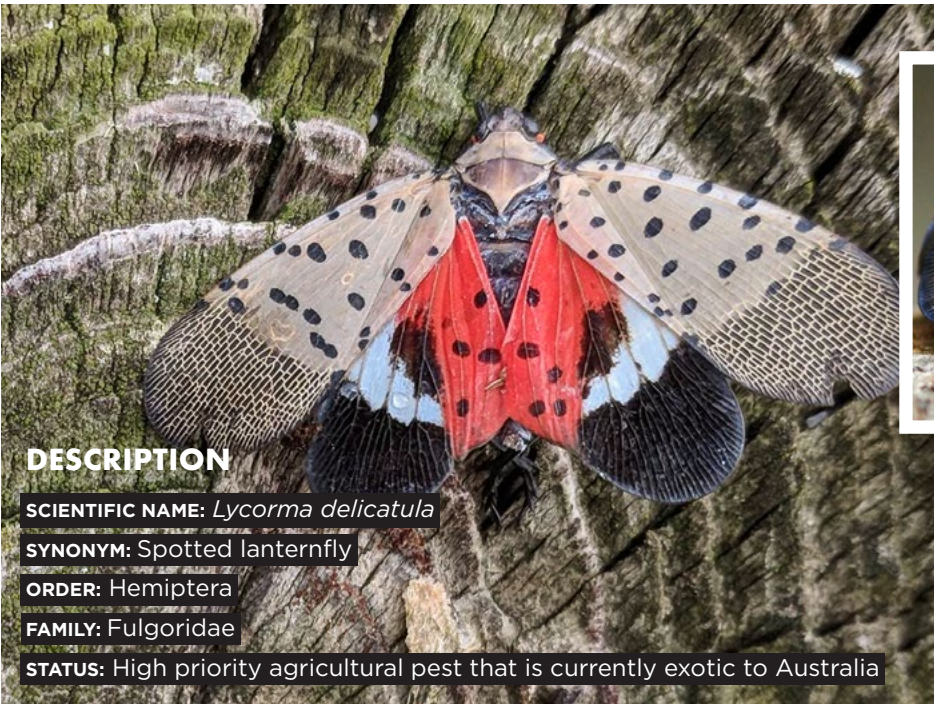


# NURSERY PAPERS

JULY  
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## PREPARING FOR EXOTIC PEST INCURSIONS: Spotted lanternfly (SLF), *Lycorma delicatula*



### DESCRIPTION

**SCIENTIFIC NAME:** *Lycorma delicatula*

**SYNONYM:** Spotted lanternfly

**ORDER:** Hemiptera

**FAMILY:** Fulgoridae

**STATUS:** High priority agricultural pest that is currently exotic to Australia

### SUMMARY

- In Australia, should *Lycorma delicatula* (spotted lanternfly) invade, it is expected to threaten nursery, fruit, landscape and hardwood industries.
- Its ability to 'hitchhike' due to non-discriminatory egg laying behaviour means that imported containers and their contents including, vehicles, machinery, equipment, nursery stock, fresh produce, cut flowers, foliage, forest products and passenger luggage are risk pathways into Australia.
- Nymph and adult feeding can result in wilting or the death of branches under high pest population levels.
- The production of 'honeydew' by the pest can lead to the development of sooty mould. Mould contaminated crops may be deemed unmarketable.
- Providing the training to staff to recognise *L. delicatula* and its feeding symptoms is paramount to the success of early detection, which will improve the chance of eradication if this pest is detected.



### BACKGROUND

*Lycorma delicatula* is an invasive planthopper (sap sucking bug), native to south-east Asia. Although not present in Australia, it is of increasing biosecurity concern due to its recent spread and invasion in South Korea and Japan and parts of the USA. Like other planthoppers the spotted lanternfly uses a tough piercing stylet to feed on the nutrient-rich phloem of its host plant.

An extensive host range means that this species could have an impact on primary production industries, ornamental and landscape plants, and the natural environment. A preferred host of *L. delicatula*, *Ailanthus altissima* (the Tree of Heaven) is a widespread, invasive plant in Australia, commonly used for urban landscaping. It is expected that *A. altissima* would play a role in supporting *L. delicatula* establishment if the pest were to enter the country.



