Assessment of the Health Risk of Venomous Spiders Associated with the Importation of Table Grapes

Te Kāwanatanga o Aotearoa
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Summary

This is an assessment of the potential public health impacts of venomous spiders (primarily *Latrodectus* taxa) in table grapes imported to New Zealand.

It assesses the potential human health risks from both (i) encountering spiders in table grapes and (ii) establishment of these spiders in New Zealand. It is intended to support the Ministry for Primary Industries to decide if it needs to adjust measures for venomous spiders on table grapes, based on whether the health impact is different now compared to 2002.

The current assessment focuses on *Latrodectus* species and three other spiders that could enter New Zealand with table grapes. Potential health impacts of venomous spiders from other genera are briefly discussed.

We conclude that based on the low level of post-border detection of *Latrodectus* species, current pre-border methods are sufficient to prevent the introduction of venomous spiders associated with imported table grapes. It is strongly suggested that import controls continue for imported table grapes and be extended to include additional species which pose a similar level of risk.

Background

Following the detection of black widow spiders in several shipments of imported grapes from California in 2000, the Ministry of Agriculture and Forestry (MAF) - now the Ministry for Primary Industries (MPI) - placed a temporary suspension on importation of table grapes from California pending a review of the risks associated with imported table grapes.

Following the review, MAF allowed California table grapes to be imported, subject to treatment measures to reduce the risks of venomous spiders being imported via this pathway. Despite the new measures, spiders continued to enter the country and trade was suspended in November 2001. A working group was then established with representation from the Ministry of Health, Department of Conservation (DOC) and MAF.

In September 2002, the Ministry of Health produced a report: *Health Impact Assessment Relating to Venomous Spiders Entering New Zealand in Association with Imported Table Grapes* (MoH 2002). The report concluded:

> *The individual health risk posed by post-border detections of black widow spiders warrants the imposition of further pre-border measures to maximise as far as possible the likelihood of these spiders being intercepted before crossing the border, and the implementation of post-border measures to mitigate the effects of any future post-border detections of spiders of public health significance on imported table grapes.*

Following a review of the information from the working group, a revised import health standard for table grapes from California was developed. The conclusion was that the risk to public health posed by spiders entering the country on imported grapes was moderately low and did not warrant the ongoing suspension of Californian imports, providing appropriate pre- and post-border measures were in place.

In 2023, MPI requested a review of the 2002 Health Impact Assessment, to support a reassessment of Import Health Standards for table grapes. This review focuses on *Latrodectus* (including some species not previously assessed), as these spiders pose the greatest potential health risk, but also includes other species of venomous spiders advised by MPI to be in countries exporting or proposing to export table grapes to New Zealand.

Hazard identification

Spiders play important roles in ecosystems; for example, they are predators of insects, such as flies, mosquitoes, mites and aphids.

Most spiders use venom to kill their prey. The venom is generally neurotoxic or cytotoxic. Neurotoxic venom can disrupt the communication between the nervous system and the muscles, causing paralysis. Cytotoxic venom affects cellular tissue, causing local or widespread tissue destruction. Most spiders use their venom to capture small invertebrates and so most spider venom bites are harmless to humans (Forster & Forster 1999). Some spiders have highly toxic venom, but their jaws are too small to bite humans. In other words, few of the estimated 100,000 species of spiders are dangerous to humans.

This report covers spiders that may be present in shipments of imported table grapes and are capable of causing envenomation, resulting in morbidity or mortality, in humans. Secondary infections can also arise from spider bites, where wounds can become infected with environmental bacteria in the absence of envenomation, however these secondary infections are out of scope for this assessment as such infections can arise from wounds generally.

Several members of the *Latrodectus* genus of spiders can inject venom that can cause illness or, in rare cases, death. These include the black widow and Australian redback spiders.

Latrodectus is a worldwide genus, with 34 known species. They are often referred to as the “widow-spiders”, with the black widow (native to North America) probably the best known. The Australian redback spider *L. hasselti* and the New Zealand katipō *L. katipo* are members of the *Latrodectus* genus.

This report includes the following *Latrodectus* species which are present in countries currently exporting or proposing to export table grapes to New Zealand:

- Australian redback (*Latrodectus hasselti*)
- Black widow spider (*Latrodectus mactans*)
- Brown widow spider (*Latrodectus geometricus*)
- Flame black widow *(Latrodectus elegans)*
- Mediterranean black widow (*Latrodectus tredecimguttatus*)
- Northern black widow (*Latrodectus variolus*)
- Red widow (*Latrodectus bishopi*)
- Western black widow spider (*Latrodectus hesperus*)
- White widow spider (*Latrodectus pallidus*)
- *Latrodectus erythromelas* (common name not found).

It also includes reference to three other spider species advised by MPI to be in countries of interest:

- Johnson Jumper (*Phidippus johnsoni*)

- Yellow sac spider (*Cheiracanthium inclusum*)
- Northern yellow sac spider (*Cheiracanthium mildei*).

Physical health effects

Envenomation occurs when venom (a mixture of multiple chemical constituents) is introduced into the body, usually from a bite or sting by a venomous animal. Not all bites from venomous spiders will result in clinical envenomation, which is a characteristic constellation of clinical signs and symptoms. The clinical envenomation syndrome associated with *Latrodectus* spiders is called latrodectism, and is generally considered the most clinically significant spider bite syndrome worldwide (Ryan et al. 2017). *Latrodectus* venom contains neurotoxins. One of these – α-latrotoxin – specifically affects mammals and is considered most likely to be responsible for the majority of the symptoms of latrodectism.

While latrodectism is seldom fatal (mortality rate <1%) (Isbister et al. 2008), it can cause significant morbidity, most notably persistent pain which can be severe and debilitating. Other common symptoms include nausea, vomiting, headache, malaise, lethargy and sweating. Both pain and other systemic effects can persist for hours to days after the bite.

