

Biosecurity Monitoring Group

Pilot Videoscopic Survey of Imported Used Vehicles and Machinery

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Preface

Approximately once every ten days a vessel docks at the Ports of Auckland and discharges a load of used imported vehicles and machinery. These range from cars, trucks, SUVs and buses to bulldozers, mining equipment and road-building equipment. The cars have travelled an average 80,000km over 8.5 years in foreign ownership, and this trade constitutes a well-known pathway for pest introduction. The MAF Quarantine Service external visual inspection that all used vehicles and machinery receive within 12 hours of arrival has served well to remove visible contamination, but little is known of what accumulated biosecurity contamination and/or exotic organisms are hidden within the structure of the vehicles and machinery, out of sight of the external inspection. A state-of-the-art videoscope was used to probe, sample and photograph inside chassis members, behind fixed protective covers, inside body side panels, above the fuel tank, within door sills or side body panels and behind bumper mouldings. This report details the procedures and findings and recommends how further investigation could be structured to provide information necessary to limit the biosecurity risk exposure on this pathway.

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1.0 Executive Summary

New Zealand imports large numbers of used vehicles and machinery, mainly from Japan, but also from Australia, Singapore and the United States of America. All used vehicles and machinery are visually inspected by MAF Quarantine Service, and given clearance once any contamination seen has been removed or treated. However, evidence suggests that visual inspection is not able to detect all the biosecurity contamination present in used vehicles and machinery.

The Biosecurity Monitoring Group used a videoscope to conduct a pilot survey investigating the occurrence of contaminants in visually inaccessible places of vehicles and machinery. A total of 171 vehicles and machinery were checked after MAF clearance had been given, either at the Ports of Auckland decontamination facilities or at a facility where vehicles are checked for compliance with New Zealand structural and equipment specifications.

Of the vehicles checked, 89 (52%) were found to one or more types of contamination, and 75 (44%) contained one or more types of biosecurity contamination. Most of these vehicles (65, or 38% of the total sample inspected) had biosecurity contaminants that would have been hidden or very difficult to see during the MAF QS inspection. The other 10 vehicles had biosecurity contamination found that could likely have been seen during the visual inspection. With 180,000 used vehicles and machinery imported in 2004-05, potentially 68,400 could have entered New Zealand with biosecurity contamination still present that could not be detected with visual inspection. An additional 10,570 may have entered with biosecurity contamination present that was visible at inspection, but not seen. Further vehicles may have been contaminated with contaminants not found with the videoscope, so the number with contaminants not able to be seen by visual inspection could be greater.

While most of the biosecurity contaminants found with the videoscope were dried plant material, seeds and soil, 11 vehicles (6% of the total sample inspected) had live arthropods (6 spiders, 1 moth) or spider egg sacs found, none of which could have been found with the visual inspection. This translates to more than 11,000 vehicles a year entering New Zealand with undetectable live arthropods or egg sacs. One vehicle had a live adult and egg sacs of the brown widow spider, *Latrodectus geometricus*, present. This and other *Latrodectus* species have been intercepted with used vehicles and machinery at the New Zealand border on multiple occasions. The videoscope results indicate that additional spiders of these species are likely to be missed by inspection. Although these results are based on a small sample, they suggest that visual inspection alone may not be adequate as a clearance measure for used vehicles and machinery.

Location of contaminants within vehicles and machinery reflected a combination of exposure to contamination and the difficulty in seeing them with external inspection. A high incidence was found in the general regions of the front and rear wheel arches and engine bay, mainly in crevices, curved and folded bodywork and associated with the suspension components. A high abundance was also seen in the enclosed locations, door sills, inside side body panels, inside major chassis members, inside front and rear bumper mouldings, and inside transverse chassis members. Within the enclosed locations there was heavy spider webbing, suggestive of a resident spider

population. Also noted was a remarkable penetration of leaves into the vehicles' structures, mostly aged and dry, but with some green and woody parts.

As might be imagined in vehicles with a mean age of 8.5 years and kilometrage of 80,000km, clay, soil, sand and gravel had become distributed throughout the body work and impacted in some chassis members. The videoscopist had major problems obtaining samples, with the tip tools at his disposal, but negotiations with the machine manufacturers have resulted in an efficient sampling shovel being available and will be used to obtain samples for fungal and nematode testing.

The survey is continuing, with a target of 300 vehicles inspected by 31 December 2005. The next report will consider the representation of the sample relative to the population being imported, and determine whether weighting of subgroups in the results is necessary before extrapolating results. The additional sampling will help determine whether the webbing seen in many vehicles is old and of little consequence, or signifies a population of spiders that is not being found by the videoscope. The possibility of plant material harbouring pathogenic fungi will also be investigated.

2.0 Recommendations for future work

- 1 The pilot study should be continued and expanded as a formal study with a dedicated videoscope operator or operators. There is a “learning curve” where the operator has to get to grips with the operation of the videoscope, in particular the hand/eye coordination necessary to advance the videoscope shaft while manipulating the joystick to locate objects. It would be more difficult to obtain consistent, reliable results with multiple, casual operators.
- 2 The nature of the industry makes it difficult to select a random sample of vehicles from across the entire population without disrupting the port and clearance facility operations. When a larger sample is obtained, the make-up of the sample should be checked against the population being imported and results for individual types of vehicles or machinery weighted if necessary, to ensure the sample is representative of the population.
- 3 The contaminants seen with the videoscope, particularly the association between used vehicles and spiders in the genus *Latrodectus*, should be assessed regarding potential risk, to determine whether the incidence of contamination remaining after clearance poses significant biosecurity risk.
- 4 The study is at present confined to used imported vehicles and machinery that have been inspected and referred for cleaning. The study should be expanded to vehicles that have been passed at initial inspection, to assess the likelihood of hidden contamination, which would, or would not, be eradicated on cleaning.
- 5 The current study had no vehicles that had been pre-shipment inspected. These should be included as a separate category to assess the incidences of invisible contamination being passed via this clearance mode.
- 6 The study should ultimately include a subset of new cars to check whether these vehicles are subject to contamination during storage before shipment.

3.0 Terminology

Biosecurity Clearance	A clearance under section 26 of the Biosecurity Act 1993
BMG	Biosecurity Monitoring Group, Biosecurity New Zealand
BNZ	Biosecurity New Zealand, Ministry of Agriculture and Forestry
Carships	The MAF database application for recording information on bulk imported used vehicles
Compliance Checking Centre	Place where vehicles are checked to make sure that they comply with New Zealand vehicle construction and equipment regulations
Contaminant	For the purposes of this screening study, contamination is defined as: Inorganic: clay, soil, sand, gravel, road splash. Organic: fruit, seeds, plant material, wood, fungi, bark, insects and other organisms, animal products, wool, hair and water, (not part of the manifested cargo and introduced into the vehicles and machinery during use offshore), which may introduce pests, diseases or unwanted species into New Zealand.
IDC	Investigation and Diagnostic Centre (formerly known as the National Plant Pest Reference Laboratory, NPPRL)
IMVDA	Independent Motor Vehicle Dealers Association
LTNZ	Land Transport New Zealand
Lymantriids	Moths belonging to the family Lymantriidae. This family is characterised by adult moths that do not feed. Examples are the Asian gypsy moth and the painted apple moth.
MAF	Ministry of Agriculture and Forestry
MAF QS	MAF Quarantine Service
Slippage	Entry of risk goods into New Zealand without biosecurity clearance, or entry of goods with biosecurity contamination into New Zealand
Risk Exposure	The degree of biosecurity risk to which New Zealand is exposed as a result of slippage

Treatment	Steam cleaning/water blasting done to remove contaminants like soil and plant material, or fumigation with methyl bromide to kill live organisms
Videoscope	A micro-camera at the tip of a flexible shaft that is used for the detailed examination of semi-enclosed areas.
VIN	Vehicle Identification Number. This is the manufacturer's serial number. It is a combination of letters and numbers 17 characters in length that is used to identify the make, model and year of the vehicle.
Wharf cleaning facility	A MAF approved decontamination facility for vehicles and equipment

4.0 Introduction

During 2004-05, 180,000 used vehicles and machinery were imported into New Zealand, principally from Japan, but also Australia, Singapore and United States of America. All used vehicles and machinery imported to New Zealand are considered biosecurity risk goods, and are covered by Import Health Standards (IHSs) that prescribe the time, and type of inspection at arrival and the decontamination standards required before the vehicles can be released from the wharf or transitional facility. Import Health Standards are in force for inspection at the border of:

- (1) Used Buses, Cars, Trucks, Utility Vehicles, and Vans From Any Country
- (2) Used Forestry and Agricultural Equipment From Any Country

The current means of issuing biosecurity clearance for used vehicles and machinery is via a visual inspection by MAF Quarantine Service (MAF QS), both of the underneath, exterior and the interior. Vehicles and machinery may either be pre-shipment inspected prior to shipping at their point of loading, principally Japan, or on arrival in New Zealand.

MAF QS advise that the initial inspection process at Ports of Auckland takes an average of 3 minutes per vehicle using a 3-person team, apart from time to prepare the vehicle for inspection. This is based on an assessment of the time taken for trained MAF Quarantine Officers to do the job under normal working conditions.

Factors influencing the time for inspection include:

- Meeting the 12 hour requirement for external inspections
- Working through internal inspections in a timely manner with regard to vehicle flows whilst maintaining inspection efficacy.

- Environmental conditions (inspections stop in some weather conditions).
- Size of vehicle or machine: most machinery will take substantially longer to inspect.

If vehicles or machinery are found to be contaminated, they are subjected to an appropriate decontamination process at an approved facility, and re-inspected by MAF QS. Of the vehicles inspected on arrival at Ports of Auckland, approximately 90% are rejected at the initial inspection¹ and sent for subsequent decontamination and re-inspection.

After biosecurity clearance is granted, all used vehicles must be processed through a LTNZ-approved compliance checking centre where their compliance with New Zealand vehicle construction and equipment regulations is checked. This process involves the uncovering of under-mudguard, door and floor panels and takes approximately 3 hours per car. Although not part of the biosecurity inspection process, this serves as an informal 3rd tier of inspection, and occasionally finds hidden arthropods or other material, but still does not get to deeply hidden areas.

The Biosecurity Strategy of 2003 refers to used vehicles and machinery as a major import pathway, the expectation being that this pathway will be subject to investigation and monitoring by Biosecurity New Zealand. This pilot study was undertaken to investigate the degree to which vehicles and machinery are contaminated with material not visually detectable, in order to assess the effectiveness of the IHS requirements, which specify that biosecurity clearance can be given once vehicles and machinery have passed visual inspection.

5.0 Objectives

The objectives of the study were:

- To test the effectiveness and practicality of using a videoscopic device for detecting contamination in used vehicles and machinery;
- To investigate the types and locations of contaminants present in vehicles and machinery that are not detectable with the current visual inspection procedures;
- To estimate the number of vehicles with hidden biosecurity contamination that receive biosecurity clearance, in order to evaluate the effectiveness of the clearance process specified by the Biosecurity New Zealand import health standards for used vehicles and machinery.