## Host plants

High priority plant pests often have the ability to survive on a wide variety of host plant species or families.

*L. delicatula* attacks over 181 plant species, favouring woody hosts (Table 1). It has been shown to feed on a variety of tree species including apple, stone fruit, grapes, walnut, and a range of ornamental species.

HOST PLANT FAMILIES	COMMON NAMES
Actinidiaceae	Chinese gooseberry family (kiwifruit)
Betulaceae	Birch family (birches, alders, and hazels)
Cannabaceae	The hops family (hops and hemp)
Ericaceae	Heather family (blueberries, rhododendron, and azaleas)
Fabaceae	Legume or pea family (acacias, wattles and mimosa)
Fagaceae	The beech family (beeches, oaks, and chestnuts)
Juglandaceae	The walnut family (walnut, pecan and hickory)
Magnoliaceae	Magnolias
Malvaceae	Mallow family (hibiscus and hollyhocks)
Moraceae	Mulberry family (banyan, breadfruit, and mulberry).
Rosaceae	The rose family (apples, cherries, apricots, peaches, apricots, quinces, almonds, plums, and roses)
Salicaceae	The willow family (poplars, willows, salvias, alders, and cottonwoods)
Sapindaceae	Soapberry family (maples, and lychee)
Ulmaceae	Elms
Vitaceae	The grape family (the common grapevine)

**Table 1.** Key plant families recorded as hosts of *L. delicatula* that may be found at nurseries. Note: The full host list is more extensive. Contact Greenlife Industry Australia for the full list.

## Symptoms

When feeding on a host this species tends to be located on the woody material of the plant from where it will extract nutrients from the phloem using a tough stylet. Constant feeding by many *L. delicatula* individuals can leave the plant host looking less vigorous, can reduce the yield of

fruit-bearing trees, and in the case of heavy infestations can result in tree or vine death. *L. delicatula* feeding can also leave the host susceptible to secondary impacts such as disease.

*Lycorma delicatula* is an inefficient processor of phloem sap and therefore it excretes large amounts of sugary waste (honeydew), which can result in sooty mould (Image 1). Due to the nature of feeding in swarms (Image 2) infestations can quickly lead to sooty mould build up at the base of the plant, on leaves and on fruit. This can attract other nuisance pests, such as ants and wasps. If sooty mould builds up on leaf tissue, the plants photosynthetic capacity can be reduced.

## Insect Phenology

As a hemimetabolous insect *L. delicatula* does not undergo a pupal stage. Rather, the distinct life stages are egg, nymph (four instars), and adult, with the adult stage being the winged form. In cooler climates *L. delicatula* will undergo one generation per year, although in warmer climates it is thought that it may undergo two generations, although this has not yet been observed.

Egg laying typically occurs during autumn. *L. delicatula* will 'over-winter' at the egg stage and first instar nymphs emerge as early as the following mid-spring. Nymphs continue development through the instars and feed on host plants over spring and summer. Adults may be seen as early as autumn and may survive for up to four months, during which time they will mate and lay eggs (Image 3).



**Image 1.** Sooty mould aggregation on leaf and fruit tissue (Joseph O'Brien, USDA Forest Service, Bugwood.org)

**Image 2.** *L. delicatula* gregarious feeding behaviour (Heather Leach, Flickr, 2020)

All images are CC-BY-NC 4.0.

## Identification

**Egg stage:** Eggs are approximately 2.6 mm in length and 1.4mm in width. They are a grey/taupe colouring and ovoid in shape. Each egg mass typically contains 30-50 eggs. The egg mass is covered with a protective secretion from the female that, when dry, resembles clay.

**Nymph stage (1st - 3rd instar):** First to third instar nymphs are black with white spots. The average size of each instar is: 1st instar 3.6-4.4 mm; 2nd instar 5.1-6.4mm and 3rd instar 6.9-9.4 mm.

**Nymph stage (4th instar):** When the final nymphal stage is reached, the spotted lanternfly becomes more colourful, turning predominantly red, although white spots are retained. Black lines also form part of the patterning. The legs stay black with white markings throughout nymphal development. The average size of the 4th instar ranges from 10.9-14.8mm.

**Adult stage:** By the adult stage *L. delicatula* has developed a pair of wings. When folded, the forewings show large black spots at the proximal end (closest to the body), which become many rows of delicate black lines about two thirds of the way down the wing.

