH06XL30	C2006/226769	Australia
Insecta: Diptera: Tipulidae: Limoniinae: Limoniini	Identification not made	Alive	Adult	Tribe Present	DH06TT38	C2006/228312	Singapore
Insecta: Hemiptera: Anthocoridae	Identification not made	Dead	Unknown	Family Present	CS06SE02	C2006/187294	China
Insecta: Hemiptera: Anthocoridae	Identification not made	Dead[45]	Adult	Family Present	CS06TT8	C2006/190715	Singapore
Insecta: Hemiptera: Anthocoridae	Identification not made	Alive	Adult	Family Present	DH06TT44	C2006/223679	Singapore

[45] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Insecta: Hemiptera: Miridae	Identification not made	Dead[46]	Adult	Family Present	CS06TT8	C2006/190715	Singapore
Insecta: Hemiptera: Pentatomidae	*Euschistus servus*	Dead	Adult	Not Present	CS06RR03	C2006/160983	Australia
Insecta: Hemiptera: Pentatomidae	*Nezara viridula*	Dead	Adult	Present	CS06JN17-18	C2006/176839	Italy
Insecta: Hymenoptera: Apidae	*Apis mellifera*	Alive	Worker	Present	DH06TT03	C2006/220095	Australia
Insecta: Hymenoptera: Braconidae: Opiinae	Identification not made	Alive	Unknown	Sub-family Present	DH06XL21	C2006/222523	USA
Insecta: Hymenoptera: Eumenidae	*Delta campaniforme*	Alive	Unknown	Not Present	DH06RR25	C2006/215289	Singapore
Insecta: Hymenoptera: Formicidae	*Camponotus* sp.	Dead	Unknown	Not Present	CS06RR03	C2006/160983	Australia
Insecta: Hymenoptera: Formicidae	*Camponotus* sp.	Dead	Unknown	Not Present	CS06RR6	C2006/198514	Singapore
Insecta: Hymenoptera: Formicidae	*Camponotus* sp.	Dead	Worker	Not Present	DH06TT06	C2006/223443	Australia
Insecta: Hymenoptera: Formicidae	*Iridomyrmex* sp.	Alive	Unknown	Genus Present	DH06LC31	C2006/233149	Australia
Insecta: Hymenoptera: Formicidae	*Linepithema humile*	Alive	Unknown	Present	DH06LC31	C2006/233149	Australia
Insecta: Hymenoptera: Formicidae	*Monomorium destructor*	Dead	Unknown	Not Present	DH06RR1	C2006/222992	Singapore
Insecta: Hymenoptera: Formicidae	*Oecophylla smaragdina*	Dead	Unknown	Not Present	CS06GM15	C2006/196690	Indonesia
Insecta: Hymenoptera: Formicidae	*Paratrechina* sp.	Alive	Worker	Genus Present	DH06SE16	C2006/225004	Germany
Insecta: Hymenoptera: Formicidae	*Rhytidoponera* sp.	Alive	Alate	Genus Present	DH06LC02	C2006/223565	Australia
Insecta: Hymenoptera: Formicidae	*Tetramorium* sp.	Dead	Unknown	Genus Present	WG06TT02	C2006/206519	Netherlands
Insecta: Hymenoptera: Formicidae: Myrmicinae	Identification not made	Dead	Unknown	Sub-family Present	CS06RR6	C2006/198514	Singapore
Insecta: Hymenoptera: Formicidae: Myrmicinae	Identification not made	Dead	Unknown	Sub-family Present	CS06RR6	C2006/198514	Singapore
Insecta: Hymenoptera: Sphecidae	*Sceliphron caementarium*	Dead	Adult	Not Present	CS06GM10	C2006/179581	Canada
Insecta: Isoptera:	Identification not made	Alive	Adult	Order Present	CS06JN01-05	C2006/155351	Malaysia
Insecta: Lepidoptera	Identification not made	Dead	Adult	Order Present	CS06TT20	C2006/202255	USA
Insecta: Lepidoptera:	Identification not made	Dead	Adult	Order Present	CS06GM14	C2006/179581	Canada
Insecta: Lepidoptera: Blastobasidae	*Blastobasis* sp.	Alive	Adult	Genus Present	DH06SE24	C2006/232186	China
Insecta: Lepidoptera: Crambidae	*Herpetogramma licarsisalis*	Dead	Adult	Present	CS06RR03	C2006/160983	Australia
Insecta: Lepidoptera: Geometridae	*Epiphryne verriculata*	Alive	Adult	Present	DH06SE29	C2006/229792	Australia
Insecta: Lepidoptera: Geometridae	*Eupithecia miserulata*	Alive	Adult	Not Present	DH06XL33	C2006/223403	USA
Insecta: Lepidoptera: Geometridae	*Pasiphila lunata*	Alive	Adult	Present	DH06TT43	C2006/223679	Singapore
Insecta: Lepidoptera: Geometridae	*Pero behrensaria*	Alive	Adult	Not Present	DH06LC27	C2006/232470	USA
Insecta: Lepidoptera: Geometridae	*Thera* sp.	Alive	Adult	Not Present	DH06TT21-26	C2006/220522	Australia
Insecta: Lepidoptera: Geometridae	*Xyridacma ustaria*	Alive	Adult	Present	DH06JN34	C2006/228643	Singapore