The most severe complications of latrodectism include pulmonary oedema, severe hypertension, cardiac disturbance, renal damage and myocardial ischemia, but all of these are considered rare. Children, individuals with sickness (including co-morbidities such as high blood pressure or heart disease), and elderly are particularly susceptible to these effects.

Mental health effects

Arachnophobia, the fear of spiders, is relatively common, varying from mild disgust to a debilitating aversion. People suffering from arachnophobia do not always require the presence of the spider to cause a negative response. In many cases no negative associative learning event needs to occur to initiate arachnophobia nor does the fear of spiders appear to be associated with higher levels of anxiety trait or an increased disposition to fears in general (Vetter & Visscher 1998). Arachnophobia is a mental illness that belongs to the anxiety disorders (World Health Organization International Register of Diseases 2024).

Arachnophobia is likely to be the most widespread human fear related to animals, with an estimated prevalence between 3.5–11.4 per cent of the world population (Mammola et al. 2022). There are thought to be multiple factors influencing the development of a phobia including genetics, social/cultural beliefs, mainstream media and real-life events (Mammola et. al. 2022). Despite their reputation, very few spiders are dangerous to humans and reports by the media who often exaggerate the dangers of spider bites are out of proportion to the actual threat they pose.

This does not mean that the effects of such fears are negligible: in a 1995 study in Sydney of people with a self-identified fear of spiders, 26% said that their fear significantly interfered with their daily life or activities (Jones & Menzies 1995). As well as the generalised fear of spiders there is the more specific fear of venomous spider

bites, in relation to oneself, others and companion animals. Cats appear particularly sensitive to black widow spider bites (Peterson 2006).

There is insufficient information to be able to quantify the potential increase in mental illness that may be triggered by spider detections or establishment. There are significant economic and social costs associated with anxiety. Mental disorders are associated with significant physical and social disability and increased mortality.

Social impacts

It is difficult to quantify intrinsic value on the environment. Putting a dollar value on the physical impacts on human health may be calculated from factors such as cost of treatment, cost of targeted health promotion activities, cost of storing antivenoms, cost of illness monitoring systems, loss of income, or insurance payments for death or illness (NZIER 2000). However, this does not include intangible impacts including quality of life, changes to lifestyle, or anxiety experienced when a potential harm is introduced into an environment.

Most New Zealanders are not aware of and do not practice the behaviours required to avoid novel venomous spiders. Therefore, the introduction of new venomous spiders into New Zealand would have a social cost in required behaviour modifications to minimise the new risk as well as a financial cost relating to awareness programmes.

Cultural considerations

Māori have a close relationship with the natural environment. The mauri of land and water, and the whakapapa of flora and fauna not only express the human relationship with the natural world, but they are the building blocks of the Māori world view and Māori identity. The protection and conservation of te ao tūroa (the natural world) is a priority for many Māori, and Māori often describe their health as a reflection of the health of te ao tūroa. Introduced species are considered a threat to the environment and are a threat to te ao tūroa.

There is a strong connection between Māori culture and te taiao (natural environment). Kaumātua have expressed concerns over changes to the environment as a result of introduced species, for example the loss of indigenous ngahere (forest) and its replacement with pine, and the devasting effect of possums on taonga species (Apiti et al. 2003).

Introduced spider species also pose a negative cultural impact through their potential effects on the New Zealand's endemic *L. katipo,* which is threatened by introduced *Latrodectus* species by interbreeding and competitive displacement (Vink et al. 2011). Katipō are a taonga species, of cultural significance to many iwi. They are an indicator of dune ecosystem health. As such they are an indicator/taonga/focus species central to dune ecosystem restoration projects led by iwi across the motu (or projects involving participation, partnership, or active involvement) (e.g. Northland, Kaitorete Spit).

There is evidence that the katipō has 'existence value' to New Zealanders; katipō words and images are used in logos, trademarks and company names, and public warnings concerning the katipō tend to relate to avoiding them in order to protect the species rather than to protect human health.

Exposure assessment

Venomous spiders in New Zealand

New Zealand is home to an estimated 2,500 spider species (Forster & Forster 1999). Of the native species, large spiders such as the black tunnelweb spider (*Porrhothele antipodiana*) can deliver painful bites, but only the very much smaller katipō (*Latrodectus katipo*) is venomous (Forster & Forster 1999).

Of the introduced species present in New Zealand, only the Australian redback (*Latrodectus hasselti*) is capable of causing a clinically significant envenomation.

Katipō

The katipō (*Latrodectus katipo*) is the only venomous (to humans) endemic land animal in New Zealand. It is fully protected under Schedule 7 of the Wildlife Act 1953. It is a coastal species, dependent on intact sand dune ecosystems (Warren Chinn, pers comms, January 2024) in which it weaves small, tangled webs to catch insects. Katipō are rare in most areas of New Zealand and studies show an accelerating overall decline in katipō numbers. Katipō are a threatened species, classified as “at risk, declining” in the NZ Threat Classification list with some populations being locally extinct from many North Island beaches. This decline is primarily due to loss and deterioration of habitat and competition with introduced spider species.

The katipō is also threatened by hybridisation with the closely related Australian Redback Spider (*L. hasseltii*), which has been shown to exist in katipō populations in Gisborne/Tairāwhiti. This poses a possible extinction threat to the katipō.

The habitat of the katipō and its rarity in most areas mean few people encounter katipō bites. Of the 444 spider-related enquiries received by the National Poisons Centre since the beginning of 2000, six related to katipō spiders.

Reactions to katipō venom vary from discomfort through to difficulty in breathing and problems with the nervous system. However, fatalities are extremely rare. The last recorded death from a katipō bite occurred in 1901 (RNZ 2019). Australian redback antivenom has been used to treat katipō bites; however, use of antivenom is no longer recommended due to an unfavourable risk-benefit balance.