The project aims to accumulate data on 300 vehicles and machinery items by 31 December 2005. This report gives a summary of the initial findings on just over half of the target sample.

¹ Estimate provided by MAF Quarantine Service, Auckland

6.0 Methodology

6.1 Sampling

In consultation with MAF QS, vehicles and machinery that had been unloaded at Ports of Auckland wharfs were sampled at the following points:

- At the Ports of Auckland after they have received clearance by MAF QS (including after any decontamination and re-inspection requirements)
- At designated compliance checking centres in Auckland.

In addition, all vehicles or machinery found with Lymantriid infestation by MAF QS were to be checked for additional egg masses in hidden areas of the vehicle, although none were found during the course of the study.

Because access to cleared vehicles was dependent on the good-will of the managers of the Ports of Auckland cleaning facilities and compliance checking facilities, a statistically random sample could not be drawn for this study. However, as far as possible, the vehicles were not selected with any bias towards vehicle type or previous actions taken.

The study did not examine new imported vehicles or machinery but it is proposed that in a later study a sample of imported new vehicles and machinery will be examined for hidden contaminants.

All available relevant data on the vehicles and machinery was recorded, including origin, place of storage in Japan or elsewhere, place of original inspection, month of transport, model of vehicle or description of machinery, and standard alpha-numeric vehicle identification number. Where possible, the vehicle was driven up a ramp or lifted on a workshop hoist to a comfortable working height for the videoscope operator.

All contaminants were recorded and, where possible, identified. Where reasonable, an attempt was made to recover them using a wire snare or alligator jaws remote manipulator that could be passed down the length of the videoscope shaft. Specimens recovered or (where impossible to recover) recorded as images were submitted for identification to the Investigation and Diagnostic Centre (IDC), at Tamaki, Auckland. Where full identification is impossible all available information is recorded and retained.

6.2 Background Information for Videoscopists

Assuming the vehicles and machinery inspected at the wharf are free of any visible pests or other contaminants, they are given biosecurity clearance and come under the control of Land Transport New Zealand (LTNZ). This agency requires extensive inspections of all used imported vehicles prior to approval for registration. This involves invasive techniques, which require much of the vehicle interior and under body panels to be removed.

Prior to videoscopic survey work beginning, staff undertaking the videoscope project were familiarized with the MAF QS clearance processes at the Ports of Auckland, and

shown through some compliance checking centres in order for them to see vehicles undergoing compliance inspections. This allowed them to view any contamination found at compliance certification, which *may* be missed during the routine off-shore or on-arrival inspection process and, where such contaminants are found within the panels and recesses of the vehicle underbody.

6.3 Equipment

The equipment used to conduct the survey was an Everest VIT 7.3mm diameter x 2000mm working length fibre-optic videoscope. This differs from conventional fibrescopes and boroscopes in that, while light is directed to the viewing area at the tip by a bundle of glass fibres, the image information is not sent back via a parallel glass fibre array, but is collected at a tip-mounted 4.2mm diameter Charge Coupled Device (CCD) camera. The information is digital rather than analogue, and can be reformed to a 480 line HDTV video picture with 440,000 pixel resolution on a 100mm hand-held LCD screen. The images can be frozen, zoomed, annotated in real-time, stored on disk as a .JPG photo-file and attached to real-time audio comments. The monitor is incorporated in a hand-held unit that also has a thumb-operated joystick to control the tip camera direction and a mini-keyboard to control the data acquisition

The equipment can be run from mains power, car battery or cigarette lighter, or by factory-supplied rechargeable NiMH batteries clipped to a waist-belt making the videoscope fully portable for remote field use.

The portability is enhanced by using a back-pack to hold the data-processing module and light source leaving both hands free to hold the monitor and direct the videoscope shaft. The design of the videoscope is such that one person can operate the equipment recording verbal comments and descriptions as .wav files, and saving freeze-frame JPG picture files of potential contaminants found during the inspection.

6.4 Data Recording

Vehicle data were recorded on field data sheets and later entered into a custom-written MS Access database. This database can store pictures and sound as a data type, so that the pictures taken in the field were stored with the rest of the data. Additional data were taken from the MAF *Carships* application.

The vehicles and machinery were assigned to one of 8 groupings: hatchbacks, sedans station wagons, vans, utilities, SUV4 x 4s, trucks, and machinery (including tractors). For some analyses where there were insufficient numbers in the individual groups, hatchbacks, sedans, and station wagons were amalgamated into “cars”. All available details of the surveyed vehicles and machinery were recorded so that additional analysis can be undertaken as more information becomes available.

The vehicles in the study covered a wide range of designs and constructions, making it difficult to standardise recording of contaminant location across types. Reporting of contaminant locations and types at the time they are observed is dependent on the videoscopist’s subjective impression and is recorded, in the field, verbally and in writing. For comparative analysis, the data were reduced to 18 standard contaminant location categories and 17 standard contaminant type categories as below.

Table 1. Standard contamination location and contamination type categories

Contamination location	Contamination type
Above exhaust	Buds
Around fuel tank	Clay/soil
Behind glove box	Dried leaves
Between rear dual tyres	Dry woody plant material
Engine bay	Egg sacs
In radiator	Feathers
Inside body panels	Fresh leaves
Inside chassis members	Grass/straw
Inside deck rails	Hair/fur
Inside door sills	Insects/Moths
Inside front bumper	Pine Needles
Inside front wheel arch	Pollen/spores
Inside rear bumper	Sand/gravel
Inside rear wheel arch	Seeds
Inside side pillars	Spider webs
Interior	Spiders
On spare tyre	Unidentifiable
Other	

7.0 Results

7.1 Vehicle characteristics and contamination incidence

This report covers the first 171 vehicles and machines examined using the videoscope. Of the vehicles examined in the study, 153 were inspected at cleaning facilities within the Ports of Auckland wharf area and 18 were inspected at a compliance checking centre at Penrose, Auckland.

Table 7.1 shows the total number of vehicles and machinery surveyed, the number and percentage found contaminated, the number and percentage with biosecurity contamination², and the 95% confidence levels for biosecurity contamination. Biosecurity contamination was identified in 44% of the vehicles and machinery checked. Many of these had multiple contaminants, either of different types or different locations, as shown in the “Instances of contamination” column.

Table 7.1: Summary of survey results

Vehicle type	Number surveyed	Number and % contaminated	With biosecurity contaminants	95% confidence limits	Instances of biosecurity contamination
Car	100	47 (47.0%)	42 (42.0%)	32.8% - 51.8%	69
SUV(4x4)	24	11 (45.8%)	7 (29.2%)	14.9% - 49.4%	9
Ute	2	1 (50.0%)	1 (50.0%)	9.4% - 90.6%	1
Van	22	13 (59.1%)	11 (50.0%)	30.6% - 69.4%	18
Truck	17	13 (76.5%)	10 (58.8%)	35.7% - 78.5%	15
Machinery	6	4 (66.7%)	4 (66.7%)	29.0% - 90.1%	11
Total	171	89 (52.0%)	75 (43.9%)	36.6% - 51.4%	123

² Biosecurity contamination includes live organisms and egg masses, plant material, seeds and soil. It excludes dead organisms, spider webs, sand, silt, clay, gravel and road splash.

Utes, vans, trucks and machinery had biosecurity contamination levels of 50% or more, compared with cars and SUVs. However, as indicated by the overlap in the 95% confidence limits, the differences in percentage of different types of vehicles contaminated were not statistically significant.

Over half of the vehicles with contamination had more than one type of contaminant found, or contamination found in more than one place, as shown in Table 7.2. This indicates that vehicles and machinery frequently have multiple contaminants not visible during the normal inspection process.

Table 7.2. Instances of multiple contamination types in vehicles and machinery

Number of contaminant types	1	2	3	4	5	≥6
Number of vehicles or machinery	34	27	17	8	3	0
Total = 186						

7.2 Visibility of contamination

At the time of inspection, the videoscopist made a subjective assessment of whether contamination found would be:

- impossible to be seen at external inspection (e.g. inside a panel or structural member, or behind a solid body attachment such as a bumper or under-mudguard protective panel);
- possible to be seen without the videoscope, but in an obscure, difficult to see location (e.g. inside a lip such as mudguard edge, among mechanical components with many surfaces, or high up in suspension components); or
- in a position that could reasonably have been seen with visual inspection.

Table 7.3 shows the results of the subjective assessment for the surveyed vehicles and machinery³.

Table 7.3. Videoscopist’s assessment of contaminant visibility

Assessment	Vehicles with biosecurity contamination	Instances of biosecurity contamination
Impossible to see with visual inspection	61	98
Unlikely to see with visual inspection	4	8
Possible to see with visual inspection	10	17
Total	75	123

The videoscopist’s opinion was that 87% of the vehicles with biosecurity contamination found and 86% of the instances of biosecurity contamination seen during videoscopic examination were impossible or unlikely to have been seen by MAF QS inspectors during the routine visual inspection process. Overall, 65 of the 171 vehicles surveyed (38%) had biosecurity contamination seen that was impossible

³ Vehicles and machinery with some contamination that was possible to see with visual inspection and others that were impossible or unlikely to be seen, were placed in the “impossible” or “unlikely” categories. The 10 vehicles in the “possible to see with visual inspection” category only had contaminants found that would have been visible during visual inspection.

or unlikely to have been seen visually. With more than 180,000 used vehicles and machinery imported during 2004-05, this equates to approximately 68,400 vehicles or machinery with biosecurity contamination still present after clearance because the contamination could not be seen during the clearance process. Note that it is unlikely that every contaminant present in used vehicles and machinery can be seen even with the videoscope, so the percentage with biosecurity contamination not visible by visual inspection could be even greater.

In addition, 10 of the 171 surveyed vehicles (6%) had biosecurity contaminants remaining after clearance that could likely have been seen with visual inspection. This equates to another 10,500 vehicles and machinery with biosecurity contaminants still present after clearance⁴. Overall, these preliminary results suggest that nearly 79,000 used vehicles and machinery could have entered New Zealand in 2004-05 with biosecurity contamination still present – approximately 44% of the total imports.

Dried plant material was the most common contaminant found (46 instances), followed by soil (29 instances), fresh plant material (21 instances), seeds (13 instances), and live organisms or egg sacs (13 instances). Eleven vehicles were found with live organisms (6 with spiders, 1 with a moth) and/or egg sacs, including one vehicle from Singapore with a live adult female brown widow spider (*Latrodectus geometricus*) and egg masses. None of the live organism or egg contaminants could have been seen with visual inspection. With 11 of 171 vehicles surveyed (6.4%) having live organisms or egg masses, this equates to more than 11,500 vehicles entering New Zealand in 2004-05 with live organisms or egg masses.

The association of various *Latrodectus* species with used vehicles and machinery has been noted numerous times at the New Zealand border: not only *L. geometricus* but also *L. mactans* (black widow), *L. hesperus* (western black widow) and *L. hasselti* (red-back) have been reported from imported used vehicles and machinery. *Latrodectus hasselti*, *L. mactans* and *L. hesperus* have also been occasionally reported from new vehicles⁵. These species not only pose a human health threat, but may also pose an ecological threat to the native katipo spider, *Latrodectus katipo*.

