EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ORGANISATION EUROPEENNE ET MEDITERRANEENNE POUR LA PROTECTION DES PLANTES

25- 30306 (24-29050, 21-26467)

This PRA document was modified in 2021 and 2025 to clarify and adjust the phytosanitary measures recommended

Pest Risk Analysis for

Oemona hirta
(revised)

September 2014

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This risk assessment follows the EPPO Standard PM PM 5/3(5) Decision-support scheme for quarantine pests (available at http://archives.eppo.int/EPPOStandards/pra.htm) and uses the terminology defined in ISPM 5 *Glossary of Phytosanitary Terms* (available at https://www.ippc.int/index.php).
This document was first elaborated by an Expert Working Group and then reviewed by the Panel on Phytosanitary Measures and if relevant other EPPO bodies.

Cite this document as:
EPPO (2014) Revised *Pest risk analysis for Oemona hirta*. Lastly revised in 2025. EPPO, Paris.
Available at https://gd.eppo.int/taxon/OEMOHI/documents
Photo: Adult *Oemona hirta*. Courtesy Prof. Qiua Wang, Institute of Natural Resources, Massey University (NZ)

25- 30306 (24-29050, 21-26467, 15-21045, 13-19036, 13-18422, 12-18133)

Pest Risk Analysis for *Oemona hirta*

This PRA follows the EPPO Decision-support scheme for quarantine pests PM 5/3 (5).
A preliminary draft has been prepared by the EPPO Secretariat and served as a basis for the work of an Expert Working Group that met in the EPPO Headquarters in Paris on 2012-05-29/06-01. This EWG was composed of:

- Mr John Bain, Scion Forest Protection (New Zealand Forest Research Institute Ltd.), Rotorua, New Zealand
- Dr Dominic Eyre, Food and Environment Research Agency, York, UK
- Dr Hannes Krehan, Federal Office, Vienna Institute of Forest Protection, Vienna, Austria
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<u>Secretariat</u>
Ms Muriel Suffert – EPPO Secretariat
Ms Fabienne Grousset – Consultant for EPPO who has prepared the draft PRA.

In addition, comments were received from Dr Christian Cocquempot (INRA, Montpellier, France) and Dr Matteo Maspero (Fondazione Minoproprio, Vertemate con Minoprio, Italy).

Core members (Mr Fried, Mr Guitian Castrillon, Ms Le Fay-Souloy, Ms Levi, Mr MacLeod, Ms Petter, Mr Pfeilstetter, Ms Schrader, Mr Sletten, Mr Steffek, Ms Ustun) reviewed the draft PRA between October and December 2012. The risk management part was reviewed by the EPPO Panel on Phytosanitary Measures on 2013-03-06. The EPPO Panel recommended that management measures should also be elaborated for wood commodities. The EPPO Council agreed in September 2013 that *O. hirta* should already be recommended for regulation as an A1 pest, with measures for the most risky pathway (plants for planting), and measures for wood, wood chips and wood waste to be elaborated later by the Panel. The Panel elaborated measures for wood commodities in 2014. They were approved by the Working Party in June 2014 and included in this revised version of the PRA.

Contents *(click to reach the section selected)*

Introduction

The interception of larvae of *Oemona hirta* (Coleoptera: Cerambycidae) on *Wisteria* plants in the UK in 2010 led to the preparation of a rapid assessment to determine the need for a detailed pest risk analysis (FERA, 2010). This assessment concluded that *O. hirta* presents a risk to forestry and amenity trees, commercial fruit crops and ornamental shrubs in the UK, and may also present a risk to citrus-growing countries. It therefore recommended that a detailed PRA was needed. In 2011, the Working Party on Phytosanitary Measures decided that an EPPO PRA should be prepared.

O. hirta is an extremely polyphagous longhorn beetle that occurs only in New Zealand (Lu & Wang, 2005). Its original hosts were native New Zealand plants, but it expanded its host range to a large number of species exotic to New Zealand, in particular fruit and plantation trees. *Citrus* spp. are the hosts that are more frequently reported as being attacked in New Zealand (hence its common name ”lemon tree borer”), but the pest attacks over 200 host species from 81 families. The majority of hosts are trees (mostly deciduous) and shrubs, but the host list also comprises some vines or lianes (climbing plants with roots), and large perennial herbaceous plants with high stems. The host range of *O. hirta* includes many major fruit, nut and forest trees and shrubs of the PRA area, a large number of plants used as ornamentals, as well as species growing in the wild. In addition to findings in 2010, it had also been intercepted in the UK in 1983.

Elements on the biology of the pest and its detection

Duration of the life cycle

The life cycle is recorded to last "at least 2 years in most parts of New Zealand" (Wang *et al.*, 1998; Lu & Wang, 2005; Clearwater, 1981). Data are lacking on whether the duration of the life cycle varies in New Zealand. However, a shorter life cycle may be possible; for example, in a laboratory study at a constant temperature of 23°C, larvae completed their development (from emergence of larvae to pupation) in between 150 and 300 days (see also ”*Larvae*” below; Wang *et al.*, 2002). Hence it is envisaged in this PRA that the pest may have an annual life cycle in some parts of the PRA area (see 3.03). Finally, a longer life cycle, three years, could also be possible, at least for part of a generation.

Life stages

Eggs.

Eggs are large (2-2.2 mm). The egg stage lasts about 9-13 days: according to Dye (1950) it lasts for 13 days at 15.5°C and for 10 days at 23.6°C, and Wang *et al.* (2002) states that it lasts for 9 days at 23˚C. Eggs are generally laid at leaf and branch junctions, cracks in the bark, fresh pruning wounds, cuts (Taylor, 1957; Clearwater, 1981; Lu & Wang, 2005; Gourlay, 2007). They are mainly laid on twigs, but some may be laid on larger branches and on main stems (Hosking, 1978) or on dead wood (Dumbleton, 1937). Females lay significantly more eggs on cut branches because of attraction to compounds released from the bark when it is cut (Clearwater & Muggleston, 1985). Pruning is favourable to attacks if the wounds are not treated correctly (e.g. Clearwater & Muggleston, 1985; Fraser *et al.* 2003).

Eggs are laid singly, although several eggs may be laid at the same spot (Dye, 1950 (up to 5 eggs); Taylor, 1957; Clearwater, 1981; Wang *et al.* 1998).

Larvae

Even when several eggs are laid at the same site, normally only one larva develops (Dye, 1950; Taylor, 1957); only exceptionally there is more than one larva per system of galleries (Cottier, 1938). Larvae approaching pupation measure 25-40 mm (Dumbleton, 1957, Clearwater, 1981; Hudson, 1934). The larval stage takes more than 1 year and larvae can be found all year round. In nature, the development of larvae takes place over two years, with a slow-down of activity in winter (Clearwater, 1981; Dye, 1950; Lu & Wang, 2005). This slow-down of activity may not occur to the same extent in areas of the PRA area where winters are milder than at origin. In experiments, Wang *et al.* (2002) obtained a mean development time of larvae of 150-300 days depending on rearing conditions, and demonstrated the absence of diapause or quiescent period. The rearing conditions in Wang *et al.* (2002) (23 ± 1°C, 57 ± 10% R.H., and a photoperiod of 14:10 (L:D)) together with the diet, were favourable to larval development, hence the short development time of larvae obtained in comparison with estimates in nature.

There is generally one infestation site per tree, although there may occasionally be several larvae in one tree, originating from eggs laid by the same female at different sites, or by females of different generations. However, the density of larvae is generally low. Clearwater & Wouts (1980) report a density of one or two lemon tree borer per tree in a citrus orchard, with infestation rarely exceeding five per tree. In a persimmon orchard, 4% of the infested trees had two attacks per tree, 1% had three attacks per tree (Rohitha *et al.*, 1992 – Note: it is understood that the number of attacks per tree refers here to the number of larvae found in a tree).

Most observations in the available literature regarding larval damage relate to citrus, but they seem to be similar for other plants (e.g. gorse, Gourlay, 2007). At hatching, the larva bores directly into the wood, first into the sapwood, then into the eartheartwood. It normally bores along branches towards the main stem, and may bore from branches into the trunk. Although many publications report attacks mostly on branches, there is evidence that larvae may also be found in trunks (Gourlay, 1964; Hosking, 1978; Wang *et al.*, 1998). A minority of larvae tunnel around the branches (when they reach wood about 0.5 inch – 1.3 cm), girdling them and possibly causing them to break (Cottier, 1938). However, Duffy (1963) notes that larvae frequently tunnel around the branch under the bark when the diameter exceeds 1.5 inch (approx. 4 cm) before boring their pupal chamber. Such galleries lead to the death of the branch, which may fall. Such girdling does not occur on stems according to Dye (1950), although occasional girdling of young stems is mentioned for poplar by Wilkinson (1997).