Redback spider

Redback spiders (*L. hasseltii*) were first reported in New Zealand in the early 1980s and are classified as ‘introduced and naturalised’ in the NZ Threat Classification System. From 1981 to February 2009, there were 54 reports of redback spiders in 37 locations throughout New Zealand (Vink et al. 2010) and there were 38 records of redbacks identified on iNaturalist NZ from 2008 to September 2024, with six of these in 2024 (iNaturalist NZ). A number of reports are from Central Otago (Bryan et al. 2015). Anecdotal reports suggest that any sightings of redback spiders resulted in the spiders (and colonies) being eradicated.

Redback spiders were intercepted at the New Zealand border over 136 times between February 1988 and July 2002 (MAF Biosecurity New Zealand, unpublished data). Between November 2002 and August 2005, eight interceptions were made in transitional facilities where uncleared imported goods were held and a further 40 interceptions were made in imports that had cleared quarantine (MAF Biosecurity New Zealand, unpublished data; AR Flynn personal communication). Redbacks have been most frequently intercepted with shipments of steel and have also been found in fresh produce such as grapes (Reed and Newland 2002) and in goods that are unpacked in warehouses then delivered to shops and homes.

Data from MPI on the number of interceptions and post-border reports of redback spiders from the fresh produce pathway from 2000 to 2024 show that a total of 21 redback spiders were reported. From this pathway 13 spiders were reportedly from Australia, 7 from USA, and 1 from Mexico.

The female Australian redback bite can cause serious illness, but since redback spiders rarely leave their webs, humans are unlikely to be bitten unless a body part such as a hand is put directly into the web. Like all spiders, redbacks do not always secrete venom when they bite, so not all spider bites will result in envenomation. Between 2017 and 2024 there were two cases of likely envenomation by redback spiders reported to the National Poisons Centre (Director National Poisons Centre, Pers comms, 2024).

In addition to the conservation impacts of redbacks on the hybridisation risk with katipō, as discussed above, redbacks are also known to feed on the endangered Cromwell chafer beetle in Central Otago (Bryan 2014).

White-tail spider

The white-tail spider (*Lampona murina*) is more common in New Zealand than the katipō and redback. It is often found in houses, including on the walls and ceilings. White-tail spiders will bite if provoked but in most cases the bite will cause little harm. White-tail spider bites are not considered venomous to humans (White 1999). However, there is a public perception, fuelled by media interest, that white-tail spiders pose a high risk to human health.
Most white-tail spider bites appear to cause little or no effect beyond transient local pain, redness, swelling and itchiness. However, in some cases the bite may become infected and painful, and rarely may form an ulcer. An Australian study has shown no evidence linking necrotic ulcers to white-tail spider bites (White & Weinstein 2014).

Current health burden from venomous spiders in New Zealand

Between 1 January 2017 and 31 December 2023, the National Poisons Centre (NPC) responded to 1,128 calls relating to reported spider bites (0.7% of all calls to the NPC). *Latrodectus* spiders were specifically mentioned 35 times although it is not possible to verify how many of these reports were from true *Latrodectus* spider bites. The NPC was consulted in two cases where patients had a clinical presentation consistent with envenomation by a *Latrodectus* species. One of these cases was a confirmed redback spider bite as the spider was captured. In the second case, the clinical symptoms were

consistent with envenomation, and the patient observed a black spider, however no spider was captured or photographed.

There has been an increase in contacts to NPC about reported spider bites from 2020 to 2023 as compared to 2017-2019. In late 2019, the Ministry of Health updated its website information about spider bites and included the NPC's 0800 764 766 number as a resource for further information, it is possible this influenced an increase in reporting of spider bites to NPC after 2020. (Director National Poisons Centre, pers comms 2024).

Between July 2016 and June 2023 there were five recorded hospitalisations related to contact with spiders or suspected spiders. Out of the five discharges, one was noted as being a "redback spider", one was noted as "white-tailed and other necrotising spiders", and the remaining three discharges were "unspecified".

NPC data on the age distribution of people with reported spider bites (Table 1) and the spider species concerned (Table 2) are provided below.

Table 1: The age distribution of patients with reported spider bites in contacts with the New Zealand National Poisons Centre.

Patient age; n (% of annual total)	2017	2018	2019	2020	2021	2022	2023	Total
0-5 years	13 (15%)	13 (16%)	13 (16%)	22 (10%)	24 (13%)	29 (12%)	33 (14%)	147 (13%)
6-12 years	4 (4%)	5 (6%)	6 (7%)	10 (5%)	11 (6%)	16 (7%)	18 (8%)	70 (6%)
13-19 years	2 (2%)	4 (5%)	3 (4%)	10 (5%)	7 (4%)	13 (5%)	16 (7%)	55 (5%)
20-64 years	38 (43%)	37 (45%)	45 (55%)	124 (59%)	98 (52%)	119 (49%)	127 (55%)	588 (52%)
65 years and older	5 (6%)	2 (2%)	5 (6%)	14 (7%)	19 (10%)	13 (5%)	15 (6%)	73 (6%)
Unknown child	2 (2%)	0 (0%)	1 (1%)	2 (1%)	4 (2%)	4 (2%)	4 (2%)	17 (2%)
Unknown Adult	23 (26%)	20 (24%)	9 (11%)	27 (13%)	24 (13%)	48 (20%)	19 (8%)	170 (15%)
Unknown Age	2 (2%)	1 (1%)	0 (0%)	2 (1%)	2 (1%)	1 (0%)	0 (0%)	8 (1%)
Total patients	89 (100%)	82 (100%)	82 (100%)	211 (100%)	189 (100%)	243 (100%)	232 (100%)	1,128 (100%)

Table 2: Reported spider species in bites in contacts with the New Zealand National Poisons Centre.