Although these results are preliminary, and a larger sample may change estimates, it appears that a substantial percentage of used vehicles and machinery contain biosecurity contaminants that are not visible to inspectors during the clearance process. The risks posed by contaminants found in the survey, particularly the association between used vehicles and *Latrodectus* spiders, should be assessed, to determine whether the clearance processes specified by the import health standards for used vehicles and machinery require revision.

7.3 Location of contaminants

The videoscope's 2-metre shaft length, depth of field (40mm to infinity) and resolution allowed close inspection of surfaces within the vehicle and, normally, visual identification of the type of contaminant. Where this was not possible, or the

⁴ The efficacy of the visual inspection process is the subject of a Biosecurity Monitoring Group survey, scheduled to finish in late November 2005. This survey will provide a more accurate estimate of this figure.

⁵ Information from Biosecurity New Zealand border and post-border interception database

contaminant seen was of particular interest, an attempt was made to catch or sample the contaminant. The tools available were a wire snare suitable for sampling light, bulky, fibrous material such as plant debris, and small alligator jaws capable of pulling off attached contaminants and holding hard objects firmly. Sampling of friable, loose material such as sand and dry soil/clay with these tools presented a challenge. An approach to the videoscope manufacturer has resulted in the design of a sampling shovel that may be available for future work.

Figure 7.1 shows the locations of all instances of contamination found in the study. A high incidence occurred within hollow structural members, such as door sills, major chassis members, cross members, and inside closed body panels. A similarly high occurrence was seen in exposed areas where contaminants could accumulate, such as under mudguards and in the engine bay, but only minor contaminant numbers were found on easily cleaned sites such as tyres, fuel tanks, wheels and bumpers.

Figure 7.2 shows the types of contaminants found by videoscope inspection. Dried leaves, spider webs and clay/soil deposits were the most frequently seen contaminant types, followed by less frequent occurrences of sand and gravel. Pine needles, seeds (mainly of various grasses), dry grass/straw, small amounts of woody plant material, plant buds that appeared to have been cut off and trapped by a moving vehicle, and an unidentifiable mass of what looked to be pollen or spores made up the bulk of the minor plant components. Three occurrences of fresh leaves were seen. Four occurrences of dead insects were seen but no live insects were seen in the study. There were 6 instances of live spiders, and 6 of spider egg sacs. The abundance of spider webs suggested that other spiders could have been missed because of their secretive nature and avoidance of the video probe.

Figure 7.3 links the sites of occurrences, the types of contaminants found and the individual abundance of each contaminants at the sites in an, admittedly, complex chart. Because this chart is overly complex to interpret in anything other than a multi-colour rendition the information is summarised in Figures 7.4 and 7.5 where the types of contaminant are assigned within 6 categories.

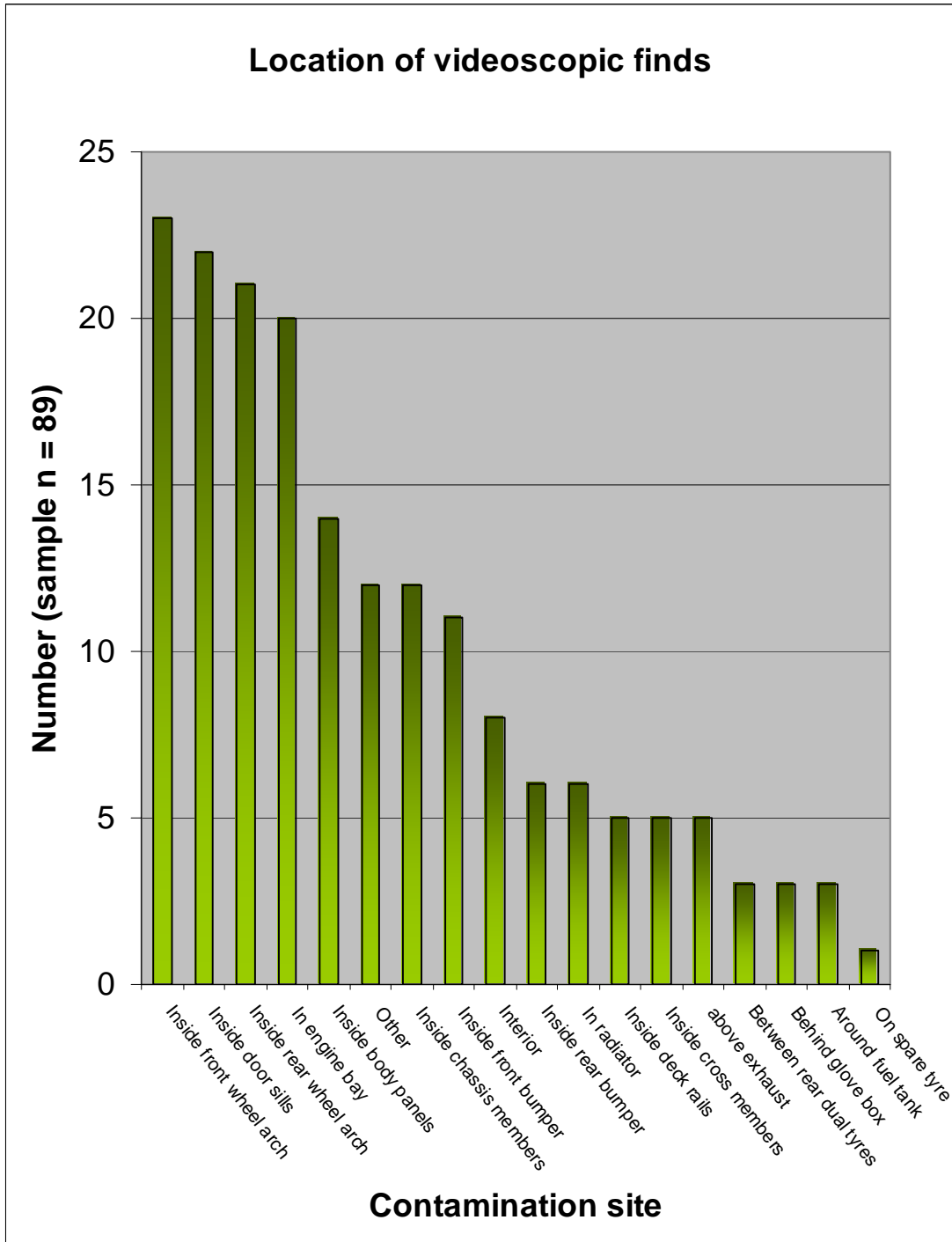


Figure 7.1. Locations within vehicles and machinery and incidences of contamination found in vehicles and machinery using videoscopic inspection