The hind wings have a large bright red patch covering most of the posterior region (farthest from the head) and black spots are present against the red backdrop. The rest of the hindwing is patterned black and white. The abdomen is yellow with black banding. Adult females range from 24-27mm in length. They are typically larger than adult males which range from 21-22mm.







## Impact

In Australia the pest is expected to be a threat to the nursery, fruits, landscape and hardwood industries. Lifestyle impacts can also be expected as it is a nuisance pest on properties, congregating on wood piles, garden furniture, fence posts and other inanimate objects.

In the US, in a vineyard at the centre of the original infestation, 90% yield loss was reported with a corresponding loss in fruit quality. Orchard trees have not as yet, observed any significant damage.

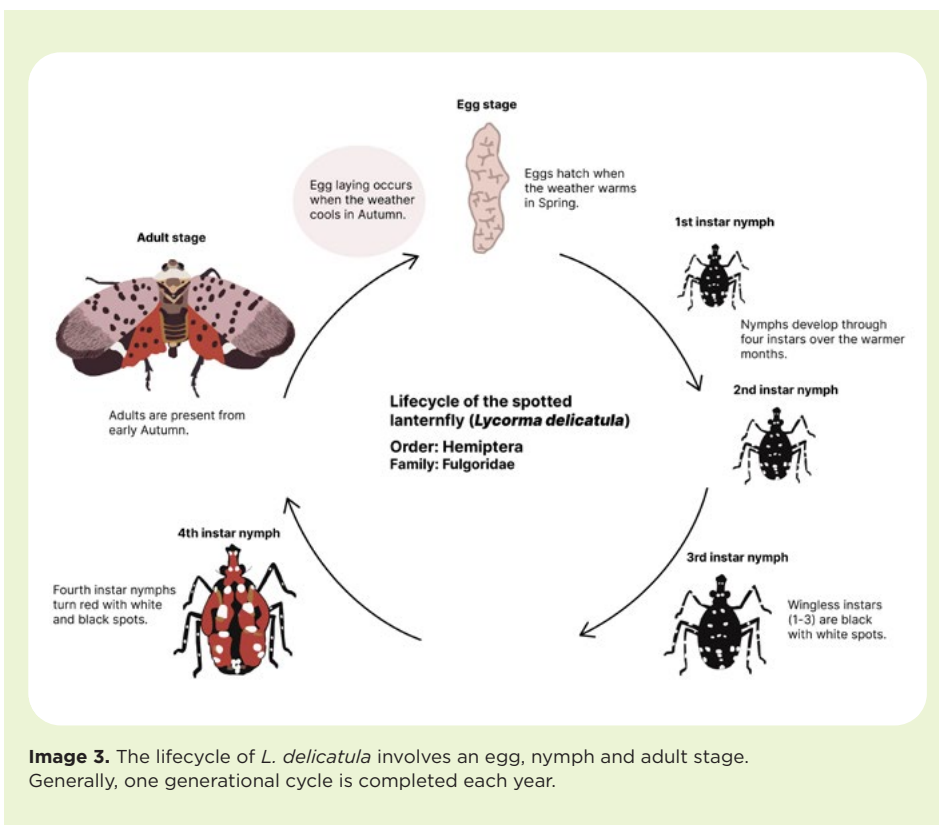
While longer-term impacts remain speculative, the diverse array of substrates on which egg masses can be laid, and the varied landscapes over which *L. delicatula* feeds mean that this pest has the potential to impact a broad range of sectors. For example, overseas there are contamination fears at production nurseries. As all products are required to be free of *L. delicatula*, they either need to be manually removed from plants or sprayed with insecticide to prevent *L. delicatula* entry or spread, thus increasing resource requirements.

## Monitoring

The striking appearance of late instar nymphs and adults should aid early detection, as should its tendency to feed in groups.

It is also important to monitor for egg batches. Smooth bark with some texture, or inanimate objects with some texture, e.g. rusted fence posts, wooden posts, under vehicle wheel hubs are locations where eggs may be found.