Reported/suspected spider species	2017	2018	2019	2020	2021	2022	2023	Total
Black tunnelweb spider (*Porrhothele antipodiana*)	2	3	-	2	2	1	1	11
Brown recluse spider (*Loxosceles reclusa*)*	1	-	-	-	-	-	-	1
Chilean recluse (*Loxosceles laeta*)**	-	1	-	-	-	-	-	1
Daddy long legs (*Pholcus phalangioides*)	1	-	-	1	3	-	1	6
False katipō spider (black cobweb spider; false widow spider; *Steatoda capensis*)	-	1	-	-	1	1	1	4
Katipō (*Latrodectus katipo*)	**1**	**3**	**4**	**3**	**4**	**9**	**5**	**29**
Redback spider (*Latrodectus hasselti*)	**1**	**1*** **	**1*** **	**-**	**1**	**1**	**1**	**6**
Slater spider (*Dysdera crocata*)	-	2	-	1	1	1	-	5
Swift ground spider (*Supunna picta*)	-	-	1	-	-	-	-	1
Vagrant spider (*Uliodon spp*)	-	-	-	1	-	-	-	1
White tailed spider (*Lampona murina, Lampona cylindrata*)	25	26	31	70	56	60	61	329
Unidentified spider	58	45	45	133	121	170	162	734
Total patients with suspected spider bites	**89**	**82**	**82**	**211**	**189**	**243**	**232**	**1,128**

*Patient bitten in the US 1 day prior. **Patient bitten in Chile 7 days prior. ***Identity apparently verified by third parties. 2018: Alexandra; 2019: Christchurch.

Venomous spiders associated with imported table grapes

Interception data provided by MPI has identified species of spiders that may be present in shipments of imported table grapes and are capable of causing envenomation, resulting in morbidity or mortality, in humans. We have included additional species from the same genera as advised by MPI, in countries from which we may potentially import table grapes in the future.

Latrodectus genus

Spiders from the *Latrodectus* genus that are present in countries currently exporting or proposing to export table grapes to New Zealand include:

- Australian redback (*Latrodectus hasselti*)
- Black widow (*Latrodectus mactans*)
- Brown widow spider *(Latrodectus geometricus*)
- Flame black widow *(Latrodectus elegans)*
- Mediterranean black widow (*Latrodectus tredecimguttatus*)
- Northern black widow (*L. variolus*)
- Red widow (*Latrodectus bishopi*)
- Western black widow (*L. hesperus*)
- White widow spider (*Latrodectus pallidus*)
- *Latrodectus erythromelas* (common name not found).

These species all have the potential to cause latrodectism and have different levels of venom. All have different ecology characteristics and traits.

Bites are infrequent because the spiders are timid and prefer to flee when disturbed. Widow spiders can bite humans when they accidentally become trapped against human skin (for example when a person reaches under objects where the spider is hiding or when they put on clothing, gloves or shoes containing the spider). It is mainly the females that bite: few bites are reported from immature black widows, whose short fangs may not penetrate the skin, or from males, who likewise have small venom glands and short fangs (Vetter & Visscher 1998).

The severity of the bite (latrodectism) depends on many factors including the age, size and sensitivity of the victim, location and depth of the bite, and when the spider last used venom. Pain is felt almost immediately after the bite, often increases for 1 to 3 hours after the bite, and can persist for 24 hours or longer. In severe cases, nausea and abdominal pain, large muscle spasms, elevation in body temperature and blood pressure, and profuse perspiration can develop.

Other species

The **Johnson jumping spider** (*Phidippus johnsoni*) mainly preys on flies but also preys heavily on other spiders. Most jumping spiders do not build webs, but spin silk for draglines and are known to inhabit well-lit places, so on bright days they can often be found perched on tree bark, blades of grass and other well-lit places. In cloudy or rainy weather, they may withdraw inside silken retreats (Buddle and Shorthouse 2000;

Professor Robert R Jackson, pers. Comm., July 2002). Jumping spiders may bite people if disturbed and give a painful, but not usually serious, bite.

Yellow sac spiders (*Cheiracanthium inclusum* and *C. mildei*) are commonly found outdoors in shrubbery, making silken retreats in curled leaves and are often found in homes where they spin silken sac webs in the corners of ceilings and walls, and behind shelves and pictures. They can be seen running on walls and ceilings at night and quickly drop to the floor to escape if they are disturbed. Bites usually occur when the spiders encounter sleeping humans and become trapped against a person's skin in clothing or bedding (Vetter and Visscher 1998). Yellow sac spiders can give painful bites that may cause necrotic lesions in those bitten.

Exposure pathways

Likelihood of entry without import controls

The import of table grapes to New Zealand between 2001 and 2016 had an increasing trend before declining between 2016 and 2020 before increasing again in 2021 (Figure 1). The largest volume of grapes imported in recent years comes from the US and Australia (Table 3).

Figure 1: New Zealand fresh table grapes imports by year (Source: https://www.indexmundi.com)

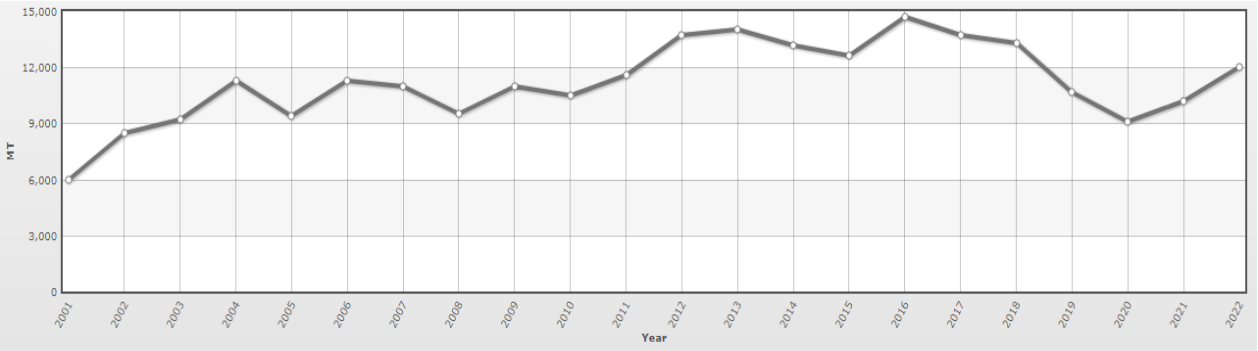

Table 3: Volume of grape imports by country of origin (Source: MPI Biosecurity New Zealand, pers. comm. October 2024)

Country	Typical import season	Volume imported (tonnes) January 2011–July 2024
Australia	January to June	46,699
Chile	January to June	21,464
South Korea	July to November	476
Mexico	June to August	6,683
Peru	October to February	7,191
USA	July to January	73,209

A hazard becomes a public health risk when there is human exposure to the hazard.