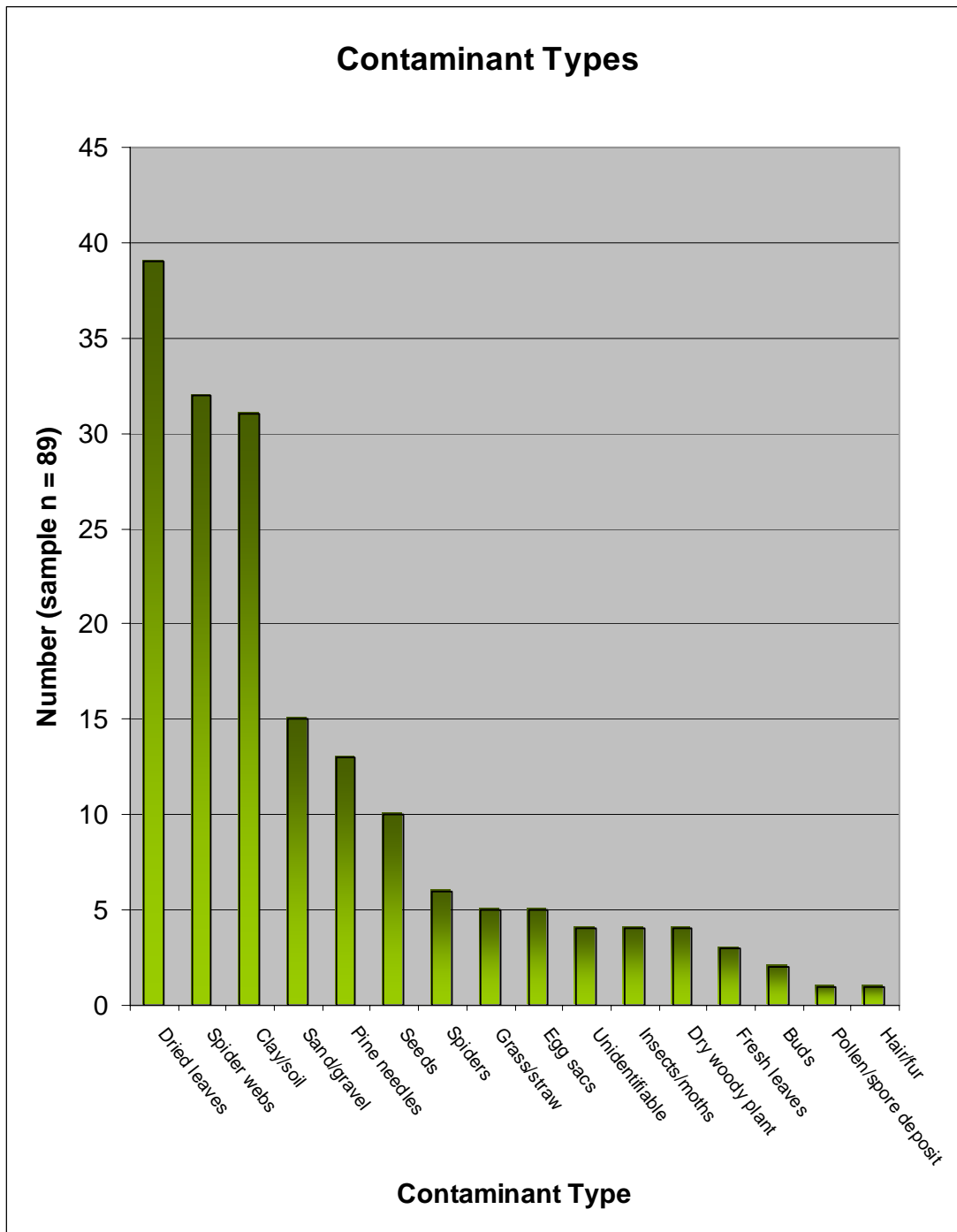


Figure 7.2. Number of instances of contaminants found in vehicles and machinery

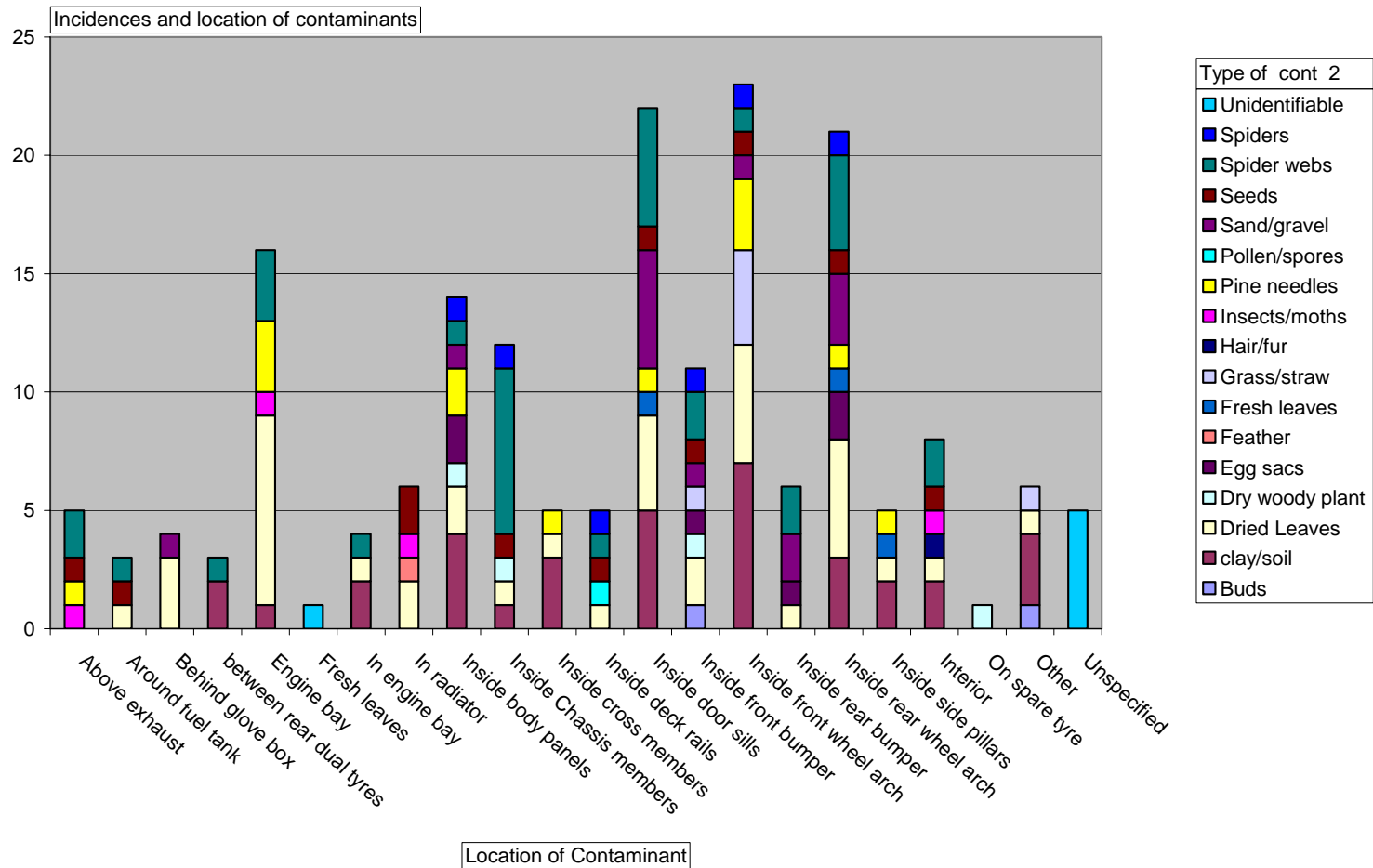


Figure 7.3. Types of contaminants found by location

Contaminant groups in vehicles and machinery

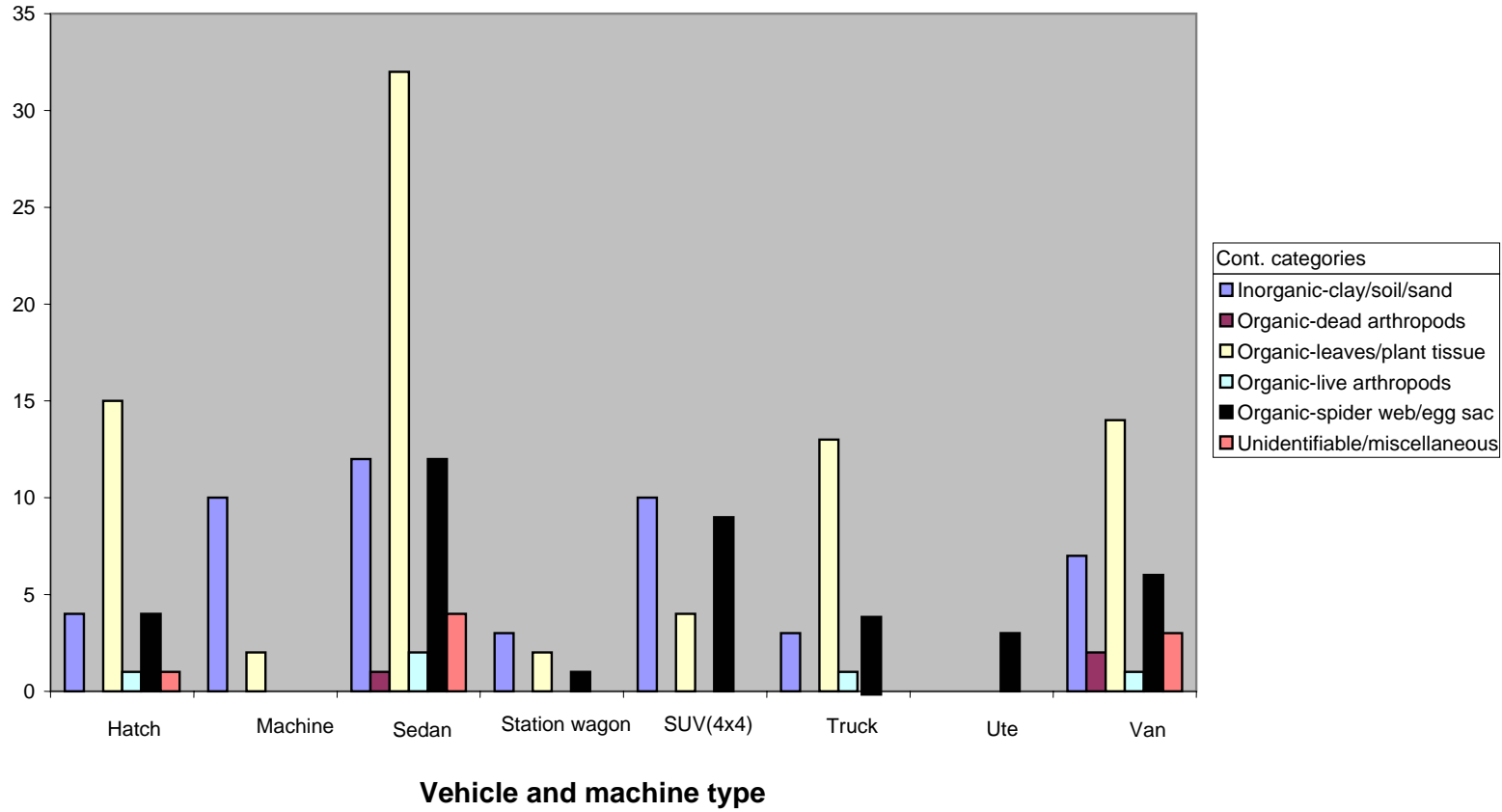


Figure 7.4. Contaminant category abundances within vehicle and machinery groups

Contaminant categories at standard locations

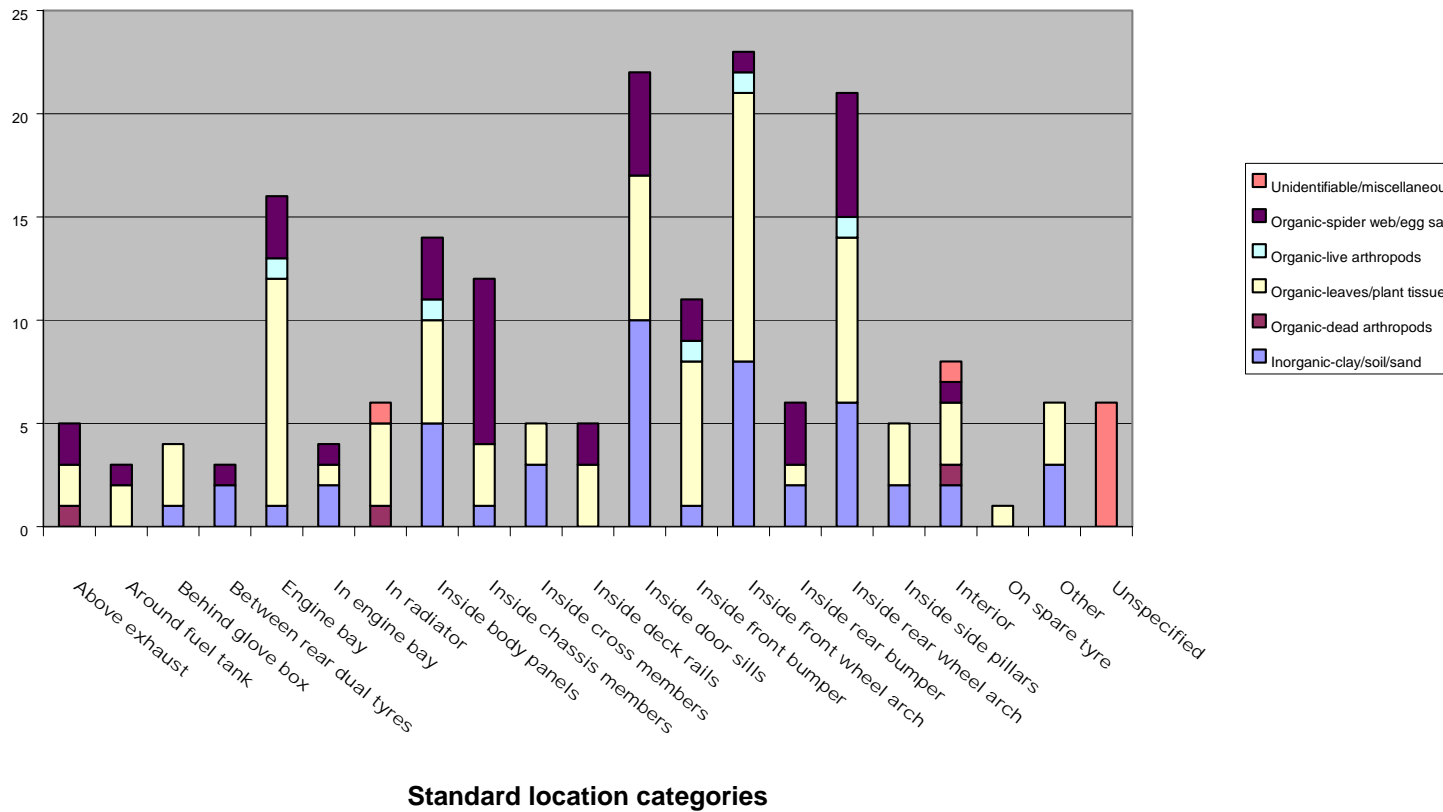


Figure 7.5. Categories of contaminants found at standard locations with videoscopic inspection