In the first year, larvae cause die-back of the infested twig. In the second year, the larvae move downwards and damage the branch, and may then reach the trunk (Dye, 1950; Cottier, 1938).

The larvae create long tunnels with short side galleries and excretion holes (measuring 1-3 mm diameter) at regular intervals (at the end of short galleries that are perpendicular to the main axis of the branch/stem), through which frass is ejected (Dumbleton, 1937; Lu & Wang, 2005). Lu & Wang (2005) notes that holes are created "every few inches". No precise figure was found, but scale bars on illustrations give an idea of the distance between the holes (6-7 cm in Clearwater & Wouts, 1980; 7-8 cm in Dye, 1950). In the first summer, larvae grow to around 15 mm and bore approximately 15 cm, while they grow more and produce more frass in the second summer (Clearwater, 1981). The speed of the larval development and growth depend on the period of laying eggs.

Dye (1950) mentions that in trees of larger diameter 4-6" (10-15 cm), the pest is always restricted to outer sapwood, and it is not found in wood with a diameter of greater than 6" (15 cm). However, this was found not to be correct: *O. hirta* is also found in trees of diameter above 15 cm, although less frequently (J. Bain, New Zealand Forest Institute, & Q. Wang, Massey University, NZ, 05-2012, personal communications).

The larvae normally attack living wood, but can survive in cut wood under certain conditions, in particular with a sufficient level of humidity. Larvae cannot develop in dry wood, but thrive in cut wood exposed to rain or humid wood (Cottier, 1938; Hosking, 1978). Live specimens are sometimes found in cut trees or branches (specimen collection details in Lu & Wang, 2005). Muggleston (1992, cited in Wang *et al.*, 2002) noted that larvae can complete their development in twigs left on the ground. On the contrary, Dye (1950) notes that larvae continue to live for some time in cut or dead wood but are unable to complete their development, and that they require actively growing wood to complete their development. Wang *et al.* (2002) were also not able to reproduce the results obtained by Muggleston with cut twigs, and note that larvae can develop and survive for about three months, but cannot complete their development on cut twigs because of the lack of moisture and low nutritional value of the twigs. It, therefore, seems that larvae may survive in cut material for some time if humidity is sufficient, but that the pest would probably not complete its development, except if it is a late larval stage or a pupae. When trees are cut, late larval stages may still pupate and emerge as adults (Q. Wang, Massey University, NZ, 05-2012, personal communication).

Pupae
Pupae measure 20-25 mm, and the pupal stage lasts 2-3 weeks (Cottier, 1938; Lu & Wang, 2005; Wang *et al.*, 2002). Dye (1950) noted variability in the duration of the pupal stage in natural conditions, and from 12 days (experimental conditions, 23.6°C controlled temperature and 90% relative humidity) to 63 days (outdoor conditions, mean temperature of 11°C and 83% relative humidity). Pupae are formed in a cell in the wood (Clearwater, 1981).

Adults
Adults measure 15-25 mm (Clearwater, 1981). They live for 30-50 days (Dye, 1950; Wang *et al.*, 1998) or 2 months (Clearwater, 1981). In experiments, in the absence of food, adults died within 14 days (Dye, 1950). Females could live for more than one month after the end of oviposition when food is available (Dye, 1950). Dye (1950) also studied the level of activity of adults at different temperatures (although data were obtained with only few individuals): adults were relatively active at 23.9°C, less active with longer periods of inactivity at 18.7°C and quiescent at 12.7°C.

Adults remain in the pupal chamber for a few days before emergence (Cottier, 1938). If climatic conditions are unsuitable, adults may remain in pupal chambers for longer periods (Dye, 1950). Wang *et al.* (2002) note that adults require in total ca. 10 days to become sexually mature after eclosion from pupae (Wang *et al.*, 2002). After emergence, the adults need a sexual maturation period of a few days (4 days, Clearwater, 1981; 3 days, Wang & Davis, 2005, citing Wang *et al.*, 1998; Wang *et al.*, 2002). The oviposition period was recorded as lasting 17 days (experimental conditions; Wang *et al.*, 2002) to 30 days (outdoors; Dye, 1950).

Recent publications report that adults feed on pollen or nectar (Wang *et al.*, 1998; Landcare Research, 2011). Feeding on fruit and fruit juices is mentioned in older publications but seems to relate more to experimental situations (Dye, 1950; Clearwater & Muggleston, 1985). Maddison (1993) also refer to adults being attracted to molasses of sugarcane (*Saccharum officinarum* - experimental data).

Adults are reported to be good flyers, but there are no data on flight distances. Regarding flight times, most flight activity is in the early evening and early morning, when mating also occurs (Clearwater, 1981). Wang *et al.* (2002) reported that mating and oviposition peaked at midnight. Adults are reported to hide beneath leaves during the day (although they are occasionally found in buildings or on vegetation during the day) (Dye, 1950). Peak flight activity occurs in October/November in New Zealand, but extends from November to March. On the basis of collection data in Lu & Wang (2005), it seems that adults may also be present at other times in some parts of New Zealand. Estimation of the flight distance of Cerambycidae is very difficult, as it depends on many parameters; however Cerambycinae are generally very good flyers, especially monophagous or oligophagous species (such as *Phoracantha*) which allows them to colonize favourable sites that are very far from each other. *O. hirta* probably also has this capacity. Because of its very wide host range, this capacity is not essential to ensure establishment, but allows the insect to reach very distant sites if its primary infestation area becomes isolated or if it detects a very favourable site (C. Cocquempot, INRA, FR, 03-2012, personal communication).

While several publications mention that adults are attracted to light (e.g. Cottier, 1938), Dye (1950) considered that adults are not attracted to light and that reports of adults in buildings are due to attraction to different odours from natural compounds. Light traps set up in heavily infested vineyards in Hawke's Bay for two days during early summer did not catch any adults (Q. Wang, Massey University, NZ, 05-2012, personal communication). Like many Cerambycinae, adults would be attracted by materials in fermentation (fruit, liquids containing sugar etc.), but attraction to light is occasional in Cerambycidae and its parameters not well understood (C. Cocquempot, INRA, FR, 03-2012, personal communication) (see also 6.04 under monitoring/trapping).

<u>Detection of the pest</u>

- Eggs are relatively large (about 2 mm) but may be laid in cuts or cracks and may not be seen.
- Adults are nocturnal and not easy to observe, but they may occasionally fly into houses or traps, and are attracted to material in fermentation (see above); however this does not guarantee detection. For details on trapping of adults, see 6.04.
- The first indication of the presence of larvae infestation is wilting of foliage (e.g. Taylor, 1957). Dieback of twigs and branches may also be observed (e.g. Dye, 1950). However, wilting of foliage does not always occur (Q. Wang, Massey University, NZ, 05-2012, personal communication). Frass may be observed at or around excretion holes (Gourlay, 2007; Landcare Research 2011; Dumbleton, 1937; Clarke & Pollock, 1980). Frass from infested twigs/stems may be visible even at the early stage of infestation on leaves and stems; young larvae also produce excretion holes (Q. Wang, Massey University, NZ, 05-2012, personal communication). Excretion holes measure 1-3 mm depending on the size of the larvae. Death of branches is an indication of girdling by older larvae. It is possible to detect signs of presence of larvae very early (within few weeks after hatching).

Based on the above, symptoms of larval infestation are the most likely to be detected. However wilting and dyeback symptoms may be caused by many other factors, and as a result infested plants may not be detected readily.

Stage 1: Initiation

1.01 - Give the reason for performing the PRA

Identification of a single pest

Following findings of *O. hirta* in the UK on *Wisteria* plants, and the conclusions from a rapid assessment (FERA, 2010) that a more detailed PRA was needed, the Working Party on Phytosanitary Regulations decided in 2011 that a PRA should be performed for the whole of the EPPO region.