Prior to the implementation of effective import controls for spiders, it is noteworthy that live black widow spiders were detected in imported table grapes at retail outlets by supermarket staff and customers in New Zealand.

Post-border detections of spiders associated with table grape imports between January 2000 and February 2002 were:

- Australia: one Australian redback; life stage and life state unknown.
- California: at the time of the suspension of trade; one post-border detection each month for the four months prior to the suspension.
- Chile: one live adult female of the genus *Clubiona* (not identified to species).

In 2015 there were several reports of venomous spiders detected in grapes from Mexico with one of the spider discoveries made by a teacher at an early childhood education centre. The teacher told *The Wairoa Star* that as she was washing a bag of Mexican red seedless grapes, she noticed a live black spider tumble out and fall onto the chopping board. The spider was identified by MPI as a black widow (**Black widows in grapes | Stuff**).

Data from MPI (unpublished, 2023) shows spiders were found in imported table grapes from Australia, Chile, Mexico, Peru, South Korea and the United States on 45 occasions during the 2003 to 2023 period (after measures to manage spiders were implemented). Live spiderlings were found in only one of these incidents. Six of these interceptions were identified to species or genus level: *Achaearanea* spp; *Cheiracanthium* spp; *Pholcus* spp; *Oecobius navus; Orienticius vulpes; Trachelas pacificus*. None of these were of the *Latrodectus* genus.

Likelihood of establishment

Given that the climate, vegetation and soil conditions in New Zealand are similar to those of the countries exporting table grapes to New Zealand, the potential of these spider species establishing in New Zealand is high.

It is known for widow spider species to establish outside of their native habitats. The brown widow spider is an example of naturalisation outside of its native habitat of Africa, due to international trade to the Americas where it is now found in 30 of the 35 countries in North, Central and South America (Wahlberg et al. 2023). Whilst it poses a low risk to humans it is known to have an impact on local native ecosystems (Wahlberg et al. 2023).

Climate change indirectly affects human health due to changes to the environment and ecosystems, including expanded ranges for pests and diseases. The warming and drying of some areas of New Zealand may make these areas more suitable for the establishment of venomous species such as the invasive Australian redback spider (Royal Society Te Aparangi 2017).

Ongoing public exposure to venomous species such as widow spiders is a likely consequence of their establishment as they readily adapt to human altered environments.

International exposure estimates

Australia: There have been no deaths in Australia from a confirmed spider bite since 1979. A spider bite is not a notifiable medical emergency in Australia, but approximately 2000 people are bitten each year by redback spiders (Spider facts, 2022). In another report, over 3,500 Australians were hospitalised due to contact with a venomous animal or plant in 2017-18 and almost one-fifth were caused by spider bites (approximately 665 or 19%), with redbacks the most common spider involved (Pointer 2021).

United States: Around 1,530 cases of black widow spider bites are reported to poison centres each year (Holstege et al. 2023). On average, 42% of cases visited hospital emergency departments, 8% were admitted to hospital (non-critical care), and 2% to critical care. No deaths were reported (Holstege et al. 2023).

Vulnerable populations

In assessing the risk, it is important to consider the impact on vulnerable populations, including Māori, Pacific Peoples, children, the elderly, and individuals with disability or pre-existing medical conditions. Exposure pathways include direct contact with spiders.

The people most vulnerable to spider venom include the sick and elderly. Grapes are seen as a gift to deliver to the sick and to people in hospital and rest homes.

Children are at risk because of their smaller body mass and limited ability to detect and respond to exotic spiders in imported table grapes. The New Zealand Heart Foundation advocates for grapes as a suitable option for children aged 12 months to 2 years as grapes are considered a nutritious snack for children, and grapes are commonly given as a healthy food choice in households.

Additionally, live spiders in supermarkets present a risk to both staff and customers.

Risk assessment

Benefits of imported table grapes

Grapes are a popular fruit with many health benefits. The Ministry of Health recommends including vegetables and/or fruit at each mealtime and as snacks, and states that: *"…vegetables and fruit provide many beneficial nutrients such as vitamins, minerals, antioxidants and dietary fibre. They protect against conditions like heart disease, stroke and some cancers"* (Ministry of Health 2020).

Imported grapes contribute to the availability of access to fresh fruit, but such access would not significantly contribute to the Ministry's nutrition strategy, which calls for special recognition of the particular needs of Māori and population groups at high risk, such as Pacific peoples. Individuals consuming grapes were more likely to be from the New Zealand Deprivation Index (NZDep) quartile one (least deprived) areas than those from quartile 4 (most deprived and at greater risk of inadequate diet) areas (Ministry of Health 1999).

Risk characterisation

It is not possible to accurately quantify the risk of bites and envenomations and the associated social and health system burdens. Data from the country of origin could be understated for comparative purposes due to the population being used to spider avoidance behaviour, or may be overstated due to the diagnostic problems discussed. There is no method to extrapolate the number of spiders of public health concern that enter the country from the number that are actually intercepted.