8.0 Discussion

8.1 Key Findings

The preliminary results show that:

- Approximately 39% of the vehicles and machinery surveyed had biosecurity contamination present that would have been impossible or unlikely to have been seen with visual inspection. This equates to approximately 68,400 vehicles per year entering New Zealand with biosecurity contamination not detectable with the current clearance process.
- This contamination is not removed by conventional water blasting or steam cleaning and will accompany the vehicle or machine into the New Zealand post-border environment.
- Eleven of the 171 vehicles surveyed had live organisms or egg sacs present, none of which could have been seen by visual inspection. This equates to approximately 11,500 vehicles per year. One of the vehicles had a live adult female brown widow spider, *Latrodectus geometricus*, and egg sacs. This species, as well as other *Latrodectus* species, have been found in association with used vehicles and machinery numerous times in the past.
- Ten of the 171 vehicles surveyed had biosecurity contaminants present that could likely have been seen by visual inspection. This equates to an additional 10,500 vehicles per year entering New Zealand with biosecurity contamination not detected by the clearance process.
- The biosecurity contaminants are mainly dried leaves, soil, seeds and fresh plant material, reflecting an accumulation over time and kilometres covered
- Spiders are fast-moving, elusive and secretive arthropods, and, in this respect the videoscope, with a limited field of view, may be inadequate to detect all of the spiders present. Many more vehicles were contaminated with webs than were seen with live spiders. At this stage there is insufficient evidence to relate the abundance of spider webs seen to the abundance of spiders seen, and no data on the proportion of spiders present that are visualised, photographed, or captured. This data acquisition may rely, long-term on further work by a dedicated skilled videoscope operator or dismantling of a small cohort of selected vehicles.
- No AGM egg masses were seen in this study, but the time of the study, April to June, did not include the main egg laying period for AGM, which happens in August to November. The videoscope examination also found no evidence of previous AGM egg laying.
- Sampling of contaminants using a sampling device passed down the length of the videoscope shaft (2m) and remotely operated under video surveillances is very difficult and there is a pronounced “learning curve” while a new operator acquires the hand-eye coordination to estimate the distance from the videoscope tip to the object being sampled, learns to move the tip, open the sampler, and catch a possibly moving animal.
- The sampling devices used in the current trial, a wire snare and an alligator jaws proved excellent to sample static and soft/friable material such as leaves, But difficulties were found in removing attached material such as spider egg sacs (see appendix 3, photographs), catching alert arthropods, and sampling impacted and firm soil and clay. Discussion with the videoscope

manufacturers is underway to provide more appropriate sampling devices. A micro-shovel has been suggested for taking soil/clay/sand samples efficiently.

8.2 Further Study

- This pilot study has provided a training ground and test-bed for videoscopic investigation of imported used vehicles. It is a difficult technique to master over a wide range of differently designed vehicles with different construction styles, most needing careful attention to detail to achieve adequate coverage of likely sites for hidden contamination.
- Subsequent study should be undertaken by a dedicated, trained videoscope operator or operators, and a standard procedure worked out for using the videoscope on different types of vehicles and machinery
- Refinement of the searching, sampling, and capturing technique by a dedicated operator would result in a more quantitative dataset and a more reliable estimate of the potential problem of spiders in imported vehicles and machinery, as disclosed by the current pilot.
- Improved sampling of soil/clay and sand would allow investigation for fungal, seed and nematode contamination.

8.3 Conclusions

The data show that a degree of slippage is occurring in the pathway, mainly because not all contaminants can be seen with the visual inspection clearance procedure specified by the BNZ import health standards for used vehicles and machinery. A difficulty in evaluating efficacy of the individual parts of the process is that records of contaminants detected at the initial inspection are not kept. Thus there is no way of evaluating what proportion of contaminants of various types and in various locations were found at the visual inspection of the surveyed vehicles, and what proportion were not.

Presently the only vehicle data recorded in *Carships* or *QuanCargo* are the standard vehicle and machinery identification, importer details and whether the vehicle or machine required decontamination after inspection. However, an initiative underway by MAF QS to record contaminants using personal data loggers in the field should result in contaminant type and location being recorded for all vehicle and machinery inspections.

The results of the on-going videoscopic project will be linked to two other BNZ projects: a survey of the efficacy of visual inspection processes, currently underway by the Biosecurity Monitoring Group, and a risk analysis of used vehicles being undertaken by the Risk Analysis Group. The results of the two studies should identify the effectiveness of the current process specified by the standard, and evaluate the risks associated with contaminants likely to be missed by current clearance procedures.

The preliminary results indicate that potentially 44% of used vehicles and machinery enter New Zealand with some type of biosecurity contamination present after clearance. Although most of the contamination was relatively

minor, the presence of a brown widow spider, *Latrodectus geometricus*, in one of the vehicles indicates that slippage of significant biosecurity contaminants is occurring in the used vehicle pathway, and that the visual inspection process specified by the standard may not deliver an adequate level of biosecurity protection on this pathway.

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Alfred Ng, Everest VIT Limited

Alan Gillespie, Videoscopist

Appendix 1 Vehicles included in study

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
1	Mazda	Demio	Van	DW3W-726187	Shed 10	Y
2	Mitsubishi	Diamante	Sedan	F36A-0310318	Shed 10	N
3	VW	Polo	Hatch	WVWZZZ6NZWW142277	Shed 10	N
4	Nissan	Navara	Ute	BGD21-601570	Onyx wash bay	Y
5	Nissan	Condor	Truck	CM87HE-44488	Onyx wash bay	Y
6	Mitsubishi		Truck	FS517VY500093	Onyx wash bay	Y
7	Mazda	MPV	Van	LVLW-105076	Shed 10	Y
8	Rover	400	Sedan	SARRTCLTKWD267563	Shed 10	Y
9	Landrover	Discovery	SUV(4x4)	SALLJRMM3VA555879	Shed 10	Y
9	Landrover	Discovery	SUV(4x4)	SALLJRMM3VA555879	Shed 10	Y
10	Ford	Explorer	Ute	FMDU34E6VZA00144	Shed 10	N
11	Komatsu		Bulldozer	B20604	Onyx washbay	N
12	Mitsubishi	Canter	Truck	FB51AB-563380	Onyx wash bay	Y
13	Mitsubishi	Canter	Truck	FB70AB-597288	Onyx wash bay	Y
14	Mitsubishi		Water Tanker	FK335C-553594	Onyx washbay	N
15	Iseki		Tractor	04934	Onyx wash bay	Y
16	Caterpillar		Truck	CAT77B	Onyx wash bay	Y
17	Kobelco	SK200	Tracked digger	yn-28619	Onyx wash bay	Y
18	Yanmar	F255	Tractor	51900	Onyx wash bay	Y
19	Nissan	Terrano	SUV(4x4)	LR50-011997	Ports of Auckland	Y
20	Hitachi	LX100	Wheel loader	G-218	Oynx Wash Bay	N
21	Mitsubishi		Truck	FE517BD-403686	Onyx wash bay	Y
22	BMW	520i	Sedan	WBADM22000BR56997	Shed 10	N
23	BMW	320i	Sedan	WBABF22030JA72708	Oynx Wash Bay	Y
24	Toyota	Caldina	Hatch	ST215-3045839	Shed 10	N

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
25	Mazda	Titan	Truck	WG5AT-123873	Shed 10	N
26	Mitsubishi	FU415N	Truck	FU415N-540026	Onyx wash bay	Y
27	Toyota	Grandvia	Van	KCH10-000719	Shed 10	Y
28	Isuzu	Bighorn	SUV(4x4)	UBS69GW-7274255	Shed 10	Y
29	Toyota	Curren	Sedan	ST207-0004695	Shed 10	Y
30	Nissan	Skyline	Sedan	HR33-084182	Shed 10	Y
31	Isuzu	Elf	Truck	NHR69E-7417938	Onyx wash bay	N
32	BMW	328i	Sedan	WBAAM52020FK83482	Shed 10	Y
33	Lexus	LS400	Sedan	JT753UF2000137155	Shed 10	N
34	Toyota	Ipsum	Van	SXM10-0016474	Shed 10	Y
35	Toyota	Terrano	SUV(4x4)	RR50-004349	Shed 10	Y
36	Nissan	Sunny	Sedan	FB14-391693	Shed 10	Y
37	Toyota	Landcruiser	SUV(4x4)	KZN130-9024151	Shed 10	Y
38	Subaru	Legacy	Sedan	BE5-039348	Shed 10	Y
39	Toyota	Dyna	Truck	LY131-0002575	Onyx wash bay	N
40	Mitsubishi	Canter	Truck	FG437E-490075	Onyx wash bay	Y
41	Caterpillar	826	Landfill compactor	87X01355	Onyx wash bay	Y
42	Mitsubishi	Diamante	Sedan	F41A-0400618	Onyx wash bay	Y
43	Toyota	Ipsum	Van	SXM15-0016214	H.B Port Services	N
44	Toyota	Corolla	Sedan	AE110-5030991	H.B. Port Services	N
45	Toyota	Caldina	Hatch	AT191-8002453	H.B. Port Services	N
46	Toyota	Landcruiser	SUV(4x4)	HDJ81-0054036	H.B. Port Services	N
47	Toyota	Corolla	Sedan	EE111-5009194	H.B. Port Services	N
48	Nissan	Pulsar	Sedan	FN15-488256	H.B. Port Services	N
49	Mitsubishi	RVR	SUV(4x4)	N73W-0001083	Shed 10	Y
50	Honda	Odyssey	Van	RA2-1100687	Shed 10	Y
51	Mazda	Familia	Sedan	BJ5W-104364	Shed 10	N
52	Subaru	Legacy	Sedan	BH5-013297	Shed 10	N

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
53	Honda	Odyssey	Van	RA2-1009928		N
54	Mazda	Atenza	Sedan	GG3S-112520	Shed 10	N
55	Toyota	Ipsum	Van	SXM15-0011107	Shed 10	Y
56	Mazda	Premicy	Hatch	CPEW-104417	Shed 10	N
57	Toyota	Platz	Sedan	SCP11-0025798	Shed 10	Y
58	Nissan	Cefiro	Sedan	A32-042986	Shed 20	Y
59	Mitsubishi	Canter	Truck	FE437C-540292	Onyx wash bay	Y
60	Mitsubishi	Diamante	Sedan	DA2A-0505596	Shed 10	Y
61	Toyota	Corolla	Hatch	AE100-0263899	Shed 10	N
62	Toyota	Starlet	Hatch	EP91-0090663	Shed 10	Y
63	Nissan	Skyline	Sedan	HV35-201779	Shed 10	Y
64	Mazda	Capella	Hatch	GWEW-116937	Shed 10	N
65	VW	Beetle	Sedan	WVWZZZ9CZYM641951	Shed 10	Y
66	Subaru	Impreza	Sedan	GC8-064142	Shed 10	Y
67	Nissan	Primera	Sedan	HP11-015433	H.B. Port services	N
68	Honda	Ascot	Sedan	CE4-1017059	H.B. Port services	N
69	Subaru	Forester	SUV(4x4)	SF5-050766	H.B. Port Services	Y
70	Mitsubishi	Legnum	Hatch	EA1W-0100590	H. B. Port Services	Y
71	Mitsubishi	Diamante	Sedan	F31A-0103169	H.B. Port Services	Y
72	Subaru	Legacy	Hatch	BH5-006997	H.B. Port Services	N
73	Daihatsu	Storia	Hatch	M100S-003521	H.B Port services	Y
74	Nissan	Primera	Sedan	P11-015321	H. B. Port Services	Y
75	Toyota	Caldina	Sedan	ST195-5022126	H. B. port Services	Y
76	Renault	Scenic	Hatch	VF1JA130225396525	H. B. Port Services	Y
78	Honda	CR-V	SUV(4x4)	RD1-5002590	Shed 10	Y
79	Isuzu	Bighorn	SUV(4x4)	UER25FW-4110271	Shed 10	N
80	Toyota	Cavalier	Sedan	TJG00-X004401	V.S.S.	Y
81	Nissan	Wingroad	Sedan	WFY10-172790	V.S.S.	Y