[46] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Insecta: Lepidoptera: Geometridae: Larentiinae	Identification not made	Alive	Adult	Sub-family Present	DH06TT08	C2006/218815	Singapore
Insecta: Lepidoptera: Lycaenidae	Identification not made	Dead	Egg Mass	Family Present	DH06RR07	C2006/234500	Fiji
Insecta: Lepidoptera: Lycaenidae	Identification not made	Alive	Unknown	Family Present	DH06RR09	C2006/234500	Fiji
Insecta: Lepidoptera: Lymantriidae	*Lymantria dispar*	Dead	Larva	Not present	WG06JN06	C2006/220333	Australia
Insecta: Lepidoptera: Noctuidae	*Agrotis infusa*	Alive	Adult	Not Present	DH06LC29	C2006/221969	Australia
Insecta: Lepidoptera: Noctuidae	*Agrotis ipsilon*	Alive	Adult	Present	DH06TT49	C2006/231104	Australia
Insecta: Lepidoptera: Noctuidae	*Chrysodeixis eriosoma*	Alive	Pupa	Present	WG06JN06	C2006/220333	Australia
Insecta: Lepidoptera: Noctuidae	Identification not made	Dead	Pupa	Family Present	CS06GM52	C2006/222947	Singapore
Insecta: Lepidoptera: Noctuidae	Identification not made	Dead	Adult	Family Present	CS06RR02	C2006/155437	USA
Insecta: Lepidoptera: Noctuidae	Identification not made	Alive	Pupa	Family Present	DH06RR09	C2006/234500	Fiji
Insecta: Lepidoptera: Noctuidae	Identification not made	Dead	Pupa	Family Present	DH06RR17	C2006/224954	Australia
Insecta: Lepidoptera: Noctuidae	*Noctua pronuba*	Alive	Adult	Not Present	CS06GM09	C2006/179581	Canada
Insecta: Lepidoptera: Noctuidae	*Noctua pronuba*	Dead	Adult	Not Present	CS06GM08	C2006/179581	Canada
Insecta: Lepidoptera: Noctuidae	*Noctua pronuba*	Dead	Adult	Not Present	DH06RR16	C2006/226558	Netherlands
Insecta: Lepidoptera: Oecophoridae	*Endrosis sarcitrella*	Alive	Adult	Present	DH06JN35	C2006/229759	Indonesia
Insecta: Lepidoptera: Oecophoridae	*Endrosis sarcitrella*	Alive	Adult	Present	DH06LC25	C2006/223031	Germany
Insecta: Lepidoptera: Oecophoridae	*Hofmannophila pseudospretella*	Alive	Unknown	Present	DH06JN24	C2006/219252	Singapore
Insecta: Lepidoptera: Oecophoridae	*Hofmannophila pseudospretella*	Alive	Unknown	Present	DH06XL19	C2006/222523	USA
Insecta: Lepidoptera: Oecophoridae	*Hofmannophila pseudospretella*	Alive	Unknown	Present	DH06XL20	C2006/222523	USA
Insecta: Lepidoptera: Oecophoridae	*Hofmannophila pseudospretella*	Alive	Adult	Present	DH06XL35	C2006/223403	USA
Insecta: Lepidoptera: Oecophoridae	*Parocystola acroxantha*	Alive	Adult	Present	DH06TT39	C2006/230852	Australia
Insecta: Lepidoptera: Oecophoridae	*Tachystola acroxantha*	Alive	Adult	Present	DH06SE23	C2006/201445	Australia
Insecta: Lepidoptera: Pyralidae	*Hednota* sp.	Dead	Adult	Genus Not Present	CS06RR03	C2006/160983	Australia
Insecta: Lepidoptera: Pyralidae	Identification not made	Dead	Adult	Family Present	CS06TT19	C2006/202255	USA
Insecta: Lepidoptera: Pyralidae: Crambinae	Identification not made	Dead	Adult	Sub-family Present	CS06RR03	C2006/160983	Australia
Insecta: Lepidoptera: Tineidae	*Erechthias capritis*	Alive	Adult	Not Present	DH06JN34	C2006/228643	Singapore
Insecta: Lepidoptera: Tineidae	*Erechthias terminella*	Alive	Adult	Present	DH06JN34	C2006/228643	Singapore
Insecta: Lepidoptera: Tineidae	*Opogona omoscopa*	Alive	Adult	Present	DH06JN40	C2006/228643	Singapore
Insecta: Lepidoptera: Tineidae	*Tineola bisselliella*	Alive	Adult	Present	DH06XL27	C2006/226769	Australia
Insecta: Lepidoptera: Yponomeutidae	*Plutella xylostella*	Dead	Adult	Present	CS06RR03	C2006/160983	Australia
Insecta: Lepidoptera: Zygaenidae	*Pollanisus* sp.	Alive	Unknown	Not Present	DH06XL18	C2006/222523	USA
Insecta: Neuroptera: Chrysopidae	*Italochrysa* sp.	Alive	Larva	Not Present	CS06GM38	C2006/218883	Australia