A high degree of patchiness has been observed in the distribution of *L. delicatula* eggs, with multiple trees sometimes observed to harbour several hundred *L. delicatula* egg masses, as well as other life stages. Therefore, monitoring should aim to include a number of host plants across a block or production nursery, rather than monitoring a group of plants that are clustered together.



**Image 3.** The lifecycle of *L. delicatula* involves an egg, nymph and adult stage. Generally, one generational cycle is completed each year.



**Image 4.** Eggs, pre-hatch (Richard Gardner, Bugwood.org)

**Image 5.** Early instar nymph (Emile Swackhamer, Bugwood.org)

**Image 6.** Fourth instar nymph (Stan Lupo, Flickr, 2019)

**Image 7.** Adult (Chesapeake Bay Program, Flickr, 2018)

All images are CC-BY-NC 4.0.





**Image 8.** *A. altissima* (the Tree of Heaven) is a naturalised invasive species often found in urban areas that is a preferred host of *L. delicatula* (Christopher Tracey, iNaturalist (CC BY-NC-SA))

Monitoring local *A. altissima* plants (Image 8) is a useful strategy as it is a highly preferred host (this tree is also preferred by another priority exotic pest, the brown marmorated stink bug (*Halyomorpha halys*)).

### Australian Fulgoridae

Differentiating a suspect exotic pest from a visually similar endemic species is important to improving reporting quality (taking the host and plant damage into account will also aid in making an accurate detection).

In Australia, there are 24 identified species belonging to the family Fulgoridae across eight genera. All of these species are native to Australia and none are classed as priority agricultural or environmental pests. Examples of morphologically similar Fulgoridae found in temperate regions, where *L. delicatula* has high establishment potential, are shown in images 9-12.



**Image 9.** *Rentinus dilatatus* (Found in ACT, WA, VIC, SA, NSW, QLD, TAS) (Geoffrey Cox, iNaturalist)

**Image 10.** *Desudaba aulica* (Found in NSW, QLD) (Jenny\_Thynne, iNaturalist)

**Image 11.** *Erilla turneri* (Found in NSW, QLD) (Victor W Fazio III, iNaturalist)

**Image 12.** *Desudaba psittacus* (Found in NSW, QLD and NT) (Sarah Webb, Australian museum) All images are CC-BY-NC 4.0.

### Optimal range

Environmental 'niche' modelling has estimated that low altitude regions are more suitable for *L. delicatula* than mountain areas and tropical habitats are not suitable for its establishment.

For southern Australia, nymph emergence is predicted to occur from November with adults evident in most regions by March. By April, survival is estimated to be highest in southern coastal regions. In Tasmania, nymph emergence is not predicted to occur in many western areas where temperatures remain too cool.



**Image 13.** *Lycorma delicatula* will lay eggs on a variety of surfaces, including inanimate objects. This poses a major transmission risk (Emelie Swackhamer, Penn State University, Bugwood.org, CC-BY-NC 4.0).

### Prevention

Preventing the *L. delicatula* entry onto Australia's shores is paramount. Eggs laid on containers and their contents including, vehicles, machinery, equipment, nursery stock, fresh produce, cut flowers, foliage, forest products and passenger luggage have the potential to be transported into Australia. Inspection of these products prior to shipment and upon receipt is vital to the detection and prevention of spread.

Imported production equipment and planting material should be sourced from a reliable supplier with standards in place to limit pest transfer. Equipment sourced from overseas, particularly from regions that have *L. delicatula*, should be segregated within the production nursery on arrival and inspected.

Training staff to recognise *L. delicatula* and its feeding symptoms is paramount to the success of early detection. Anything unusual should be reported to the Exotic Plant Pest Hotline on 1800 675 888 or through the MyPestGuide Reporter App. Early detection significantly improves the chances of eradication.

### LINKS TO RESOURCES

- Fact sheet: [www.planthealthaustralia.com.au/pests/spotted-lanternfly/](http://www.planthealthaustralia.com.au/pests/spotted-lanternfly/)
- Identify pests with the PEST ID tool: <https://pestid.com.au/>
- More information: [www.extensionaus.com.au/botanicgardensbiosecurity](http://www.extensionaus.com.au/botanicgardensbiosecurity)
- PAST EDITIONS OF NURSERY PAPERS ARE AVAILABLE ONLINE: <https://www.greenlifeindustry.com.au/communications-centre>

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