The potential burden on public health and the public health system from post-border detections or establishment of spiders of public health significance includes:

- treatment of bites and their sequelae
- anxiety related to publicity about post-border detections of spiders or the presence of venomous spiders
- professional education campaigns
- accessing expert advice (medical and taxonomic)
- public awareness campaigns
- establishment of response plans.

Factors exacerbating the risk include:

- lack of relevant experience of health professionals in the identification of spider bites for appropriate treatment
- lack of systems in New Zealand for the rapid identification of exotic spiders
- lack of local learned avoidance behaviours increasing the risk of exposure and of bites.

Risk assessment

Of the species of spiders detected post-border multiple times from January 2000 to November 2001 in association with imported table grapes and considered to be of potential public health significance, the two black widow spiders (*Latrodectus mactans,* black widow spider and *Latrodectus hesperus* Western black widow spider) were found to be a public health hazard with the potential to cause significant morbidity or mortality. The other two *Latrodectus* spiders (brown widow spider and Australian redback) and the yellow sac spider were also found to be of public health significance. Johnson jumpers were found to be of little medical concern.

The impacts of *Latrodectus* spiders range from painful bites through to neurotoxic envenomation. Not all individuals who are bitten suffer symptoms beyond the initial bite and individuals who do suffer further symptoms usually recover in 3 to 5 days. However, children, individuals with underlying health conditions, the elderly, and those with high blood pressure or heart disease can be much more seriously affected.

Even in the country of origin of venomous spiders, health professionals have problems with accurate identification of the spiders, and with recognising when symptoms relate to spider bites at all. New Zealand does not have 'rapid response' taxonomic services, and the misidentification of spider bites can have serious consequences given that there are sometimes unpleasant and dangerous reactions to antivenoms.

Therefore, *Latrodectus* spiders pose a moderate health risk, bites would in some cases require medical intervention, and in a small number of cases the effects of bites could be severe, but they do not represent the scale of risk that is posed by, for example, insects capable of vectoring infectious diseases to humans (most notably mosquitoes).

Bunches of grapes provide good hiding places for spiders. Prior to import controls being put in place, all eight post-border detections of black widow spiders between January 2000 and November 2001 were in uncontrolled environments and these spiders are known to sometimes bite humans when they accidentally come into contact with human skin. Grapes are delivered unprocessed to supermarkets and carried and eaten unprocessed by hand. Therefore, post-border detections of venomous spiders provide for high individual exposure, creating a moderately high public health risk.

Latrodectus spiders are capable of exploiting human-altered environments. In Australia, around 2000 people are bitten each year by redback spiders (Spider facts, 2022) and approximately 665 people are hospitalised due to spider bites (Pointer 2021). However, if venomous spiders were to establish in New Zealand, the risk of spider bites could be higher than in countries where venomous spiders are established, such as Australia. This is because New Zealanders will not practice the same habitat mitigation and avoidance behaviours as people who are accustomed to managing the risks from venomous organisms.

The impacts on human health and health systems triggered by black widow spiders would be amplified by associated non-physical impacts and the public perception of the health risk posed by black widow spiders.

However, the risk of live *Latrodectus* spiders arriving in New Zealand via the imported table grape pathway is currently very low, and the risk of *Latrodectus* spiders establishing in New Zealand from imported grapes is very low while the current controls remain in place.

Therefore, the public health risk posed by the importation of table grapes where the exposure would be provided by *Latrodectus* spiders becoming established in New Zealand is considered very low.

Potential financial costs associated with post-border detections and the establishment of populations of *Latrodectus* spiders relate to the treatment of bites, the loss of production from bites, professional training, professional information dissemination, public information dissemination, the establishment of rapid response taxonomic services, the auditing, establishing and maintenance of antivenom stores, spider colony detection and control measures, and the contracting of expert advice. In addition, there would be a social cost relating to the behaviour modifications required to minimise the new risk. There are no significant health benefits arising from the importation of table grapes into New Zealand.

Based on this assessment the Chief Technical Officer (Health) has found that the public health risk posed by venomous spiders entering the country on imported table grapes warrants the continuation of the current controls (or the implementation of equivalent controls) to minimise, as far as possible, the likelihood of live venomous spiders crossing the border.

Risk management

Risk management is the process of evaluating alternative actions, selecting options and implementing treatment in response to risk assessments; the decision-making will incorporate scientific, technological, social, economic and political information, and the process requires value judgements (e.g. on the tolerability and reasonableness of costs) (EnHealth 2022).

Risk is a part of everyday life, and individuals assess risks based on factors like age, gender, cultural background, education, and personal experiences. For example, younger individuals might view activities like skydiving as acceptable risks, while older people may perceive the same activity as too dangerous. Priorities for managing risk should be based on risk assessment but should also consider public perception of risk. The possible risk-reduction options must be evaluated, including the social, economic, and cultural implications of each (Health NZ 2024).

As with any other risk management process, regular and continuous monitoring and review is vital, as the risks themselves may alter over time. As circumstances change, some risks may take on greater significance than before, while the importance of others may lessen. When monitoring and reviewing risk management processes, it is necessary to consider:

- the risks themselves
- risk management strategies
- factors affecting the likelihood and consequences of the risks
- the cost-effectiveness of the control or mitigation plans
- the effectiveness of the control or mitigation actions
- the systems and processes behind the mitigation activities.

Import controls

MPI is responsible for Import Health Standards (the system in place to ensure safe trade). The import of commercially produced fresh grapes requires a system in place where activities such as in-field monitoring, pest control, harvesting, cleaning, sorting and grading of the grapes have been undertaken. These activities are carried out to minimise the presence of regulated pests and commodity damage which could expose the commodity to regulated pests. Phytosanitary inspection, certification and documentation form part of general requirements. Additional requirement options to manage some pest currently include, pest free areas, agreed pest control activities, irradiation, fumigation, cold treatment and a combination of fumigation and cold treatment.