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Insecta: Neuroptera: Chrysopidae	*Italochrysa* sp.	Alive	Egg	Not Present	CS06GM38	C2006/218883	Australia
Insecta: Orthoptera: Acrididae	*Gesonula mundata*	Dead[47]	Adult	Not Present	CS06TT13	C2006/190715	Singapore
Insecta: Trichoptera: Leptoceridae	*Oecetis* sp.	Alive	Adult	Genus Present	DH06JN34	C2006/228643	Singapore
Reptiles							
Reptilia: Squamata: Gekkonidae	*Hemidactylus frenatus*	Alive	Adult	Not present	DH06RR26	C2006/225216	Malaysia
Plants							
Liliopsida: Cyperales: Poaceae	*Avena fatua*	Dead	Seed	Present	CS06XL24	C2006/228463	Vietnam
Liliopsida: Cyperales: Poaceae	*Avena fatua*	Dead	Seed	Present	DH06SE30	C2006/216674	China
Liliopsida: Cyperales: Poaceae	*Avena* sp.	Alive	Seed	Genus Present	WG06JP02	C2006/217453	Australia
Liliopsida: Cyperales: Poaceae	*Dactyloctenium* sp.	Alive	Seed	Genus Not Present	CS06GM21	C2006/215449	Thailand
Liliopsida: Cyperales: Poaceae	*Dactyloctenium* sp.	Alive	Seed	Genus Not Present	CS06GM35	C2006/219408	Singapore
Liliopsida: Cyperales: Poaceae	*Dactyloctenium* sp.	Alive	Seed	Genus Not Present	CS06GM43	C2006/216959	Malaysia
Liliopsida: Cyperales: Poaceae	*Dactyloctenium* sp.	Alive	Seed	Genus Not Present	CS06RR9	C2006/198514	Singapore
Liliopsida: Cyperales: Poaceae	*Dactyloctenium* sp.	Alive	Seed	Genus Not Present	WG06JN04	C2006/219507	Australia
Liliopsida: Cyperales: Poaceae	*Hordeum* sp.	Dead	Seed	Genus Present	CS06XL24	C2006/228463	Vietnam
Liliopsida: Cyperales: Poaceae	*Hordeum vulgare*	Dead	Seed	Present	CS06TT3	C2006/186551	South Korea
Liliopsida: Cyperales: Poaceae	*Hordeum vulgare*	Dead	Seed	Present	DH06RR02	C2006/227499	South Korea
Liliopsida: Cyperales: Poaceae	*Hordeum vulgare*	Alive	Seed	Present	WG06JP02	C2006/217453	Australia
Liliopsida: Cyperales: Poaceae	*Hordeum vulgare*	Alive	Seed	Present	WG06RR08	C2006/227656	China
Liliopsida: Cyperales: Poaceae	*Lolium* sp.	Dead	Seed	Genus Present	CS06XL24	C2006/228463	Vietnam
Liliopsida: Cyperales: Poaceae	*Lolium* sp.	Alive	Seed	Genus Present	DH06XL05	C2006/217737	Singapore
Liliopsida: Cyperales: Poaceae	*Lolium* sp.	Alive	Seed	Genus Present	WG06JP02	C2006/217453	Australia
Liliopsida: Cyperales: Poaceae	*Oryza sativa*	Dead	Seed	Not Present	CS06TT4	C2006/184579	Pakistan
Liliopsida: Cyperales: Poaceae	*Panicum* sp.	Alive	Seed	Genus Present	CS06LC14	C2006/201373	USA
Liliopsida: Cyperales: Poaceae	*Pennisetum* sp.	Alive	Seed	Genus Present	CS06GM55	C2006/211462	Singapore
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Dead	Seed	Present	CS06RR9	C2006/198514	Singapore
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Dead	Seed	Present	CS06XL24	C2006/228463	Vietnam
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Dead	Seed	Present	DH06RR21	C2006/214254	China
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Alive	Seed	Present	DH06SE30	C2006/216674	China
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Alive	Seed	Present	DH06XL05	C2006/217737	Singapore