1.02a - Name of the pest

Oemona hirta

1.02b - Indicate the type of the pest

Arthropod

1.02d - Indicate the taxonomic position

The taxonomic position is as follows:
Domain: Eukaryota
Kingdom: Metazoa
Phylum: Arthropoda
Class: Insecta
Order: Coleoptera
Family: Cerambycidae
Subfamily: Cerambycinae
Tribe: Callidiopini
Genus: *Oemona*
Species: *hirta* (Fabricius, 1875)

1.03 - Clearly define the PRA area

EPPO region.

The PRA area is the EPPO region (see www.eppo.org for map and list of member countries).

1.04 - Does a relevant earlier PRA exist?

no

No PRA on *Oemona hirta* was found. In 2010, a rapid assessment of the need for a detailed PRA was conducted in the UK (FERA, 2010). Information from the rapid assessment has been included in the present PRA. *O. hirta* is a quarantine pest for the Republic of Korea (Anon, 2006), Chile (Anon, 2007) and Peru (MAF, 2010) but the PRAs to support these listings (if they exist) are not available.

Because of some similarities in biology, host plants and appropriate management measures, this PRA uses information from other EPPO PRAs on wood borers, especially *Saperda candida* (Cerambycidae; EPPO, 2011a), *Agrilus anxius* (Buprestidae; EPPO, 2011b) and *Apriona* spp. (Cerambycidae; not yet published; drafted in 2011).

1.06 - Specify all host plant species. Indicate the ones which are present in the PRA area.

Oemona hirta is extremely polyphagous. Its original hosts were native New Zealand plants (e.g. *Melicytus* sp. - Wang & al., 1998; Clearwater, 1981; *Leptospermum* sp. - Dye, 1950, citing Broun, 1896). It has now widened its host range to include a large number of species that have been introduced into New Zealand. *O. hirta* is recorded as being the insect with the highest number of host plants in New Zealand (Plant SyNZ, 2011). Over 200 host species from 81 families are listed in Annex 1, among which only over 40 species are endemic. It is likely that this host list is incomplete, but it probably includes most hosts that are commonly cultivated (e.g.in commercial orchards or plantations, nurseries, gardens) and forest surveys. The status of certain hosts that are mentioned only in old publications is uncertain, but they have been retained in Annex 1.

The majority of hosts are trees (mostly deciduous but also evergreens) and shrubs, but the host list also comprises some vines or lianes (e.g. *Freycinetia* sp.; *Ripogonum scandens*) and some large perennial herbaceous plants with high stems (e.g. *Asparagus setaceus, Dahlia imperialis, Verbascum thapsus* (mullein)). In New Zealand, the hosts occur in a variety of habitats: native plants are mostly present in the wild, or grown as forest or ornamental trees, while exotic species were introduced particularly for fruit production (commercial or gardens), for ornamental purposes or as plantation trees.

In the PRA area, many hosts occur, including some New Zealand native hosts, which are grown as ornamentals. The presence and use of host plants in the PRA area are outlined in Annex 1 and details on selected hosts are given under 3.01.

It is difficult to determine which species are preferred hosts or which species suffer more damage than others at origin. An attempt was made to separate hosts based on the literature available. Two categories emerged:

- hosts on which damage has been reported relatively frequently;
- hosts on which there seems to be occasional damage and hosts specifically reported as subject to minor and infrequent damage

This leaves the status of all other hosts uncertain (see *Uncertainty on hosts* below). Endemic species were not considered in the categories below (as they would mostly be minor ornamental plants in the PRA area), although some damage is mentioned in the literature (see 6.01).

<u>Hosts on which damage has been reported relatively frequently (see 6.01)</u>

Fruit species:

- ***Citrus* spp.**: without doubt the most reported host of *O. hirta* in its present area of distribution. The common name of *O. hirta* is "lemon tree borer". All commercial species and varieties are reported to be attacked. Lemon, mandarin, grapefruit, and orange are the main species grown in New Zealand (Cottier, 1938; Dumbleton, 1937; Clearwater, 1981; Wang & Shi, 1999; Lu & Wang, 2005; Landcare Research, 2011, Q. Wang, Massey University, NZ, 05-2012, personal communication).
- **persimmon (*Diospyros kaki*)** (Glucina, 1980; Kitagawa & Glucina, 1984; Rohitha *et al.*, 1992; Wang *et al.*, 2002)
- **grapevine (*Vitis vinifera*)** (Wang & Shi, 1999; Wearing *et al.*, 2000; Lu & Wang, 2005; Landcare Research, 2011)
- **apple (*Malus* spp.)** (Wang & Shi, 1999; Lu & Wang, 2005). The literature available mentions *Malus sylvestris* or *Malus*, but *M. domestica* is also attacked (Q. Wang, Massey University, NZ, 05-2012, personal communication)

Non-fruit species:

- **poplar (*Populus* spp.)** (Hosking, 1978; Wilkinson, 1997; Wang *et al.*, 2002)
- **gorse (*Ulex europaeus*)**. Severe damage has been reported in New Zealand, This damage is considered positive, as gorse is an invasive plant in New Zealand (Gourlay, 2007)

<u>Hosts for which there seems to be occasional damage, and hosts specifically reported as subject to minor and infrequent damage in the literature (see 6.01)</u>

Fruit species:

- **almond, cherry, plum, peach (*Prunus dulcis*, *P. avium*, *P. domestica, P. persica*)** (Wang *et al.*, 2002; Fraser *et al.*, 2003; Lu & Wang, 2005; Wang & Davies, 2005)
- **blueberry (*Vaccinium* sp.)** (Thomas, 1981)
- **chestnut (*Castanea* sp.)** (Wang *et al.*, 2002)
- **hazelnut (*Corylus* sp.)** (HGANZ, 2008)
- **pear (*Pyrus* spp.)** (Landcare Research, 2011)
- **walnut (*Juglans*)** (Wang *et al.*, 2002)

Non-fruit species:

- **broom (*Cytisus scoparius*)**. As for gorse, damage is considered beneficial in New Zealand as broom is an invasive plant (Landcare Research, 2006; Syrett, 2006).
- **blackwood (*Acacia melanoxylon*)** (Nicholas & Brown, 2002)
- **conifer hosts (*Abies*, *Pinus*, *Chamaecyparis, Cryptomeria, Cupressus, Sequoia sempervirens*).** Hosking (1978) reported that softwoods are rarely attacked. This is also confirmed by more recent experience (J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communication).
- ***Euonymus japonicus*** (used in experiments by Dye (1950) because of observations that it was often heavily infested)
- **oak (*Quercus* sp.)** (Braithwaite *et al.*, 2007)
- ***Paulownia*** (Nicholas *et al.*, 2007)
- **willow (*Salix* sp.)** (shelterbelts, Baker, 1982; Baker *et al.*, 1982)
- ***Alnus*, *Acacia*, *Eucalyptus*, *Fraxinus*, *Platanus*, *Podocarpus*, *Ulmus***: *O. hirta* is not mentioned as a pest in pests list of Agroforestry New Zealand (while it is for *Populus*).

Woody dicotyledons are the hosts that are mainly attacked in New Zealand, while findings on other plant species (including conifers, monocotyledons such as palms and bamboos, non-woody dicotyledons) have been extremely rare, and may relate to one or very few findings on one species during surveys (J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communication).

Uncertainties on hosts

- **Data are lacking** on the importance as hosts in New Zealand of plant species that are not mentioned in the two categories above, including those of economic or environmental importance in the PRA area, such as:
  - Fruit species*: Eriobotrya japonica* (loquat), *Ficus* (incl. *carica* - fig), *Macadamia tetraphylla* (macadamia), *Persea americana* (avocado), *Prunus armeniaca* (apricot), *Prunus persica* var. *nucipersica* (nectarine), *Punica granatum* (pomegranate), *Ribes uva-crispa* (gooseberry), *Solanum betaceum* (tamarillo).
  - Non-fruit species*: Acer* spp., *Aesculus hippocastaneum*, *Betula*, *Chaenomeles*, *Crataegus*, *Cornus*, *Erica*, *Fraxinus angustifolia*, *Hibiscus rosa-sinensis*, *Laurus nobilis*, *Lonicera*, *Lupinus*, *Magnolia*, *Nerium oleander*, *Phoenix*, *Photinia, Prunus salicina, Prunus serrulata, Rhododendron, Robinia pseudoacacia, Rosa* sp., *Sambucus nigra*, *Sorbus aucuparia, Syringa vulgaris* (lilac), *Tilia cordata* and *Wisteria* (although this species was intercepted in the UK (see 1.12), no information was found on its status in New Zealand).
- **Related species.** It is uncertain whether related species could be hosts. For example many major rosaceaous trees and shrubs are hosts (*Malus*, *Pyrus*, *Prunus*, *Chaenomeles*, *Rosa*, *Crataegus, Eriobotrya, Sorbus*), but *Cydonia oblonga* (quince), fruit species of *Rubus* (e.g. species of raspberries or blackberries), *Cotoneaster*, *Mespilus* or *Pyracantha* have not been reported as hosts.