Risk perception

People see hazards and risks, both real and perceived, differently. Risk perception refers to people's beliefs, attitudes, judgments, and feelings toward risk, and

incorporates the wider social and cultural values people adopt toward hazards. Perception is a significant consideration in risk communication (Nriagu, 2019).

Differences in risk perception can arise from a lack of knowledge about potential health effects, but also from differences in individual risk assessment (see above), misinformation (false information) or disinformation (deliberate deception).

Perceptions of risk tend to increase when exposure is involuntary, unfamiliar, or perceived as unfair, such as new technologies, or to exposures to hazards that don't directly benefit them. The public's perception of risk tends to increase when people believe they have no say in whether they are exposed or not. Risk perception may be heightened when there is uncertainty about the long-term effects of exposure.

Health impacts that invoke a deep sense of fear, even if the actual risk is low, tend to generate greater public concern, such as dreaded outcomes. For example, the public is particularly concerned about potential health impacts, like cancer, especially in children.

The public's fears should not be dismissed as unscientific or irrational, but acknowledged as being valid and relevant to those individuals or communities who are likely to be affected by another party's activity and over which they have no direct control.

The announcement of detections or incursions of exotic pests leads to public anxiety: media statements regarding the identification of exotic species of public health significance (such as spiders, ants, wasps, mosquitoes) are often followed by anxious calls to National Public Health Service staff from members of the public. The calls may come from people geographically remote from where the identified specimen was found.

In the past, there has been strong media interest in post-border detections of black widow spiders. There is a potential impact on health services from media coverage of black widow detections or evidence of populations of black widows establishing in areas of New Zealand. Anecdotally, the media coverage of the post-border black widow spider detections in 2001 led to a number of concerned calls to public health services. Risk perception can be managed, to some extent, through appropriate risk communication and education (below).

Risk communication

Risk communication is the real-time exchange of information, advice and opinions between experts or officials and people who face a hazard or threat to their survival, health, economic or social wellbeing. The purpose of risk communication is to enable people at risk to make informed decisions to mitigate the effects of a threat (hazard) – such as a disease outbreak – and take protective and preventive measures. Risk communication is proven to be a critical tool in emergency preparedness and response. It is a core capacity of the International Health Regulations (IHR 2005) and is one of five strategies within the Pandemic Influenza Preparedness (PIP) framework.

If the recipient of a message does not trust the source, it is likely that the message will not be believed. Trust between experts and the public is dependent upon effective risk communication. The delivery of accurate and transparent information is a critical element of gaining trust. In some situations, trust may be difficult to obtain due to past history, organisational affiliation, and other issues. In these cases, objective third parties can help build trust and influence the perception of risk perception (Stone, 2014).

There is often strong media interest in widow spider detections. Being proactive with communication strategies relating to any further widow spider detections could help with being prepared for any future detections or incursions.

A range of options exist for communicating potential public health risks associated with venomous spiders in imported table grapes. Cost estimates for communication vary widely depending on the scale of incursion. For example, communication of risk associated with incursion in localised areas would cost less than a national awareness campaign that may be necessary if spiders became more widespread.

Utilising government agencies' in-house communication resources (e.g. media releases, website and social media information) would not require a significant additional budget. However, if higher profile campaigns were required to raise awareness, particularly at national level, additional budget would be required. It is difficult to estimate costs for a public awareness campaign, as it depends on a range of factors, including:

1. Reach: local/regional/national.
2. Duration of campaign.
3. Cost of ad placements for different media platforms.
4. Cost of design for different media platforms.

Any communication plan related to incursion of venomous spiders would need to be developed in conjunction with other agencies, particularly MPI, and probably the Department of Conservation and WorkSafe New Zealand.

Educating consumers at point-of-sale of the potential risks and educating high risk communities and groups, such as some occupational settings, could be cost effective and have a big impact at mitigating risks.

Health NZ provides advice to the public regarding spider bites (**https://info.health.nz/keeping-healthy/environmental-health/pests-and-insects/treating-spider-bites**) and the HealthEd website offers a pamphlet (**https://healthed.govt.nz/products/spiders-in-new-zealand**). Healthline provides a free 24/7 over the phone service for the public and health professionals and the National Poisons Centre (NPC) operates a 24/7 Poisons Information Service accessible to all New Zealanders, including the general public and medical professionals.

Treatment of spider bites and latrodectism

The following advice is summarised from the National Poison Centre's advice on treatment of katipō or redback spider bites, and so is the most applicable advice for treating latrodectism in New Zealand. Treatment is primarily symptomatic, as there is limited evidence for the efficacy of antivenom, and it may have side effects.

If someone reports a suspected spider bite and envenomation, the person should be reassured, the bite area washed with soap and water or a mild antiseptic, and a cold pack applied to the area. Painkillers like paracetamol and/or ibuprofen may be taken for local pain. If patients present with only mild, or no, local effects the patient may be discharged with instructions to return should further signs and symptoms appear.

If the person experiences undue muscle spasms or distress, they may benefit from treatment of their symptoms. Admission to a closely monitored environment is recommended for those suffering signs of severe envenoming but admission to an intensive care environment is unlikely to be required in most cases.

While there is limited evidence for the efficacy of antivenom and its routine use is questioned, redback spider antivenom can be considered in those suffering signs and symptoms consistent with significant envenoming by a *Latrodectus* spider (latrodectism). If antivenom is considered, the patient must be informed that benefit may not occur and that there is a risk of adverse effects including anaphylaxis and serum sickness.

Conclusion

Since the original health risk assessment (Ministry of Health 2002) was completed, additional countries are under consideration for exporting table grapes into New Zealand. These countries have different *Latrodectus* species than those assessed in the original document but the risks to the New Zealand population remain primarily those of envenomation, with associated risks to mental health and wellbeing.

Imports from Australia and USA still pose the highest risk of *Latrodectus* interception, due to the volume of table grapes being imported and the greater presence in these countries of the more venomous *Latrodectus* species, i.e. black widow and Australian redbacks. Those people at greatest risk from imported venomous spiders are older people, those with pre-existing conditions, and children.