[47] Found dead in container after fumigation ordered by surveyor: may have arrived alive

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Alive	Seed	Present	WG06JP01	C2006/217453	Australia
Liliopsida: Cyperales: Poaceae	*Triticum aestivum*	Alive	Seed	Present	WG06JP02	C2006/217453	Australia
Liliopsida: Cyperales: Poaceae	*Zea mays*	Dead	Seed	Present	CS06SE01	C2006/180717	China
Liliopsida: Cyperales: Poaceae	*Zea mays*	Alive	Seed	Present	DH06RR22	C2006/223368	Australia
Magnoliopsida: Apiales: Apiaceae	*Coriandrum* sp.	Dead	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Apiales: Apiaceae	*Foeniculum vulgare*	Dead	Seed	Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Apiales: Apiaceae	*Petroselinum crispum*	Dead	Seed	Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Asterales: Asteraceae	*Senecio* sp.	Alive	Seed	Genus Present	CS06LC09	C2006/169777	Australia
Magnoliopsida: Asterales: Asteraceae	*Sonchus oleraceus*	Dead	Seed	Present	DH06SE30	C2006/216674	China
Magnoliopsida: Asterales: Asteraceae	*Taraxacum* sp.	Dead	Seed	Genus Present	CS06GM16	C2006/207253	Australia
Magnoliopsida: Asterales: Asteraceae	*Taraxacum* sp.	Dead	Seed	Genus Present	CS06JN19	C2006/176839	Italy
Magnoliopsida: Capparales: Brassicaceae	*Brassica* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Capparales: Brassicaceae	*Myagrum perfoliatum*	Dead	Seed	Not Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Capparales: Brassicaceae	*Rapistrum rugosum*	Dead	Seed	Present	DH06SE30	C2006/216674	China
Magnoliopsida: Capparales: Capparidaceae	*Cleome* sp.	Dead	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Caryophyllales: Amaranthaceae	*Amaranthus* sp.	Alive	Seed	Genus Present	CS06LC14	C2006/201373	USA
Magnoliopsida: Caryophyllales: Chenopodiaceae	*Chenopodium* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fabales: Fabaceae	*Cicer arietinum*	Alive	Seed	Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fabales: Fabaceae	*Lens* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fabales: Fabaceae	*Medicago* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fabales: Fabaceae	*Melilotus* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fabales: Fabaceae	*Phaseolus* sp.	Alive	Seed	Genus Present	DH06JN33	C2006/232970	Australia
Magnoliopsida: Fabales: Fabaceae	*Phaseolus* sp.	Dead	Seed	Genus Present	DH06RR12	C2006/219743	Thailand
Magnoliopsida: Fabales: Fabaceae	*Phaseolus* sp.	Dead	Seed	Genus Present	DH06RR12	C2006/219743	Thailand
Magnoliopsida: Fabales: Fabaceae	*Phaseolus vulgaris*	Alive	Seed	Present	DH06TT05	C2006/207941	China