Host records not supported by New Zealand literature:

- **holly** (Ostoja-Starzewski, 2010) probably referred to "holly oak" (*Quercus ilex*) (Eyre, personal communication).
- **blackcurrant** (Ostoja-Starzewski, 2010) probably referred to "*Ribes uva-crispa"* (i.e. gooseberry) and not *Ribes nigrum* (blackcurrant) (Eyre, personal communication).
- **sugarcane, *Setaria verticilliata***. Records in Maddison (1993) (repeated in Maddison & Crosby, 2009) refer to adults of *O. hirta* being attracted to molasses of sugarcane (experimental data) and occasionally trapped in inflorescences of *Setaria verticilliata.* This was not considered as host records.

Consequently holly (*Ilex* spp.), blackcurrant (*Ribes nigrum*), sugarcane (*Saccharum officinarum*) and *Setaria verticilliata* are not mentioned in the host list in Annex 1.

1.07 - Specify the pest distribution for a pest initiated PRA

New Zealand:

In the literature, *O. hirta* is recorded to be present throughout the country in several publications (e.g. in Clearwater, 1981; Lu & Wang, 2005), but to be uncommon in very dry areas (Hosking, 1978). Lu & Wang (2005) provided a (partial) distribution map based on the collection points of museum specimens (Annex 2). In addition, an outlined distribution map was prepared based on records in Scion's Forest Health Database and Lu & Wang (2005) (J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communication; see Annex 2). *O. hirta* has been recorded in 21 out of 28 geographic areas of New Zealand. Amongst the 7 areas where it has not been recorded, 5 are drier areas and 2 are not drier but have not been subject to intensive collecting. However, the low number of records in drier areas may be an artefact, e.g. because of the low host plant density.

O. hirta has been collected from sea level up to altitudes over 1200 m (Lu & Wang, 2005). It has also been recorded in surveys on some islands: Somes and Mopokuna (in Wellington harbour; Grehan, 1990); Cuvier (northeast of the North Island; Campbell *et al.*, 1984); Kapiti (southwest of the North Island; Moeeds & Meads, 1987); Blumine and Pickersgill (north of the South Island; Moeeds & Meads, 1987).

EPPO region: absent, intercepted only (see 1.12 for details on interceptions).

Records not considered valid

- **Malaysia**. APPPC (1987) is indicated as the source of a record for Malaysia in FERA (2010) and Ostoja-Starzewski (2010), but this publication only mentions *O. hirta* (misspelled *Cemona hirta*), lemon tree borer, in New Zealand. FERA (A. MacLeod, FERA, UK, 2010, personal communication) confirmed that the record for Malaysia is not valid.
- **Japan**. MAF (2007) indicates the interception in New Zealand of one live adult of *O. hirta* on a used utility vehicle coming from Japan. No further indication of the presence of *O. hirta* in Japan was found in the literature or the internet, and it is assumed that this adult had contaminated the utility vehicle after its arrival in New Zealand from Japan.

Consequently, *O. hirta* is not considered to occur in Malaysia or Japan, and these countries have therefore not been considered as possible origins for *O. hirta* in this PRA.

Stage 2: Pest Risk Assessment

Section A: Pest categorization

Identity of the pest (or potential pest)

1.08 - Does the name you have given for the organism correspond to a single taxonomic entity which can be adequately distinguished from other entities of the same rank?

yes

O. hirta is a single taxonomic entity. There are only four species in the genus *Oemona* (all from New Zealand). These species were revised by Lu & Wang (2005), but no change made to *O. hirta*. One major difference between *O. hirta* and other three *Oemona* species is that the latter have a limited host range (2-3 species). The other three *Oemona* species are not known as important pests (Lu & Wang, 2005). Lu & Wang (2005) also provide a diagnosis of the genus and a key to *Oemona* species.

The genus *Oemona* Newman 1840 has *Isodera* (White, 1846) as a synonym and was also previously named *Aemona* (Broun, 1880) in some early literature. In addition Lu & Wang (2005) give additional synonyms (listed below; see details of authorities in the publication).

Common name: lemon tree borer (e.g. in Clearwater, 1981)
Synonyms: *Isodera hirta, Aemona hirta, Saperda hirta, Saperda villosa, Isodera villosa, Oemona villosa, Oemona humilis.*

1.10 - Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products?

yes (the organism is considered to be a pest)

In New Zealand, *O. hirta* is recorded as a pest of hosts that are important economically or environmentally. It attacks a wide range of plants, including many trees used for fruit production (e.g. citrus, apple or persimmon), in forest and plantations (e.g. oak and poplar) or in the wild (e.g. endemic species such as New Zealand mangrove). The main damage is caused by larvae that bore into branches or stems. This may cause death of branches, reduced growth and have an impact on yield and long-term productivity of fruit trees (Taylor, 1957; Wang & Shi, 1999). Damage is detailed in 6.01.

1.12 - Does the pest occur in the PRA area?

no

O. hirta is absent from the PRA area. It has been intercepted in the UK, but is not regarded as established or transient there. Up to July 2010 the pest had been intercepted on *Wisteria* from New Zealand on three occasions: in 1983 (one live larva); in June 2010 (larvae on several *Wisteria* rootstocks in a nursery); in July 2010 (one larva in a plant from the same supplier).
In 2009, some galleries and frass on 4-5 *Wisteria* imported from New Zealand had led to the destruction of the plants by the nursery (FERA, 2010). No samples were submitted for laboratory analysis, but *O. hirta* could have been the cause of the damage. FERA (2010) mentions that it is possible that the pest could have escaped from those infested *Wisteria*, but note that *O. hirta* has not been observed so far.

1.14 - Does at least one host-plant species occur in the PRA area (outdoors, in protected cultivation or both)?

yes

The majority of the host species and genera of *O. hirta* occur in the PRA area. They are grown for fruit production (commercially or in gardens), for ornamental purposes (private and public gardens, landscaping, cities), and occur naturally or are planted in forests, including commercial plantations. Many host species (or related species in the same genera) are endemic to the PRA area and grow in the wild (e.g. oak, chestnut, hawthorn, gorse, broom, mullein), and may cover extensive areas (e.g. poplar – see 3.01). The host range comprises many species of importance in the PRA area:

- for fruit production (possibly a majority of the fruit trees and shrubs grown in the PRA area, with apple, apricot, avocado, cherry, chestnut, citrus, gooseberry, loquat, nectarine, peach, pear, persimmon, plum, pomegranate, vaccinium)
- for nut production (almond, hazelnut, macadamia, walnut)
- in forests (e.g. alder, ash, birch, oak, poplar)
- in plantations (e.g. eucalyptus, poplar, willow)
- in the wild as components of ecosystems (e.g. hawthorn, gorse, broom, *Sorbus*, and most forest trees).

- as major ornamentals (e.g. *Chaenomeles*, hibiscus, horse chestnut, rose, *Phoenix*, *Wisteria*).

The list in Annex 1 gives details on the use of the hosts in the PRA area, and further details on main host species and genera are given in section 3.01.

Hosts considered not to be present or with very limited distributions in the PRA area:
Several of the host plants in Annex 1 (in brackets) are tropical and unlikely to be grown in many areas outdoors in the PRA area. No reference was found to their availability in commercial nurseries or their use as ornamentals. They might still have a limited presence in the PRA area, in collections, botanical gardens etc. However, the market of ornamentals varies considerably from year to year and some of these species might be available at certain times and grown in protected environments.

1.15a - Is transmission by a vector the only means by which the pest can spread naturally?

no

O. hirta is a free-living organism.

1.16 - Does the known area of current distribution of the pest include ecoclimatic conditions comparable with those of the PRA area or sufficiently similar for the pest to survive and thrive (consider also protected conditions)?

yes

According to the map of Köppen-Geiger in Annex 3, there is climatic similarity between New Zealand and part of the PRA area (Western Europe up to Poland on the East and up to the North of Spain and Italy to the South).