Establishment of *Latrodectus* species not already present in New Zealand may change sensitive ecosystems and have cultural impacts for local tangata whenua. As relationships between climate change and the impact on ecosystems are still being understood. It is likely that a warmer climate in New Zealand will increase the risk of *Latrodectus* species establishing, and to enable them to establish more widely in New Zealand.

Based on the low level of post-border detection of these species, current pre-border methods are sufficient to prevent the introduction of venomous spiders associated with imported table grapes. It is strongly suggested that import controls continue for imported table grapes.

References

Apiti A, Tassell-Matamua N, Moriarty T. 2023. He Taonga Ke Nga Kaumatua: Kaumatua Perspectives of te Taiao, Ngahere and Taonga Species. *Knowledge Cultures*, 1, 19-33.

Bryan S. 2014. An investigation into the abundance and ecological impact of Australian redback spiders (*Latrodectus hasseltii*) within and around the Cromwell Chafer Beetle Nature Reserve, Central Otago. *WLM Report Number: 277* Department of Zoology, University of Otago.

Buddle CM and Shorthouse DP. 2000. Jumping spiders of Canada. *Newsletter of the Biological Survey of Canada (Terrestrial Arthropods)*, 19, 16-18.

Davey GC 1992. Classical conditioning and the acquisition of human fears and phobias: A review and synthesis of the literature. *Advances in Behaviour Research and Therapy*, 14(1), 29-66.

Forster RR, Forster L. 1999. Spiders of New Zealand and their Worldwide kin. *Otago University Press*, 8, 1710.

Holstege S, Farah R, Sweeney J, Murray A, and Holstege C. 2023. Epidemiological Review of Black Widow Human Exposure as Reported to the National Poison Data System. *Wilderness & Environmental Medicine*, 34(4).

Hoehl S, Hellmer K, Johansson M, and Gredeback G. 2017. Itsy Bitsy Spider...: Infants React with Increased Arousal to Spiders and Snakes. *Frontiers in Psychology.*

Isbister GK, Brown SGA, Miller M, Tankel, A, Macdonald E, Stokes B, Ellis E, Nagree Y, Wilkes GJ, James R, Short A, and Holdgate A. 2008. A randomised controlled trial of intramuscular vs. intravenous antivenom for latrodectism – the RAVE study. *QJM: An International Journal of Medicine*, 101(7), 557-565.

International Health Regulations 2nd Edition (2005). World Health Organization. ISBN 978-92-4-158041-0

Jones MK, Menzies RG. 1995. The etiology of fear of spiders. *Anxiety, Stress and Coping*, 8(3), 227-234.

Meier J, White J. 1995. Handbook of clinical toxicology of animal venoms and poisons. *CRC Press Inc*, Boca Raton, Florida, USA.

Ministry of Health. 1999. *New Zealand Food: New Zealand People: Key results of the 1997 National Nutrition Survey*. Wellington: Ministry of Health.

Ministry of Health. 2002. *Risk Assessment for Exotic Spiders Associated with Imported Table Grapes.* Prepared for Ministry of Health.

Ministry of Health. 2020. *Eating and Activity Guidelines for New Zealand Adults.* Wellington: Ministry of Health.

Peterson ME. 2006. Black widow spider envenomation. *Clinical Techniques in Small Animal Practice*, 21(4), 187-190.

Pointer S. 2021. Venomous bites and stings 2017-2018. Injury and statistics series no. 134. *Australian Institute of Health and Welfare,* Canberra. Retrieved from: Venomous bites and stings 2017–18, Summary - Australian Institute of Health and Welfare (aihw.gov.au).

Radio New Zealand. 2019. Rita Hague on the last recorded katipō spider victim. Retrieved from: RNZ Audio Player.

Nriagu, Jerome O. (2019) Encyclopedia of Environmental Health 2nd ed." (2019). *Faculty Bookshelf*. 259. https://hsrc.himmelfarb.gwu.edu/books/259

Royal Society Te Aparangi. October 2017. Human Health Impacts of Climate Change for New Zealand: Evidence Summary. https://www.royalsociety.org.nz/assets/documents/Report-Human-Health-Impacts-of-Climate-Change-for-New-Zealand-Oct-2017.pdf

Ryan NM, Buckley NA, Graudins A. 2017. Treatments for Latrodectism – A Systematic Review on Their Clinical Effectiveness. *Toxins (Basel)*, 9(4), 148.

Spider facts. 2022. Australian Museum. Retrieved from: Spider facts - The Australian Museum.

Wexler P (Ed) (2014) *Encyclopedia of Toxicology* 3rd Edition US National Library of Medicine, Bethesda, MD, USA

Vetter RS, Visscher PK. 1998. Bites and stings of medically important venomous arthropods. *International Journal of Dermatol*, 37(7), 481-496.

Vink CJ, Derraik JGB, Phillips CB, Sirvid PJ. 2010. The invasive Australian redback spider, Latrodectus *hasselti Throrell* 1870 (Araneae: Theridiidae): current and potential distributions, and likely impacts. *Biological Invasions*, 13,1003-1019.

Wahlberg A, Antoniazzi R, Schalk CM. 2023. Patterns of the introduction, spread, and impact of the brown widow spider, Latrodectus geomatricus, in the Americas. *Journal of Arachnology*, 51(2), 195-205.

White, Julian (July 1999) *Necrotising arachnidism.* Med J Aust 1999; 171 (2): 98. https://www.mja.com.au/journal/1999/171/2/necrotising-arachnidism

White J, Weinstein SA (September 2014) *A phoenix of clinical toxinology: white-tailed spider (Lampona spp.) bites. A case report and review of medical significance* Toxicon 2014 Sep:87:76-80 https://pubmed.ncbi.nlm.nih.gov/24923740/