Magnoliopsida: Fabales: Fabaceae	*Pisum sativum*	Alive	Seed	Present	DH06TT07	C2006/227042	China
Magnoliopsida: Fabales: Fabaceae	*Pisum* sp.	Alive	Seed	Genus Present	DH06TT35	C2006/235477	Singapore
Magnoliopsida: Fabales: Fabaceae	*Senna* sp.	Alive	Seed	Genus Present	CS06GM16	C2006/207253	Australia
Magnoliopsida: Fabales: Fabaceae	*Vicia* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Fagales: Betulaceae	*Alnus* sp.	Dead	Seed	Genus Present	CS06GM15	C2006/196690	Indonesia
Magnoliopsida: Gentianales: Asclepiadaceae	*Araujia sericifera*	Alive	Seed	Present	DH06SE27	C2006/220506	Australia
Magnoliopsida: Gentianales: Asclepiadaceae	*Araujia sericifera*	Alive	Seed	Present	DH06TT09	C2006/218815	Singapore

Taxonomy	Species	Viability	Life Stage	Status	Specimen	Consignment	Country of origin
Magnoliopsida: Magnoliales: Ulmaceae	*Ulmus* sp.	Dead	Seed	Genus Present	CS06JN19	C2006/176839	Italy
Magnoliopsida: Malvales: Malvaceae	*Malva* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Malvales: Malvaceae	*Malva* sp.	Alive	Seed	Genus Present	DH06XL05	C2006/217737	Singapore
Magnoliopsida: Myrtales: Myrtaceae	*Callistemon* sp.	Dead	Seed	Genus Present	DH06XL04	C2006/223985	Australia
Magnoliopsida: Myrtales: Myrtaceae	*Eucalyptus* sp.	Alive	Seed	Genus Present	CS06GM01	C2006/157280	Japan
Magnoliopsida: Polygonales: Polygonaceae	*Rumex acetosella*	Alive	Seed	Present	DH06XL05	C2006/217737	Singapore
Magnoliopsida: Ranunculales: Berberidaceae	*Berberis* sp.	Alive	Seed	Genus Present	DH06RR20	C2006/220823	Pakistan
Magnoliopsida: Rosales: Rosaceae	*Prunus* sp.	Alive	Seed	Genus Present	CS06TT01	C2006/158386	Japan
Magnoliopsida: Scrophulariales: Pedaliaceae	*Sesamum indicum*	Alive	Seed	Not Present	CS06GM16	C2006/207253	Australia
Magnoliopsida: Scrophulariales: Pedaliaceae	*Sesamum indicum*	Alive	Seed	Not Present	CS06JN08	C2006/168181	China
Magnoliopsida: Scrophulariales: Pedaliaceae	*Sesamum indicum*	Alive	Seed	Not Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Solanales: Solanaceae	*Capsicum* sp.	Alive	Seed	Genus Present	DH06XL36	C2006/228394	Singapore
Magnoliopsida: Solanales: Solanaceae	*Solanum* sp.	Alive	Seed	Genus Present	CS06RR9	C2006/198514	Singapore
Magnoliopsida: Violales: Cucurbitaceae	*Citrullus* sp.	Alive	Seed	Genus Present	DH06RR04	C2006/228006	Australia
Tardigrades							
Incertae sedis[48]: Eutardigrada: Macrobiotidae	*Macrobiotus* sp.	Unknown	Unknown	Genus Not Present	CS06LC10	C2006/169777	Australia
Incertae sedis: Eutardigrada: Milnesiidae	*Milnesium tardigradum*	Unknown	Unknown	Present	CS06LC10	C2006/169777	Australia