Following a rapid assessment, FERA (2010) judges that given a similarity of climate between New Zealand and the UK (temperate oceanic climate), and because of the presence of hosts, it is likely that *O. hirta* could establish outdoors in the UK. Specifically for *Wisteria* (subject to interceptions of *O. hirta*), it notes that these are planted in the UK in conditions that would probably be suitable for the development of larvae (oriented to the South and against walls that would help keep temperature high).

The conditions under protected conditions in the PRA area would also be appropriate, although most hosts are not likely to be grown under protected conditions.

For the purposes of this analysis, such a comparison is not sufficient, and ecoclimatic conditions and their suitability for *O. hirta* are studied in more detail in 3.03.

1.17 - With specific reference to the plant(s) or habitats which occur(s) in the PRA area, and the damage or loss caused by the pest in its area of current distribution, could the pest by itself, or acting as a vector, cause significant damage or loss to plants or other negative economic impacts (on the environment, on society, on export markets) through the effect on plant health in the PRA area?

yes

O. hirta could attack a wide range of important plant species in the PRA area, in cultivation and in many natural and semi-natural environments. *O. hirta* could have an economic impact, mainly due to yield loss through death of branches and reduction in the long-term productivity of fruit trees, and to a lesser extent because of the death of trees and the need to remove infested plants in some situations. *O. hirta* could also have an environmental and social impact (e.g. by attacking forests or plants in the wild). Export markets of plants for planting (fruit trees and ornamentals) and of wood may be affected by the presence of the pests.

This pest could present a phytosanitary risk to the PRA area.

1.18 - Summarize the main elements leading to this conclusion.

- known pest of a wide range of species that are important in the PRA area for fruit production, forestry, as ornamental trees and in the wild. In New Zealand, *O. hirta* has successfully transferred to a wide range of species that are exotic in that country but endemic in the PRA area.
- hosts are widespread in the PRA area and are cultivated commercially in orchards, nurseries and plantations, and occur in gardens, forests and wild habitats.
- ecoclimatic conditions appear to be similar in at least part of the PRA area (Western Europe) and in New Zealand, which would be favourable to establishment.

Stage 2: Pest Risk Assessment Section B

Probability of entry of a pest

2.01a - Describe the relevant pathways and make a note of any obvious pathways that are impossible and record the reasons. Explain your judgement

Aspects of the life cycle relevant to the pathways (see details in *Introduction*):

- The life cycle lasts about 2 years, but it is considered that it may be longer or shorter in certain conditions (see *Introduction* and 3.03).
- Adults lay eggs in crevices or wounds on twigs and branches.
- Larvae start boring immediately after hatching and tunnel mostly along the branch, but may occasionally tunnel around a branch, causing girdling. The larvae may reach the main stem.
- Larvae create excretion holes at regular intervals along the galleries to eject the frass from their tunnels.
- Pupae are formed in the wood.
- Adults are good fliers and are nocturnal.

Details about the life cycle of the pest are given in the Introduction of the PRA and in the EPPO data sheet (in preparation).

1. Pathways studied in detail in this PRA

Pathway 1. Plants for planting (other than seeds) of host species from New Zealand

Eggs may be present on the bark, on wounds at the surface of the wood, at leaf and branch junctions. Larvae of all ages and pupae may be present, mostly in twigs and branches but also in stems. In the UK, *O. hirta* larvae was intercepted as on plants for planting of *Wisteria* sp. (FERA, 2010).

This pathway covers trees, shrubs, vines and non-woody plants reported to be hosts of *O. hirta* (as per Annex 1, but especially hosts reported in the literature as subject to frequent or occasional damage, as identified in 1.06). It covers plants that are used in forestry, as ornamentals or for fruit production. Most species are trees or bushes, but there are some commercial hosts that are not (such as grapevine, gooseberry, blueberry). Regarding fruit species, this pathway covers a large number of the fruit trees, shrubs or vines that are commercially grown in the PRA area.

The pathway covers all plants for planting other than seeds. Cuttings/budwood is also covered as they may carry eggs and small larvae. The pest has been found in twigs with a diameter less than 1 cm (Q. Wang, Massey University, NZ, 05-2012, personal communication). It is considered possible that exchange of cuttings of poplar and willow could lead to the international movement of sap suckers and stem borers (Tillesse *et al.*, 2007).

Finally bonsais are also included in this pathway. There is no indication in the literature that *O. hirta* is found in bonsais, but it is considered as a possibility, because other cerambycid wood borers of similar size have been found in bonsais (e.g. *Anoplophora chinensis*, Haack *et al.*, 2010). Bonsais could be considered in a distinct pathway because of the differences in management and use at origin and destination, and to specific regulations in place for bonsais in many countries of the PRA area (including the EU). However, bonsais are covered together with other plants for planting as there are insufficient data available to consider them separately. In particular the trade data available does not allow differentiation of bonsais from other plants for planting although some of the imported plants for planting could be bonsais, in particular *Acer* (see species possibly used as bonsais in Annex 1).

Pathway 2. Wood (round or sawn, with or without bark, firewood) of host species from New Zealand

Larvae and pupae may be present in wood. Some of the host species for which wood is used for logs, veneers, biofuel are: *Abies*, *Acer*, *Alnus*, *Betula*, *Castanea, Eucalyptus*, *Fagus*, *Juglans, Malus*, *Pinus*, *Populus*, *Prunus*, *Pyrus*, *Quercus*, *Ulmus, Zelkova.* It is uncertain whether some of the endemic hosts of *O. hirta* are exported as wood. According to NZWOOD (2012), the following hosts of *O. hirta* are used for wood in New Zealand with limited availability: *Agathis australis*, *Knightia excelsa*, *Nothofagus truncata*, *Nothofagus solandri*. NZFFA (no date) also lists the following hosts of *O. hirta* among endemic trees being investigated (or known as good options) for possible growing in plantations for timber production: *Alectryon excelsus*, *Chamaecytisus palmensis*, *Coprosma* spp., *Dodonaea viscosa*, *Kunzea ericoides*, *Leptospermum scoparium*, *Pittosporum* spp., *Vitex lucens*. No information was found on whether these species are exported to the PRA area, and in which form (e.g. round or sawn wood). The main species exported from New Zealand as wood is *Pinus radiata* (J. Bain, New Zealand Forest Institute Ltd., NZ, 05-2012, personal communication).
This pathway also includes cut branches.

2. Pathways considered very unlikely currently but that will present risk if trade increases

Wood chips. This pathway is considered as very unlikely.In New Zealand, wood chips are made from trunks and not branches, mostly of pine wood, and on the few occasions that *O. hirta* has been found in pine, it has been in the

branches rather than in the trunks (J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communication). Eggs of *O. hirta* are laid on living trees, and wood chips could not become infested after processing. In addition, the trade of wood chips to the PRA area from New Zealand is considered extremely minimal. EU trade statistics (Eurostat) over the period 2002-2011 (see Table 1 in Annex 5) indicate no import of coniferous wood chips or particles from New Zealand, and only one import of less than 1 tonne (to Denmark, 2007) of non-coniferous wood chips. It is considered unlikely that the trade of wood chips from New Zealand will increase because of the cost of shipping. Finally, processing of wood into wood chips is a destructive process that should destroy most of larvae, even if one study (McCullough *et al.*, 2007) has shown survival of some larvae of *Agrilus planipennis* in wood chips processed with a 10-cm screen. Mature larvae of *O. hirta* are of similar size to those of *A. planipennis*: *O. hirta* 25-40 mm (Hudson, 1934, Dumbleton, 1957, Clearwater, 1981); *A. planipennis*: 26-32 mm (EPPO data sheet). Pupae of *O. hirta* are larger than those of *A. planipennis* (20-25 mm for *O. hirta*; 10-14 for *A. planipennis*).
The Panel on Phytosanitary Measures considered that the main reason for the low probability of entry was because of low volumes of import. As this may change in future, the Panel recommended that management measures should also be elaborated for wood commodities. This will be discussed at the next Panel meeting in October 2013.