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
82	Mitsubishi	Delica	Van	PE8W-0118680	V.S.S.	Y
83	Honda	Logo	Hatch	GA3-3064746	V.S.S.	N
84	Mitsubishi	Legnum	Hatch	EA1W-5103789	V.S.S.	Y
85	Toyota	Estima Lucida	Van	TCR21-0063323	V.S.S.	Y
86	Mazda	Capella	Hatch	GWEW-105902	V.S.S.	N
87	Nissan	Pulsar	Sedan	FN15-431308	V.S.S.	N
88	Nissan	Terrano	SUV(4x4)	JRR50-005559	V.S.S.	N
89	Toyota	Prado	SUV(4x4)	KZJ95-0014066	V.S.S.	N
90	Toyota	Carib	Hatch	AE115-0045411	V.S.S.	Y
91	Nissan	Blubird	Sedan	EU14-609259	V.S.S.	Y
92	Toyota	Windom	Sedan	MCV21-0012920	V.S.S.	N
93	Honda	Odyssey	Van	RA1-1059641	V.S.S.	Y
94	Mitsubishi	Lancer	Hatch	CS5W-0203870	V.S.S.	N
95	Toyota	Sprinter	Hatch	AE115-0020335	V.S.S.	N
96	Honda	Civic	Hatch	EK2-1009069	V.S.S.	Y
97	Mazda	Capella	Station wagon	GVEW-100075	V.S.S.	Y
98	Mazda		Truck	WGLAD-123902	Onyx wash bay	N
99	Toyota	Townace	Truck	CM51-0022588	Onyx wash bay	Y
100	Honda	Inspire	Sedan	UA2-1028061	H.B port services	N
101	Nissan	Sunny	Sedan	FB14-399116	H.B port services	N
102	Mitsubishi	Pajero	SUV(4x4)	H57A-5000297	H. B. Port Services	N
103	Honda	Odyssey	Van	RA1-1132079	Shed 10	N
104	Toyota	Emina	Van	TCR10-1356116	Shed 10	N
105	Toyota	Harrier	SUV(4x4)	MCU15-0001845	Shed 10	N
106	Toyota	RAV-4	SUV(4x4)	SXA10-0087026	Shed 10	N
107	Mitsubishi		Sedan	DA2A-0503695	Shed 10	N
108	Honda	Accord	Sedan	CF4-1026030	Shed 10	N
109	Mitsubishi	Fuso	Truck	FH217E-501012	Onyx wash bay	Y

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
110	Toyota	Toyoace	Truck	LY211-0004283	Onyx wash bay	Y
111	Honda	CR-V	SUV(4x4)	RD1-1060581	Shed 10	N
112	Honda	Odyssey	Van	RA3-1030184	Shed 10	Y
113	Toyota	Raum	Hatch	EXZ10-0037993	H.B. Port Services	N
114	Subaru	Legacy	Hatch	GF8-020787	H.B. Port Services	N
115	Toyota	Hilux	SUV(4x4)	KZN130-9025557	H.B. Port Services	N
116	Honda	Odyssey	Van	RA1-1143768	H.B. Port Services	N
117	Toyota	Celica	Hatch	ST202-0103968	H. B. Port Services	Y
118	Toyota	Ipsum	Van	SXM10-7057276	H.B. Port Services	N
119	Toyota	Estima	Sedan	ACR40-0025638	H.B. Port Services	Y
120	Toyota	Granvia	Van	KCH10-0007047	H.B. Port Services	N
121	Mitsubishi	Legnum	Hatch	EA1W-5103177	H.B. Port Services	Y
122	Nissan	Presea	Sedan	R11-104679	H.B. Port Services	Y
123	Toyota	Landcruiser	SUV(4x4)	KIWIUB01FBAK0024	Shed 10	Y
124	Nissan	Mistral	SUV(4x4)	KR20-603968	Shed 10	Y
125	Mazda	Demio	Hatch	DW5W-204335	Shed 10	Y
126	Nissan	Sunny	Sedan	FB14-420116	H. B. Port Services	Y
127	Toyota	Levin	Sedan	AE110-5058925	H.B. Port Services	Y
128	Subaru	Impreza	Sedan	GC1-022207	H. B. Port Services	Y
129	Toyota	Starlet	Hatch	EP91-0394465	Shed 10	Y
130	Toyota	RAV-4	SUV(4x4)	SXA11-7053792	Shed 10	Y
131	Mitsubishi	Galant	Sedan	EA1A-0009185	H.B. Port Services	Y
132	Toyota	Corolla	Sedan	AE101-0202436	H.B. Port Service	Y
133	Mitsubishi	Legnum	Station wagon	EC5W-0015691	Shed 10	Y
134	Honda	Odyssey	Van	RA5-1100332	Shed 10	N
135	Mazda	Capella	Station wagon	GW8W-105317	Shed 10	N
136	BMW	318	Hatch	WBACG62030AL11339	Shed 10	N
137	Toyota	Mark2	Sedan	JZX110-6035580	H.B. Port Services	N

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
138	Toyota	Hilux	SUV(4x4)	KZN130-9029642	H.B. Port Services	N
139	Toyota	Starlet	Hatch	EP91-0376304	Shed 10	Y
140	Toyota	Altezza	Sedan	GXE10-0006188	Shed 10	N
141	Toyota	Starlet	Hatch	EP91-0115314	Shed 10	N
142	Subaru	Legacy	Station wagon	BH5-039485	Shed 10	N
143	Subaru	Impreza	Station wagon	GF4-011592	H. B. Port Services	Y
144	Honda	Inspire	Sedan	UA2-1105417	H.B. Port Services	Y
145	Nissan	Skyline	Sedan	HR33-108493	Shed 10	N
146	Subaru	Legacy	Sedan	BE5-066426	Shed 10	N
147	Honda	CR-V	SUV(4x4)	RD1-1097136	H. B. Port Services	Y
148	Nissan	Avenir	Station wagon	PNW11-006227	H. B. Port Services	N
149	Toyota	Ipsum	Van	ACM21-5013837	H. B. Port Services	N
150	Toyota	Levin	Sedan	AE111-5056323	H. B. Port Services	N
151	Toyota	Funcargo	Hatch	NCP21-0027260	H. B. Port Services	N
152	Toyota	Vitz	Hatch	NCP10-0184833	H. B. Port Service	N
153	Isuzu	Mu	SUV(4x4)	UCS69DW-7109142	Shed 10	N
154	Honda	Inspire	Sedan	UA2-1032006	Shed 10	Y
155	Subaru	Forrester	Station wagon	SF5-008911	Shed 10	N
156	Nissan	Primera	Sedan	P11-007693	H. B. Port Services	N
157	Mazda	Demio	Hatch	DW5W-145471	Shed 10	N
158	Nissan	Sunny	Sedan	FB14-414832	Shed 10	Y
159	Mazda	Atenza	Sedan	GGES-101186	Shed 10	N
160	Honda	Torneo	Sedan	CF4-1001600	H. B. Port Services	N
161	Toyota	Hilux	SUV(4x4)	RZN185-0007753	H. B. Port Services	N
162	Suzuki	Cultus	Hatch	GC21W-108053	H. B. Port Services	N
163	Mitsubishi	Delica	Van	PD8W-0018284	H. B. Port Services	N
164	Subaru	Legacy	Station wagon	BG5-286514	H. B. Port Services	Y
165	Toyota	Caldina	Station wagon	ST191-0120371	H. B. Port Services	N

Study reference number	Make	Model	Vehicle type	VIN_number/other ID No.	Survey site	Contaminant found
166	Nissan	Prairie	Station wagon	PM11-022291	H. B. Port Services	N
167	Honda	Accord	Sedan	CF6-1010544	Shed 10	N
168	Honda	Civic	Hatch	EK3-1016993	Shed 10	Y
169	Toyota	Hiace	Van	LH103-1028528	Shed 10	Y
170	Toyota	Hiace	Van	LH162-0011077	Shed 10	N
171	Toyota	Caldina	Station wagon	ST191-4038187	Shed 10	N

Appendix 2 Contamination found in vehicles and machinery

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
15/06/00	Morning Breeze	WBABF22030JA72708	BMW	320i	Sedan	Cobwebs	Front bumper - inside
15/06/00	Morning Breeze	WBABF22030JA72708	BMW	320i	Sedan	Dried leaves	Sills
15/06/00	Morning Breeze	WBABF22030JA72708	BMW	320i	Sedan	Soil	Sills
11/04/05	Prince of Streams	FK335C-553594	Mitsubishi		Water Tanker	Soil	Cross members
11/04/05	Prince of Streams	FK335C-553594	Mitsubishi		Water Tanker	Dry straw	Front grill
11/04/05	Prince of Streams	FK335C-553594	Mitsubishi		Water Tanker	Soil	Rear dual tyres
11/04/05	Planet Ace	GC8-064142	Subaru	Impreza	Sedan	Live spider	Inside chassis
11/04/05	Plant Ace	HR33-084182	Nissan	Skyline	Sedan	Cobwebs	Rear arches
11/04/05	Plant Ace	ST207-0004695	Toyota	Curren	Sedan	Moth	Radiator
11/04/05	Plant Ace	ST207-0004695	Toyota	Curren	Sedan	Cobwebs	Rear arches
11/04/05	Plant Ace	ST207-0004695	Toyota	Curren	Sedan	Spider	Rear arches
11/04/05	Plant Ace	UBS69GW-7274255	Isuzu	Bighorn	SUV(4x4)	Cobwebs	Inside chassis
11/04/05	Plant Ace	UBS69GW-7274255	Isuzu	Bighorn	SUV(4x4)	Cobwebs	Rear axle
12/04/05	Trans Pacific 3	FE517BD-403686	Mitsubishi		Truck	Dried leaves	Inside chassis
13/04/05	Scottish Star	LR50-011997	Nissan	Terrano	SUV(4x4)	Soil	Inside chassis
18/04/05	Trans Pacific 3	04934	Iseki			Soil	Above differential housing
18/04/05	Trans Pacific 3	04934	Iseki		Machine	Soil	Rear wheels
18/04/05	Trans Pacific 3	51900	Yanmar	F255	Machine	Grasses, wheat	Both front wheels
18/04/05	Trans Pacific 3	51900	Yanmar	F255	Machine	Soil	Both front wheels
18/04/05	Trans Pacific 3	51900	Yanmar	F255	Machine	Soil	Engine bay
18/04/05	Trans Pacific 3	51900	Yanmar	F255	Machine	Buds	Inside towing pipe
18/04/05	Trans Pacific 3	87X01355	Caterpillar	826	Machine	Soil	Both front wheels
18/04/05	Trans Pacific 3	87X01355	Caterpillar	826	Machine	Soil	In front of drive shaft
18/04/05	Trans Pacific 3	87X01355	Caterpillar	826	Machine	Clay	Under control panel