[48] Kingdom association not assigned

14.3 AP questionnaire

Biosecurity Monitoring Group Questionnaire for Accredited Persons (APs)

1. Name (optional)……………………………………………………………………………………….
2. Name of facility……………………………………………………………
3. Types of cargo received by the facility:

☐ Food items ☐ Machinery/equipment ☐ Home appliances/furnishings/home ware

☐ Brick/tiles/stoneware ☐ Chemicals/solvents/paints/fertilisers ☐ Wood/bamboo/cane items

☐ Books/magazines/printed items/paper ☐ Other (please specify) ……………………………………

4. How many APs operate from this facility? ……..
5. When did you do your training? (mm/yyyy) ....
6. What form did your training take (online/classroom)? ....
7. Do you feel the training prepared you well for the inspection of sea containers?

……

8. How could training in the inspection of sea containers be improved?

……

9. How many containers do you inspect per week (on average) ……..
10. What country/region do the bulk of your containers come from? ………………………………………
11. How long does it take you to inspect and unpack one container (on average)? ………………………...
12. What are the most common types of contaminants that you find in containers?

    ………………………………………………………………………………………….……………

13. Do you personally send your log sheets to MAF or are they sent to a central place (e.g. a head office) for sending …………………………………………………………………………….
14. Are you aware of the website lodgement for log sheets?....... Do you use it?.........
15. If the answer to 14a is Yes, do you find it user friendly? ………………………………………………
16. If the answer to 15 is No, what would encourage you to use the website?

    ……

17. Does the inspection of sea containers impact on your workload? If yes, please explain.

……

18. How frequently do you call MAF during the course of your inspections?

19. How do you rate MAF's response if/when you call them out to your facility?.

☐ Excellent ☐ Very good ☐ Good ☐ Poor ☐ Very poor

If response is poor or very poor could you give suggestions on how it could be improved

………

20. Have your facilities been audited by MAF since the APs were trained. Yes/No/Not sure

21. Have you seen the *Container Watch* publication. Yes/No

22. Have you seen any Publications from MAF e.g. Know Your Enemy?

    ………………………………………………………………………………………………….

23. What information in these publications is of most use to you?

………

24. Would you like to see any changes to the content or layout of these publications? If yes, what do you suggest?………………………………………………………………………………………………

25. What biosecurity risks are you aware of that are associated with containers?

………

26. What concerns (if any) do you have about sea container biosecurity?

....

27. How could we improve the system?

………

14.4 AP concerns about sea container biosecurity

Issue	Respondents	% of Responses
External contamination is not dealt with properly on the wharf; contaminants may fall off en-route to TFs; it is not possible to inspect the top and the bottom of containers; truck drivers are not trained[49] in biosecurity	10	25%
APs may be missing risk items when they inspect containers	7	18%
Worried about cleanliness of containers before export	3	8%
Concerned about machinery arriving dirty from overseas; it should be cleaned offshore	3	8%
Concern about the lack of MAF staff to inspect containers	3	8%
Frequent changes to procedures mean that it is difficult to establish a regular inspection regime	2	5%
All containers should be designated as high risk and should be fumigated	2	5%
Concern about container contents	2	5%
Concern that exporters are not following MAF requirements and uncertainty about conditions overseas	2	5%
Worried about the possibility of finding snakes and the availability of anti-venom	2	5%
No communication from MAF about general issues	1	2%
Worried about the safety of opening fumigated containers	1	2%
Concern about micro-organisms that are not seen during inspections	1	2%
Concern about the credibility of fumigation certificates and the adequacy of treatment	1	2%

[49] A number of container truck drivers are also trained accredited persons: these responses only indicate the opinions of the APs interviewed at transitional facilities.