Wood waste
Larvae and pupae may be present in wood. Association of the pest with waste wood is similar to association with wood or wood chips, depending on the size of wood pieces. Entry with sawdust is not possible. There are no details available on what sort of wood waste is currently imported into the PRA area (and which tree species are in those commodities). The trade of “sawdust, and wood waste and scrap” from New Zealand to the PRA area is considered extremely minimal. EU trade statistics (Eurostat) over the period 2006-2011 (see Table 5 in Annex 5). The trade has increased, as it was null before 2010 and reached 21 470 tonnes in 2010 and 31 480 tonnes in 2011, which is much more that the import of round or sawn wood.
The Panel on Phytosanitary Measures considered that the main reason for the low probability of entry was because of low volumes of import. As this may change in future, the Panel recommended that management measures should also be elaborated for wood commodities. This will be discussed at the next Panel meeting in October 2013.

3. Pathways identified but not considered in detail in this PRA

Wood packaging material. As larvae and pupae develop in wood, they can be present in wood packaging material but are unlikely to complete their development because they need a sufficient humidity level to allow development. Since the adoption of ISPM 15 in 2002 (a new version was adopted in 2009: *Regulation of wood packaging material in international trade*, FAO, 2009), all wood packaging material moved in international trade should be debarked and then heat treated or fumigated with methyl bromide and stamped or branded, with a mark of compliance. These treatments are internationally considered as adequate to destroy larvae (including Cerambycidae) that are present in wood packaging material at the time of treatment. In addition, there are no reports of this pest being intercepted in wood packing material (the EPPO Reporting Service 2000-2011 was checked). For this reason, the EWG did not continue the assessment of this pathway.

Movement of individuals, shipping of live beetles, e.g. traded by collectors. Cerambycidae are widely collected and *O. hirta* may circulate between hobby entomologists, but are most likely to be sent dead.

4. Pathways considered very unlikely

Wooden objects made from wood of host plants. Larvae or pupae may be present in such objects, although processing may destroy them and desiccation would impair their development. This pathway is considered very unlikely, and there is also not enough information to consider it in detail.

Cut foliage and cut roses. Eggs may be present on cut branches. According to information available, larvae of *O. hirta* may survive in cut twigs and branches (Muggleton, 1992 cited in Wang *et al.*, 2002; Wang *et al.*, 2002). Cut roses were added to this pathway although no references were found to the location of the pest in rose bushes (to know whether the pest is in the stems carrying flowers). Cut foliage and cut roses are likely to be traded with very small diameter stems (less than one year old), and are intended for use in flower displays. It may, therefore, only harbour eggs or young larvae, which are very unlikely to develop to adults once the foliage has been cut off, because of the relatively short life time of the foliage (used in bouquets etc.). Eggs or young larvae may be present in cut foliage and roses, and may continue their development as long as these are maintained in vegetation, but they will later die.

There is no indication that the host species are used for producing cut foliage, nor that these are traded from New Zealand to the PRA area. EU trade statistics (Eurostat) for 2003-2010 indicate a minor trade of fresh foliage, branches and other parts of plants (except conifers) (commodity code 06049190) from New Zealand (see Table 1 in Annex 4), with a few tonnes every year to the Netherlands. However, the only imports of cut flowers and branches from New

Zealand to the Netherlands in 2008-2010 were *Cymbidium* and *Paphiopedilum* (cut orchids) (D.J. van der Gaag, Plant Protection Service, NL, 05-2012, personal communication). There had been a very small import of cut roses and buds to the Netherlands in the past (Table 2 in Annex 4), but not after 2004.

The trade of these commodities from New Zealand is very limited. Assuming that the level of trade is very low, coupled with the biological considerations above, the pathway of cut branches and cut roses is considered very unlikely and is not studied further.

Hitch-hiking. There is no indication that this would be a relevant pathway for intercontinental movement of the pest. In New Zealand, a live adult of *O. hirta* was intercepted at one occasion on a used utility vehicle from Japan (MAF 2007, see 1.07). It is assumed that it had become associated with it after its arrival in New Zealand. *O. hirta* does not present any ecological features that would favour hitch-hiking (e.g. attraction to light in loading sites). However in theory, adults could become associated in New Zealand with other non-host commodities and material as they fly, have a relatively long life, and in some circumstances may be attracted to odours (see Introduction and 6.04). Nevertheless, transport from New Zealand to the PRA area by sea would be at least 4-5 weeks (i.e. similar or longer as from Asia; EPPO, 2011a; see 2.07 for Pathway 1), while adults are reported by Dye (1950) to survive only 14 days without food and over 1 month with food. If adults were associated with fruit crates, the fruit is unlikely to be at a stage of maturation allowing adults to feed on juices). If *O. hirta* becomes associated with commodities at origin, it is therefore unlikely to survive transport in most circumstances. The elements above give a vague indication that *O. hirta* may have the potential to be a hitch-hiker in very limited circumstances (e.g. fast transport from New Zealand, non-host commodities if adults can feed, e.g. on molasse), but there is no information available to study this in detail.

4. Pathways commonly considered for other pests but not judged possible for this pest

Bark of host plants. Eggs may be associated with bark. However, it is considered that processes used to produce the bark commodity will likely destroy part of the eggs and that the remaining ones will be exposed to desiccation. If larvae hatched, they would not find wood to feed on. Finally, there is no indication that there is a trade of bark from New Zealand to the PRA area.

Fruit. *O. hirta* does not develop on fruit, nor lay eggs on fruit. Reports of adults feeding on fruit and fruit juices can be found in older publications, but seem to relate more to experimental situations (Dye, 1950; Clearwater & Muggleston, 1985). Australian commodity-PRAs on apple fruit and stone fruits from New Zealand (Biosecurity, 2004 & 2006) concluded that such fruits are not pathways for entry of *O. hirta*.

Seeds of host plants, soil. No life stages of *O. hirta* are associated with seeds or soil.

Natural spread. This is not possible from New Zealand to the PRA area because of the distance. There are no indications of natural spread to countries in Oceania, but any country is situated at least 1000 km away from New Zealand. Natural spread between countries of the PRA area would be possible if the pest establishes; this is covered in the "spread" section (section 4).

2.01b - List the relevant pathways that will be considered for entry and/or management. Some pathways may not be considered in detail in the entry section due to lack of data but will be considered in the management part.

- Plants for planting (other than seeds) of host species from New Zealand
- Wood of host species from New Zealand
- Wood chips, wood waste (only for management – *to be done in 2013-2014*)

Pathway 1: Plants for planting (other than seeds) of host species from New Zealand

2.03 - How likely is the pest to be associated with the pathway at the point(s) of origin taking into account the biology of the pest?

likely

***Level of uncertainty:* low**

O. hirta is considered as one of the most common insects in New Zealand (Lu & Wang, 2005) and it is widespread in the country. The relative importance of hosts at New Zealand production sites is not known, but citrus, persimmon, grapevine, apple and poplar are frequently reported as hosts in the literature. Larvae may be present in the plants at any time, and both larvae and pupae in dormant plants. There may sometimes be several larvae in a plant (e.g. Rohitha *et al.*, 1992; Clearwater & Wouts, 1980; see Introduction). Larvae or pupae are mostly present in branches but may also occur in main stems. Eggs may also be present, especially on twigs. For this reason, cuttings/budwood may also carry the pest. Where plants are required to be exported dormant and free from leaves (e.g. for some species into the EU), the plants are likely to be exported during the NZ winter period, life stages susceptible to be associated will be larvae or pupae.

O. hirta attacks healthy trees (Dye, 1950). Several publications mention that it becomes a problem when trees are weakened or under stress (hazelnut, HGANZ, 2008; plum, Fraser *et al.*, 2003), but it may be that healthy trees can recover from attacks more easily. In any case, plants for planting intended for export would presumably be healthy but could nevertheless be infested.

The association is likely for woody dicotyledons, which are the hosts that are mainly attacked in New Zealand, while findings on other plant species (including conifers, monocotyledons such as palms and bamboos, non-woody dicotyledons) have been extremely rare (see 1.06).

2.04 - How likely is the pest to be associated with the pathway at the point(s) of origin taking into account *current management* conditions?

moderately likely

***Level of uncertainty:* Medium** (Lack of data on management for the plants covered in this pathway).

It is likely that plants for export are grown in nurseries under managed conditions. Depending on the level of scrutiny of the plants, adults (in flight or trapped – see 6.04), signs of larval activity and eggs may be observed prior to export. However, the pest has been intercepted on *Wisteria* sp. in the UK (FERA, 2010), showing that the association is possible under current management conditions. According to Wilkinson (1997), *O. hirta* has caused losses in both poplar and tree willow pole production nurseries.