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
18/04/05	Trans Pacific 3	CAT77B				Moth	Above oil sump
18/04/05	Trans Pacific 3	CAT77B				Cobwebs	Rear dual tyres
18/04/05	Trans Pacific 3	yn-28619	Kobelco	SK200	Machine	Soil	Cab
18/04/05	Trans Pacific 3	yn-28619	Kobelco	SK200	Machine	Soil	Inside Tracks
18/04/05	Trans Pacific 3	yn-28619	Kobelco	SK200	Machine	Soil	Turret mount
20/04/05	Magic Wind	BE5-039348	Subaru	Legacy	Sedan	Soil	Inside side pillars
20/04/05	Magic Wind	BE5-039348	Subaru	Legacy	Sedan	Dried leaves	Radiator
20/04/05	Magic Wind	BE5-039348	Subaru	Legacy	Sedan	Seeds	Radiator
20/04/05	Magic Wind	FB14-391693	Nissan	Sunny	Sedan	Buds	Front bumper - inside
20/04/05	Magic Wind	FB14-391693	Nissan	Sunny	Sedan	Cobwebs	Front bumper - inside
20/04/05	Magic Wind	FB14-391693	Nissan	Sunny	Sedan	Cobwebs	Inside chassis
20/04/05	Magic Wind	FB14-391693	Nissan	Sunny	Sedan	Cobwebs	Sills
20/04/05	Magic Wind	RR50-004349	Toyota	Terrano	SUV(4x4)	Soil	In front of gear box
20/04/05	Magic Wind	RR50-004349	Toyota	Terrano	SUV(4x4)	Soil	Panel - front left
20/04/05	Magic Wind	RR50-004349	Toyota	Terrano	SUV(4x4)	Soil	Rear arches
20/04/05	Magic Wind	SXM10-0016474	Toyota	Ipsun	Van	Soil	Cross members
20/04/05	Magic Wind	SXM10-0016474	Toyota	Ipsun	Van	Cobwebs	Inside chassis
20/04/05	Magic Wind	SXM10-0016474	Toyota	Ipsun	Van	Soil	Panel - front right
21/04/05	Astral Ace	WBAAM52020FK83482	BMW	328i	Sedan	Dry leaf	Engine bay
22/04/05	Trans Future 3	FG437E-490075	Mitsubishi	Canter	Truck	Cobwebs	Cab
22/04/05	Trans Future 3	KZN130-9024151	Toyota	Landcruiser	SUV(4x4)	Cobwebs	Inside chassis
26/04/05	Trans Pacific 8	F41A-0400618	Mitsubishi	Diamante	Sedan	Pine needles	Panel - front right
26/04/05	Trans Pacific 8	FS517VY500093	Mitsubishi		Truck	Dried leaves	Under pedals
27/04/05	Wild Lotus	CM87HE-44488	Nissan	Condor	Truck	Seeds	Deck struts
27/04/05	Wild lotus	CM87HE-44488	Nissan	Condor	Truck	Dried leaves	Interior - behind glove box
27/04/05	Wild lotus	CM87HE-44488	Nissan	Condor	Truck	Gravel and sand	Interior - behind glove box
28/04/05	Prominent Ace	A32-042986	Nissan	Cefiro	Sedan	Feather	Radiator
28/04/05	Prominent Ace	A32-042986	Nissan	Cefiro	Sedan	Seeds	Radiator
28/04/05	Prominent Ace	DA2A-0505596	Mitsubishi	Diamante	Sedan	Dried leaves	Around petrol tank
28/04/05	Prominent Ace	DA2A-0505596	Mitsubishi	Diamante	Sedan	Seeds	Around petrol tank

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
28/04/05	Prominent Ace	DA2A-0505596	Mitsubishi	Diamante	Sedan	Webs	Around petrol tank
28/04/05	Prominent Ace	DW3W-726187	Mazda	Demio	Van	Sand	Cross members
28/04/05	Prominent Ace	DW3W-726187	Mazda	Demio	Van	Cobwebs	Inside chassis
28/04/05	Prominent Ace	DW3W-726187	Mazda	Demio	Van	Dried plant material	Inside chassis
28/04/05	Prominent Ace	EK2-1009069	Honda	Civic	Hatch	Gravel	Sills - left hand side
28/04/05	Prominent Ace	EP91-0090663	Toyota	Starlet	Hatch	Dried leaves	Front wheel arches
28/04/05	Prominent Ace	EP91-0090663	Toyota	Starlet	Hatch	Soil	Front wheel arches
28/04/05	Prominent Ace	FE437C-540292	Mitsubishi	Canter	Truck	Live spider	Deck rails - inside
28/04/05	Prominent Ace	HV35-201779	Nissan	Skyline	Sedan	Dried leaves	Engine bay
28/04/05	Prominent Ace	HV35-201779	Nissan	Skyline	Sedan	Dried leaves	Inside side pillars
28/04/05	Prominent Ace	HV35-201779	Nissan	Skyline	Sedan	Dried leaves	Sills
28/04/05	Prominent Ace	KCH10-000719	Toyota	Grandvia	Van	Cobwebs	Above exhaust pipe
28/04/05	Prominent Ace	KCH10-000719	Toyota	Grandvia	Van	dead insects	Above exhaust pipe
28/04/05	Prominent Ace	KCH10-000719	Toyota	Grandvia	Van	Cobwebs	Inside chassis
28/04/05	Prominent Ace	KCH10-000719	Toyota	Grandvia	Van	Seeds	Inside chassis
28/04/05	Prominent Ace	SCP11-0025798	Toyota	Platz	Sedan	Cobwebs	Bonnet - inside
28/04/05	Prominent Ace	SCP11-0025798	Toyota	Platz	Sedan	Cobwebs	Engine bay
28/04/05	Prominent Ace	SCP11-0025798	Toyota	Platz	Sedan	Egg sacs	Panel - both front
28/04/05	Prominent Ace	SCP11-0025798	Toyota	Platz	Sedan	Live spiders	Panel - both front
28/04/05	Prominent Ace	SCP11-0025798	Toyota	Platz	Sedan	Fresh leaves	Rear arches
28/04/05	Prominent Ace	SXM15-0011107	Toyota	Ipsum	Van	Fresh leaves	Sills
28/04/05	Prominent Ace	SXM15-0011107	Toyota	Ipsum	Van	Soil	Sills
28/04/05	Prominent Ace	TCR21-0063323	Toyota	Estima Lucida	Van	Dry leaves	Cross members
28/04/05	Prominent Ace	TCR21-0063323	Toyota	Estima Lucida	Van	Pine needles	Cross members
28/04/05	Prominent Ace	TCR21-0063323	Toyota	Estima Lucida	Van	Seeds	Front wheel arches
3/05/05	Kiwi Breeze	BGD21-601570	Nissan	Navara	Ute	Cobwebs/seeds	interior vents/ int. pillars
3/05/05	Kiwi Breeze	BGD21-601570	Nissan	Navara	Ute	Cobwebs	Rear bumper - inside
3/05/05	Kiwi Breeze	BGD21-601570	Nissan	Navara	Ute	Cobwebs	Sills - left hand side
3/05/05	Kiwi Breeze	CM51-0022588	Toyota	Townace	Truck	Dried leaves	Front bumper - inside
3/05/05	Kiwi Breeze	CM51-0022588	Toyota	Townace	Truck	Seeds	Front bumper - inside

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
3/05/05	Kiwi Breeze	FB51AB-563380	Mitsubishi	Canter	Truck	Cobwebs	Strut edge, inside
3/05/05	Crown Emerald	FB70AB-597288	Mitsubishi	Canter	Truck	Pollen/spores	Struts under deck
3/05/05	Crown Emerald	LVLW-105076	Mazda	MPV	Van	Pine needles	Both front wheels
3/05/05	Crown Emerald	LVLW-105076	Mazda	MPV	Van	Sand	Panel - front right
3/05/05	Crown Emerald	SALLJRMM3VA555879	Landrover	Discovery	SUV(4x4)	Cobwebs	Sills
3/05/05	Crown Emerald	SARRTCLTKWD267563	Rover	400	Sedan	Soil	Inside side pillars
8/05/05	Maersk Sun	N73W-0001083	Mitsubishi	RVR	SUV(4x4)	Cobwebs	Inside chassis
8/05/05	Maersk Sun	N73W-0001083	Mitsubishi	RVR	SUV(4x4)	Fresh leaves	Inside side pillars
8/05/05	Maersk Sun	N73W-0001083	Mitsubishi	RVR	SUV(4x4)	Soil	Rear arches
8/05/05	Maersk Sun	N73W-0001083	Mitsubishi	RVR	SUV(4x4)	Sand	Sills
8/05/05	Maersk Sun	RA2-1009928	Honda	Odyssey	Van	Cobwebs	Above exhaust pipe
8/05/05	Maersk Sun	RA2-1009928	Honda	Odyssey	Van	Seeds	Above exhaust pipe
8/05/05	Maersk Sun	RA2-1009928	Honda	Odyssey	Van	Dried leaves	Radiator
8/05/05	Maersk Sun	RA2-1100687	Honda	Odyssey	Van	Dead insects	Interior - under seats
8/05/05	Maersk Sun	RA2-1100687	Honda	Odyssey	Van	Seeds	Interior - under seats
8/05/05	Maersk Sun	VF1JA130225396525	Renault	Scenic	Hatch	Egg sacs	Front bumper - inside
8/05/05	Maersk Sun	VF1JA130225396525	Renault	Scenic	Hatch	Live spider	Front bumper - inside
8/05/05	Maersk Sun	WVWZZZ9CZYM641951	VW	Beetle	Sedan	Dried leaves	Engine bay
8/05/05	Maersk Sun	WVWZZZ9CZYM641951	VW	Beetle	Sedan	Soil	Sills
11/05/05	Oriental Phoenix	AE115-0045411	Toyota	Carib	Hatch	Dried leaves	Front and rear arches
11/05/05	Oriental Phoenix	AE115-0045411	Toyota	Carib	Hatch	Egg sacs	Front and rear arches
11/05/05	Oriental Phoenix	AE115-0045411	Toyota	Carib	Hatch	Sand	Front and rear arches
11/05/05	Oriental Phoenix	AE115-0045411	Toyota	Carib	Hatch	Gravel and sand	Sills
11/05/05	Nele Maersk	EA1W-0100590	Mitsubishi	Legnum	Hatch	Dried leaves	Panel - both front
11/05/05	Nele Maersk	EA1W-0100590	Mitsubishi	Legnum	Hatch	Dried leaves	Sills - right hand side
11/05/05	Oriental Phoenix	EA1W-5103789	Mitsubishi	Legnum	Hatch	Dried leaves	Engine bay
11/05/05	Oriental Phoenix	EA1W-5103789	Mitsubishi	Legnum	Hatch	Pine needles	Engine bay
11/05/05	Oriental Phoenix	EA1W-5103789	Mitsubishi	Legnum	Hatch	Dried leaves	Rear arches
11/05/05	Oriental Phoenix	EA1W-5103789	Mitsubishi	Legnum	Hatch	Cobwebs	Sills - right hand side
11/05/05	Oriental Phoenix	EA1W-5103789	Mitsubishi	Legnum	Hatch	Seeds	Sills - right hand side