14.5 AP competency assessment

AP Observation Sheet

Inspector ___________________ Date_______________

Facility _____________________ AP Number __________________

1. Number of APs present at the inspection ______
2. Conducted external examination Yes / No
3. Checked seal intact. Yes / No
4. Opened door slowly checking for contaminants Yes / No
5. Inspected cargo during unloading. Yes / No
6. Lifted pallets and looked at underside. Yes / No / NA
7. Role during devan _________________________
8. Distance from devan. __________metres
9. Looked for ISPM 15 marks on wood packaging Yes / No / NA
10. Thorough internal inspection including ceiling and walls. Yes / No
11. Collected contaminants and swept floor (if necessary) Yes / No / NA
12. Quarantine waste disposed of in accordance with standard Yes / No
13. If devan stopped for any reason (eg smoko) container closed. Yes / No / NA
14. Required equipment at hand eg spray can when container opened Yes / No
15. Proportion of time physically present during the devan. %
16. State response to live pests (if appropriate)

____
____
____

17. Overall impression of competence including attitude

Poor Average Above Average Good Excellent

14.6 Definition of Risk Units

Risk goods that do not conform to an import health standard on arrival pose an unacceptable level of risk, and so are seized when detected. Although seizures represent an unacceptable risk, not all seizures are equal in terms of the risk they pose: a piece of backyard fresh fruit poses a risk of fruit fly outbreak, and is intuitively higher risk than a soiled tennis shoe, but lower risk than a live dog without proper certification, which may pose a risk of rabies. A live dog without appropriate documentation from Australia, where rabies is absent, is likely to be a lower risk than one from the United States, where rabies is present. A piece of raw meat from south-east Asia may pose a risk of foot and mouth disease, while a piece of fully-cooked meat from the same origin would not. A kilogram of wheat intended for sowing would be higher risk than a kilogram of wheat from the same origin that was destined for processing. Thus, seizures can be given a risk rating, in terms of risk units per kilogram or per unit, based on the type of product, the country or region of origin, the level of treatment and the end use.

Seizures, once seized and properly treated or disposed of, no longer constitute a risk to New Zealand: they represent risk managed. However, slippage (undetected entry of non-conforming risk goods into New Zealand) does represent a risk to New Zealand. Quantifying slippage seizures in terms of risk units, rather than so many kilograms of fruit fly host material and so many units of nursery stock, and so on, means that a single value of residual risk can be expressed for a pathway. This value, although meaningless by itself, can be tracked over time, compared with values obtained for other pathways, and used as an indicator of changes in biosecurity risk. Differences in the residual risk of a pathway under different risk management regimes can also be used to give a value to the biosecurity benefit of those regimes, relative to their cost.

14.6.1 Residual risk and Seizure Detection Rate

The risk unit system exists as a series of tables in the Quantum database, enabling a risk unit value to be applied consistently to seizures whether recorded in Quanmail, Quanpax or Quancargo, whether made by MAF QS as part of normal operations or found by BMG during pathway monitoring surveys. The ratio of risk units found by MAF QS to total risk units estimated to have arrived in a period of time (based on monitoring slippage) is a measure of the operational efficacy of the clearance process (which is based on a Biosecurity New Zealand standard) in averting risk: this is referred to as the seizure detection rate. However, the seizure detection rate is not a measure of risk in itself: the value of residual risk, expressed in risk units, for a pathway indicates the level of risk posed by the pathway, regardless of what proportion it is of the total risk on the pathway. If one pathway has 20,000 risk units arriving per month and risk management processes seize 50% and another has 100,000 risk units arriving per month and 90% is seized, the residual risk of the two pathways is the same at 10,000 risk units per month.