Detection is difficult, although frass may be observed on twigs or stems. Wilting of foliage may not occur at early stages of infestation, and does not always occur. Eggs are relatively large (about 2 mm) but may be laid in cuts or cracks and may not be seen. The presence of larvae may not be detected until a larva has produced several excretion holes or obvious wilting of foliage. Adults are medium size beetles (15-25 mm in length), but they are mostly nocturnal and hide under leaves during the day, and are therefore not easily observed. Adults may be trapped (see 6.04) but these specific traps are not expected to be used in routine in nurseries.

The likelihood of association may be lower for cuttings as cuttings are easier to inspect at the place of production than rooted plants and therefore infested cuttings are less likely to be traded.

Existing import requirements or prohibitions (see question 7.10 and Annex 8) may limit the association of the pest with certain host plants.

2.05 - Consider the volume of movement along the pathway (for periods when the pest is likely to be associated with it): how likely is it that this volume will support entry?

moderately likely

***Level of uncertainty:* medium** (lack of detailed data for host species but global trade is limited anyway)

EU trade statistics (Eurostat) for 2003-October 2011 indicate small trades from New Zealand (Tables 1-7 in Annex 6) for broad categories of plants for planting as listed below. However as these are broad categories, these plants would include both host and non-host species.

- *fruit and nuts trees* and *shrubs* (grafted or not, other than vine) (06022090), with 101 tonnes in total in 2010 (Table 1).
- *ornamental trees and shrubs* in the form of rooted cuttings and young plants (06029045) and outdoor plants with roots (06029049), with respectively 252 and 98 tonnes in total in 2010 (Tables 2 and 3);
- *forest trees* (06029041): in 2010 only 62 tonnes, only to Germany (Table 4) (note: no data is available on the

species imported under this category, and the data referred to in the next paragraph did not include species that would be imported for use as forest trees).

- *unrooted cuttings and slips (other than vine)* (06021090) with only 18 t in total to Germany, only in 2010 (Table 5). Note that these could be non-fruit or fruit species.
- *indoor plants (rooted cuttings and young plants, excluding cacti)* (06029070) (Table 6), with 60 tonnes in total in 2010. Note: this is included here as it is the category used for some consignments of plants for planting of hosts plants to some EU countries in the data referred to in the next paragraph (including parts of imports for *Acer*, *Coprosma*, *Cornus*, *Corokia*, *Hebe*, *Magnolia*, *Wisteria*).
- *rose plants* (grafted or not - 06024090/06024000/06024010) (Table 7), generally to only one country in any one year, and mostly below 1 tonne.

In Eurostat, there was no import in the category "perennial outdoors plants" (06029951) or vine (unrooted cuttings and slips – 06021010; slips, grafted or rooted – 06022010), which is consistent with the prohibition of import of plants of *Vitis vinifera* in the EU according to Eurostat.

Data were also provided by some EPPO countries regarding imports of plants for planting, and it includes imports of some host plants for planting from New Zealand (Table 8 in Annex 6). The data were provided by four major plant importers in the EU but do for example not include data from Ireland which is a major importer of plants for planting of the fruit species considered according to Eurostat, and UK-data are also missing. Although the data are incomplete, it provides some information on host plant genera imported from New Zealand into the PRA area. The available data relate to genera, and the imported plants may have been host species or not. The nature of the material imported (e.g. bonsais, cuttings) was not specified in the data obtained from EPPO member countries.

A number of host species (in particular *Citrus*, *Vitis vinifera*, and some species in the Families Rosaceae and Palmae) are prohibited from being imported into some countries of the PRA area (see details in 7.10 and in Annex 9).

With the reservations above, moderately large volumes of plants for planting of host genera listed in Annex 1 are imported from New Zealand into the PRA area (in the order of 100.000 plants, mainly *Wisteria* and *Acer*), although not from the host genera which are known to be frequently attacked, like *Citrus* spp. However, it is not known how frequently *Wisteria* and *Acer* are attacked in New Zealand.

The fact that *O. hirta* was detected on *Wisteria* imported from New Zealand in the UK (FERA, 2010) shows that entry is possible despite limited import volumes [approx. 20000 Wisteria were received in the UK from New Zealand in 2010]. Although some consignments were destroyed because of the presence of *O. hirta*, some other infested consignments may have gone undetected.

There has been a substantial increase in the number of *Acer* plants imported from New Zealand over the years. *Acer* may be the host genus with the largest trade from New Zealand to the whole PRA area, as it would probably also be imported to some other countries of the PRA area, including the UK. *Acer* spp. are also grown as bonsai species, and part of the imports may have been bonsais.

Even if detailed data are missing for the other EU countries and non-EU countries, it is thought that total import volume of host plants of *O. hirta* would be low. However, it is considered that a low volume may support entry, and the likelihood has been rated as "moderately likely".

2.06 - Consider the frequency of movement along the pathway (for periods when the pest is likely to be associated with it): how likely is it that this frequency will support entry?

unlikely

***Level of uncertainty:* low**

The EWG considered that the frequency of movement is not critical for plants for planting as they would anyway be imported in periods favourable to the plant development.

There are no precise data on frequency of import of consignments of hosts, except for Wisteria in 2010. The frequency is assumed to be low. The pest can be associated with the pathway at any time (larvae and pupae), but plants for planting would be imported at times favourable for planting, i.e. not throughout the year. Where plants are required to be exported dormant and free from leaves (e.g. for some species into the EU), the plants are likely to be exported during the NZ winter period and it is most likely that any *O. hirta* present would be inactive larvae or pupae. However at arrival in Europe in summer time they could become active and find ideal conditions for establishment.

EU trade statistics (Eurostat) for 2010 indicate that imports of plants for planting occur mostly between April and August (Table 9 in Annex 6). In addition, according to Table 1-7 in Annex 6, imports do not occur every year for most countries.

2.07 - How likely is the pest to survive during transport or storage?

very likely

***Level of uncertainty:* low**

Larvae on plants for planting will survive transport and continue feeding on their host. They live in branches or stems in two consecutive years. Pupae are also likely to survive. Conditions that will allow survival of the plants will also allow survival of the pest inside the plants. The pest would also be able to survive in cuttings for the duration of transport, as it is reported to survive in cut twigs and branches (Muggleston, 1992, cited in Wang *et al.*, 2002; Wang *et al.*, 2002), and these would remain viable during transport. Some information is given below on transport time and conditions.

No information was found on transport time for plants from New Zealand but, by sea, it would presumably be longer than for Asia and probably about 4-5 weeks (EPPO, 2011a). Plants are stored at cool temperatures in transport (EPPO, 2010). According to information provided by Turkish importers, temperature range during the transport of plant for planting of fruit trees is 4-6°C (N. Ustun, Plant Protection Research Institute, TR, 12-2011, personal communication; EPPO PRA for *Apriona* spp.). If plants are transported by airplane, survival of the pest is also very likely.

Other Cerambycidae (e.g. *Anoplophora chinensis*, *Apriona* spp., *Batocera* spp.) are intercepted alive in Europe in plants for planting from Asia (EPPO PRAs, EPPO Reporting Service) and are presumably transported in similar conditions.

2.08 - How likely is the pest to multiply/increase in prevalence during transport or storage?

very unlikely

***Level of uncertainty:* low**

The life cycle lasts about 2 years (although shorter or longer durations may be possible – see Introduction and 3.03) and would not be interrupted during transport. All stages associated with plants for planting (eggs, larvae, pupae, pre-emerging adults) could continue their development. Mature larvae, pupae or pre-emerging adults slow down their development if conditions are unfavourable. In theory, if late stages are present, adults may emerge during transport or storage. However, this is unlikely because adults normally emerge in spring, when temperatures would be higher than in transport. Dye (1950) reported that adults were quiescent at 12.7°C. At the temperatures indicated in 2.07 for transport, of plants for planting of fruit species, adults are unlikely to emerge. In addition several days of sexual maturation are needed prior to mating.

2.09 - Under current inspection procedures how likely is the pest to enter the PRA area undetected?

likely

***Level of uncertainty:* medium**

Some countries have requirements in place for certain hosts (see 7.10 for this pathway). When not subject to prohibitions (which applies mostly to fruit and ornamental species, especially in the families Rosaceae, Rutaceae and Palmae), hosts may be subject to requirements against other pests. Inspections may be carried out at origin, and also at destination if import phytosanitary requirements are in place. However, there are no specific requirements targeting *O. hirta*. The current requirements, either of a general nature or specific against other pests, would not be sufficient to ensure detection of *O. hirta*, although they would imply some inspection.