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
11/05/05	Oriental Phoenix	EU14-609259	Nissan	Bluebird	Sedan	Grasses, wheat	C.V. joint
11/05/05	Oriental Phoenix	EU14-609259	Nissan	Blubird	Sedan	Dried leaves	Front wheel arches
11/05/05	Nele Maersk	F31A-0103169	Mitsubishi	Diamante	Sedan	Dried leaves	Engine bay
11/05/05	Nele Maersk	F31A-0103169	Mitsubishi	Diamante	Sedan	Dried leaves	Rear arches
11/05/05	Nele Maersk	F31A-0103169	Mitsubishi	Diamante	Sedan	Soil	Rear arches
11/05/05	Chang Kun	M100S-003521	Daihatsu	Storia	Hatch	Dried leaves	Sills - right hand side
11/05/05	Nele Maersk	P11-015321	Nissan	Primera	Sedan	Pine needles	Engine bay
11/05/05	Nele Maersk	P11-015321	Nissan	Primera	Sedan	Pine needles	Rear arches
11/05/05	Oriental Phoenix	RA1-1059641	Honda	Odyssey	Van	Dried grass	Both front wheels
11/05/05	Oriental Phoenix	RA1-1059641	Honda	Odyssey	Van	Soil	Both front wheels
11/05/05	Oriental Phoenix	RD1-5002590	Honda	CR-V	SUV(4x4)	Cobwebs	Bonnet - inside
11/05/05	Oriental Phoenix	RD1-5002590	Honda	CR-V	SUV(4x4)	Dried leaves	Front bumper - inside
11/05/05	Oriental Phoenix	RD1-5002590	Honda	CR-V	SUV(4x4)	Dried leaves	Front wheel arches
11/05/05	Chang Kun	SF5-050766	Subaru	Forester	SUV(4x4)	Soil	Panel - front left
11/05/05	Nele Maersk	ST195-5022126	Toyota	Caldina	Sedan	Dried leaves	Engine bay
11/05/05	Nele Maersk	ST195-5022126	Toyota	Caldina	Sedan	Dried leaves	Interior - behind glove box
11/05/05	Nele Maersk	ST202-0103968	Toyota	Celica	Hatch	Dried leaves	Engine bay
11/05/05	Oriental Phoenix	TJG00-X004401	Toyota	Cavalier	Sedan	Wheat	Front bumper
11/05/05	Oriental Phoenix	TJG00-X004401	Toyota	Cavalier	Sedan	Dried leaves	Front wheel arches
11/05/05	Oriental Phoenix	WFY10-172790	Nissan	Wingroad	Sedan	Sand	Rear bumper - inside
19/05/05	Trans Pacific 6	GVEW-100075	Mazda	Capella	Station wagon	Dried leaves	Front and rear arches
19/05/05	Trans Pacific 6	GVEW-100075	Mazda	Capella	Station wagon	Sand	Rear arches
25/05/05	Knud Lauritzen	LY211-0004283	Toyota	Toyoace	Truck	Dried twigs	Spare tyre
25/05/05	Knud Lauritzen	RA3-1030184	Honda	Odyssey	Van	Live spider	Front wheel arches
25/05/05	Knud Lauritzen	RA3-1030184	Honda	Odyssey	Van	Dried leaves	Rear bumper - inside
25/05/05	Trans Pacific 12	FH217E-501012	Mitsubishi	Fuso	Truck	Dried leaves	Deck rails - inside
25/05/05	Trans Pacific 12	FH217E-501012	Mitsubishi	Fuso	Truck	Dried leaves	Interior - behind glove box
27/05/05	Trans Pacific 3	EA1W-5103177	Mitsubishi	Legnum	Hatch	Pine needles	Front wheel arches
31/05/05	Nicoline Maersk	GF4-011592	Subaru	Impreza	Station wagon	Soil	Sills
31/05/05	Nicoline Maersk	R11-104679	Nissan	Presea	Sedan	Dried leaves	Front and rear arches

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
31/05/05	Nicoline Maersk	R11-104679	Nissan	Presea	Sedan	Gravel	Front and rear arches
31/05/05	Nicoline Maersk	R11-104679	Nissan	Presea	Sedan	Cobwebs	Panel - front left
31/05/05	Nicoline Maersk	R11-104679	Nissan	Presea	Sedan	Pine needles	Sills - left hand side
31/05/05	Nicoline Maersk	R11-104679	Nissan	Presea	Sedan	Sand	Sills - left hand side
1/06/05	Nippon Highway	AE101-0202436	Toyota	Corolla	Sedan	Sand	Front bumper - inside
1/06/05	Nippon Highway	AE110-5058925	Toyota	Levin	Sedan	Dried plant material	Panel - front left
1/06/05	Nippon Highway	EA1A-0009185	Mitsubishi	Galant	Sedan	Soil	Front wheel arches
1/06/05	Nippon Highway	EC5W-0015691	Mitsubishi	Legnum	Station wagon	Dried leaves	Panel - front left
1/06/05	Nippon Highway	EC5W-0015691	Mitsubishi	Legnum	Station wagon	Soil	Panel - front left
1/06/05	Nippon Highway	EP91-0376304	Toyota	Starlet	Hatch	Pine needles	Front wheel arches
1/06/05	Nippon Highway	KR20-603968	Nissan	Mistral	SUV(4x4)	Sand	Front wheel arches
1/06/05	Nippon Highway	KR20-603968	Nissan	Mistral	SUV(4x4)	Soil	Front wheel arches
2/06/05	Hoegh Trubadour	KIWIUB01FBAK0024	Toyota	Landcruiser	SUV(4x4)	Pine needles	Panel - front right
2/06/05	Trans Future 3	ACR40-0025638	Toyota	Estima	Sedan	Soil	Sills - left hand side
7/06/05	Maersk Cloud	DW5W-204335	Mazda	Demio	Hatch	Dried leaves	Engine bay
7/06/05	Maersk Cloud	DW5W-204335	Mazda	Demio	Hatch	Pine needles	Engine bay
8/06/05	Magic Wave	HR33-108493	Nissan	Skyline	Sedan	Egg sacs	Rear bumper - inside
8/06/05	Magic Wave	UA2-1032006	Honda	Inspire	Sedan	Dried leaves	Front wheel arches
8/06/05	Magic Wave	UA2-1032006	Honda	Inspire	Sedan	Soil	Front wheel arches
9/06/05	Trans Pacific 8	RD1-1097136	Honda	CR-V	SUV(4x4)	Egg sacs	Rear arches
9/06/05	Trans Pacific 8	RD1-1097136	Honda	CR-V	SUV(4x4)	Cobwebs	Rear bumper - inside
9/06/05	Trans Pacific 8	RD1-1097136	Honda	CR-V	SUV(4x4)	Cobwebs	Sills
9/06/05	Trans Pacific 8	RD1-1097136	Honda	CR-V	SUV(4x4)	Sand	Sills
13/06/05	World Glory	BG5-286514	Subaru	Legacy	Station wagon	Egg sacs	Panel - front right
13/06/05	Haul Tropicana	FB14-414832	Nissan	Sunny	Sedan	Dried leaves	Boot
13/06/05	Haul Tropicana	FB14-414832	Nissan	Sunny	Sedan	Hair/fur	Under handbrake cover
13/06/05	World Glory	FB14-420116	Nissan	Sunny	Sedan	Pine needles	Inside side pillars
13/06/05	World Glory	GC1-022207	Subaru	Impreza	Sedan	Pine needles	Above exhaust pipe
21/06/05	Polar Chile	LH103-1028528	Toyota	Hiace	Van	Cobwebs	Behind Rear Mudguard
21/06/05	Polar Chile	LH103-1028528	Toyota	Hiace	Van	Seeds	Behind Rear Mudguard

Arrival date	Vessel name	VIN_number	Make	Model	Vehicle type	Type of Cont.	Location
21/06/05	Polar Chile	LH103-1028528	Toyota	Hiace	Van	Roots	Front bumper - inside
21/06/05	Polar Chile	LH103-1028528	Toyota	Hiace	Van	Sand	Rear bumper - inside
22/06/05	Fugaku Maru	EK3-1016993	Honda	Civic	Hatch	Cobwebs	Right Suspension Column
22/06/05	Fugaku Maru	EK3-1016993	Honda	Civic	Hatch	Dried grass	Right Suspension Column
7/07/05	Saronic Bay	FU415N-540026	Mitsubishi	FU415N	Truck	Cobwebs	In front of gear box
7/07/05	Saronic Bay	FU415N-540026	Mitsubishi	FU415N	Truck	Dried leaves	In front of gear box

Appendix 3 *Species list*

Identified at date of writing:

Species	Common name	Location
<i>Latrodectus geometricus</i>	Brown Widow	Renault Scenic Hatchback, Inside front bumper
Badumna sp	Black house spider	Mitsubishi Canter, Deck rails
Badumna sp	Black house spider	Subaru Impreza, Inside chassis rails
Baudmna sp	Black house spiders	Toyota Platz, sedan, Inside both front body panels

Unidentified at time of writing:

Species	Common name	Location
---	Egg sac	Toyota Carib Hatchback, Front and rear wheel arches
---	Egg sac	Renault Scenic Hatchback, Inside front bumper
---	Egg sac	Toyota Platz Sedan, Inside both front body panels
---	Egg sac	Subaru Legacy Station wagon, Inside front right panel
---	Egg sac	Honda CRV SUV 4X4, Rear arch
---	Egg sac	Nissan Skyline, Inside rear bumper
Order Araneae	Spider	Honda Odyssey, Front wheel arches/suspension
Order Araneae	Spider	Toyota Curren saloon, Rear wheel arch/suspension
Class Chilopoda	Centipede	Under parked used imports on wharf, Possibly local
Family Tettigoniidae	Katydid	Under parked used imports on wharf, Possibly local
Order Blattoidea	Cockroach	Under parked used imports on wharf, Possibly local

Appendix 4 Representative videoscope photographs

- (1) Mud/plant material construction, possible pupal case?
- (2) Plant material
- (3) Spider, could not be caught
- (4) Spider egg sac attached to metal surface in chassis member
- (5) Spider egg sac within a silk covering
- (6) Spider within chassis member.

These illustrate the resolving quality of the tip CCD micro-camera and the field of view available to the operator.