14.6.2 Development of the risk unit scale

The concept of "risk units" (formerly called "urtcils") was developed in 1995-96 as a way to assign relative weights to slippage seizures found during a survey of international mail. The originator of the concept, Neil Hyde, developed a matrix of seizure types from different parts of the world and sent the matrix to experienced operational staff in MAF Quarantine Service, plant scientists at the MAF Plant Protection Centre at Lynfield, and animal scientists in MAF Regulatory Authority. The three groups were asked to rate the various types of seizures from 1-10, with 10 being an extreme risk and 0 representing a conforming risk good or no risk, based on the type of product, types of pests/diseases present in the region of origin and not present in New Zealand, and level of processing and/or end use in some instances. The group weightings were then averaged and rounded to a single weighting.

The weighting did not take quantity seized into account, so the weighting was applied to a standard quantity based on the way in which the product was commonly intercepted. For instance, all fruit fly host material was given a rating of 10 – the common quantity seized is a piece of fruit, such as an apple, with a weight of approximately 100 grams. If a piece of fruit weighing 100 grams has a rating of 10 risk units, then fruit fly host material as a class should have a weighting of 100 risk units per kilogram seized.

For two product classes, nursery stock and live animals, the weighting was increased to reflect the extreme high risk of these classes. Live animals from any country were originally given a rating of 10 – this was increased to 100-200 per unit (animal). Nursery stock from any country was originally given a rating of 8 – this was increased to 50-150 per unit (plant).

In 1998 the seizure classification system was changed by MAF Biosecurity Authority, with subclasses being added for most seizure classes. What had previously been Meat Products was divided into subclasses such as meat, offal, pate, extracts, fat/tallow, and other meat products. A processing or qualifier field was also added for many classes, so that meat products in any subclass could be recorded as having no treatment, being home processed, being commercially processed without zoosanitary assurance or being commercially processed with zoosanitary assurance. Plant products (not for food) could be recorded as manufactured or not manufactured. Live animals and nursery stock subclasses could be recorded as prohibited, new to New Zealand without entry approval, not present in New Zealand but with entry approval, and present in New Zealand.

The addition of subclasses and qualifiers greatly expanded the original risk unit scale: with 20 world regions, over 100 subclasses and 2-4 qualifier categories for many of the subclasses, over 2000 combinations had risk unit weightings developed. The new ratings for the highest risk combinations (e.g. meat with no treatment) were based on the original values, with lower values being applied for lower risk combinations (e.g. commercially processed extracts).

Risk units were initially only applied to risk goods and therefore an item contaminated with hitchhiker organisms, such as insects or spiders, was given the same risk unit weighting irrespective of the number of organisms it was contaminated with. In 2006 the risk unit system was adjusted to give an individual risk unit value for each hitchhiker organism found.

14.6.3 Application to sea containers

Risk goods like sea containers and used vehicles were not given a rating when the original risk unit scale was developed. The main risk with these types of goods is due to contamination with material such as soil, seeds and dried plant material, as well as with live hitchhiker organisms. Seizures of soil, seeds, dried plant material and live hitchhikers do have risk unit ratings, on a per unit or per kilogram basis – these ratings were used to develop the risk unit rating for contaminated used vehicles during the 2005-06 survey, and a similar process was used to develop values for contaminated sea containers.

Separate risk unit values were developed for external and internal contamination, as different types of contaminants are found externally and internally. A risk unit value already existed for contaminated wood packaging, so this was not counted in the evaluation of internal contamination.

The average quantity of individual contaminant types was determined, multiplied by the proportion of contaminated containers with that contaminant type, and then multipled by the risk unit rating for a standard quantity of that contaminant. The values were then summed and rounded up to the next integer to give a total risk unit value per contaminated container.

For instance, of 263 loaded containers with external contaminants, 175 had soil. The average quantity of soil was approximately 0.37kg per container with soil, and soil as a seizure has a value of 10 risk units per kg. Thus, the risk unit value of the soil on the outside of containers was calculated as 0.37 x 175/263 x 10, or 2.5 risk units. The contributions of seeds, feathers, dried plant material and hitchhiker organisms were calculated in the same way, to give an overall value for externally contaminated containers. The same process was applied to internal contamination.