Liebhold *et al.* (2012) report that most plants that carry some form of pest, and are inspected, are not detected. The EWG considered that infested plants could be detected by careful examination but inspectors need to be trained in where to look for the pest. At present, inspectors in the EPPO region are probably not familiar with this pest. Experience with inspection of imported plants for planting for *Anoplophora chinensis* has shown that such organisms are very difficult to detect during their hidden stages (Van der Gaag *et al.*, 2008). Detection may be easier on cuttings, although it would also require careful examination and would depend on the intensity of sampling.

In the UK (FERA, 2010), it is assumed that there has been extensive importation of host plants from New Zealand. Although plants for planting from New Zealand require a PC and import inspection, only two interceptions of *O. hirta were* recorded in 1983-2010.

2.10 - How likely is the pest to be able to transfer from the pathway to a suitable host?

likely

***Level of uncertainty:* low**

O. hirta has many hosts that have a wide distribution in the PRA area, in commercial cultivation, as ornamentals, in forests, parks, gardens or in the wild. In addition, adults fly (see 4.01). They feed on flowers, nectar and leaves. It is likely that if adults emerge they will find a host to feed, although adults can mate and oviposit without having fed first, as long as water is available. At least one male and one female at the same location and at the same time are needed to start a population. Mating and oviposition is most likely to occur if the plants for planting of an infested lot are kept at the same place. In the UK, Wisteria plants are kept at the nursery for several months before being sold to garden centres.

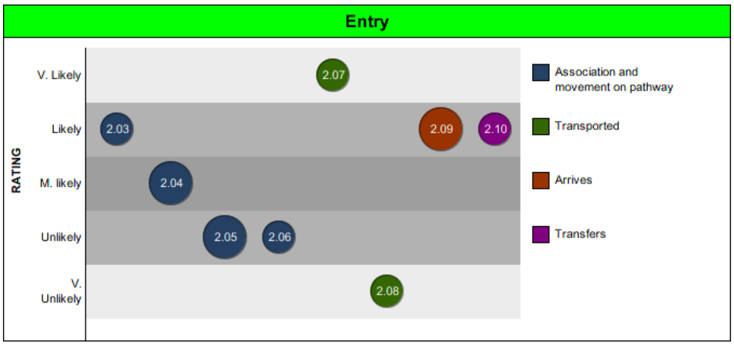
2.11 - The probability of entry for the pathway should be described

moderately likely

***Level of uncertainty:* medium**

The answers are visualized below. The probability of entry on this pathway is considered as moderately likely. Several parameters are favourable (likely) (e.g. association at origin, survival in transport, difficulties of detection, transfer), but entry with the current volumes (2.05) and association with the pathway under the current management conditions (2.04) have been assessed as moderately likely. The pest has been found in imported *Wisteria* plants in the UK in 1983 and 2010. The probability of entry will increase if the import volume of hosts from New Zealand increases.

The pest is more likely to be associated with woody dicotyledons, which are the hosts that are mainly attacked in New Zealand, while findings on other plant species (including conifers, monocotyledons such as palms and bamboos, non-woody dicotyledons) have been extremely rare, and may relate to one or very few findings on one species during surveys (J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communication).



Pathway 2: Wood of host species from New Zealand

2.03 - How likely is the pest to be associated with the pathway at the point(s) of origin taking into account the biology of the pest?

unlikely

***Level of uncertainty:* medium** (lack of data of trade of non coniferous host wood)

Larvae and pupae normally develop in branches and are not usually present in main stems although they may occasionally be found in the trunk (Dye, 1950). Eggs are laid on the bark or in wounds and could be associated with the bark on the wood, especially on branches.

Coniferous species are rarely attacked. Therefore the association is considered as very unlikely for coniferous wood, and unlikely to moderately likely for non-coniferous wood. However, export of wood will be mainly or only from coniferous species (see 2.01) and, therefore, the EWG rated the overall likelihood of association with export of wood as unlikely with a medium uncertainty.

2.04 - How likely is the pest to be associated with the pathway at the point(s) of origin taking into account *current management* conditions?

unlikely

***Level of uncertainty:* medium**

There is no management of *O. hirta* in forests. Same rating as for 2.03.

2.05 - Consider the volume of movement along the pathway (for periods when the pest is likely to be associated with it): how likely is it that this volume will support entry?

very unlikely

***Level of uncertainty:* low**

EU trade statistics (Eurostat) for 2002-2011 (see Tables 1-3 in Annex 5) indicate very small occasional imports from New Zealand of:

- fuelwood (only to Ireland, and only 21 t in 2002, 3 t in 2003 and 17 t in 2008) (Table 1). It is not known whether consignments would include hosts of *O. hirta*, although this is likely because of the wide host range.
- rough or roughly squared wood of eucalyptus (44039930 - 60 t to Ireland in 2005) and birch (44039959 - 45 t to the UK in 2009) (Table 2)
- sawn wood of conifers (44071015 - only in 2004-2010, with minor quantities, except 10.000 t to Spain in 2004, and only 292 t in total in 2010), oak (44079115 - 18 t to the UK in 2007) and poplar (44079991 - 286 t to the UK in 2003) (Table 3).

In addition, countries of the PRA area reporting to the International Poplar Commission (Croatia, Italy, Bulgaria, Belgium, France, Spain) did not indicate any imports of poplar and willow roundwood and wood chips from New Zealand (FAO, 2008).

The likelihood was rated as "very unlikely" as only small quantities are imported, and not every year. The assessment may be different if wood exports from New Zealand increased, but this is considered as being very unlikely as New Zealand is not a major wood exporter except for *Pinus radiata* (but this is a rare host), and because of the cost of shipping of such low value commodities.

2.06 - Consider the frequency of movement along the pathway (for periods when the pest is likely to be associated with it): how likely is it that this frequency will support entry?

very unlikely

***Level of uncertainty:* low**

Imports do not occur every year. In particular, for the whole period considered (2002-2010) for trade to the EU, rough wood of eucalyptus and birch were imported, respectively, in June 2005, and February and December of 2009 (see Table 4 in Annex 5).

2.07 - How likely is the pest to survive during transport or storage?

moderately likely

***Level of uncertainty:* medium** (no published data on survival during transport under practical conditions)

O. hirta usually lays its eggs on living plants (Wang *et al.*, 2002). According to Cottier (1938) and Hosking (1978) it seems that larvae and pupae may carry on their development and survive in dead wood, at least for some time. Late instar larvae and pupae are expected to develop to adults (Q. Wang, Massey University & J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communications). The humidity of the wood in transport may

soon become insufficient and its nutritional value would also decrease (another factor hindering survival in dead wood according to Dye, 1950 and Wang *et al.*, 2002). Larvae and pupae would be more likely to survive on unprocessed round wood with bark, as the presence of bark would prevent desiccation. In debarked wood pre-pupae and pupae may complete their life cycle, but larvae are not expected to survive.
Finally no interception records for *O. hirta* in wood were found (EPPO Reporting Service), although the genus or species would not necessarily be reported in EU interceptions data as the pest and the wood is not regulated. Hence, there would be no phytosanitary controls.

The likelihood was rated as moderately likely (similar to the draft PRA on *Apriona* spp.).

2.08 - How likely is the pest to multiply/increase in prevalence during transport or storage?

very unlikely

***Level of uncertainty:* low**

The life cycle lasts for at least 2 years. Even if larvae survive, they are not likely to complete their development. It is impossible that adults will emerge, mate and oviposit during transport as they need a living host for oviposition.

2.09 - Under current inspection procedures how likely is the pest to enter the PRA area undetected?

Very likely

***Level of uncertainty:* low**

Signs of attack by larvae (excretion holes, frass, galleries at cross-sections) may be observed on wood if inspections are performed. However, wood regulations in the PRA area tend to target wood from specific origins, especially North America, and wood from New Zealand may not be targeted by inspections as much as wood from these origins. There are currently no specific phytosanitary measures for the host species used for wood. In addition only a small part of wood consignments would be inspected and it is unlikely that all infestations would be detected.

2.10 - How likely is the pest to be able to transfer from the pathway to a suitable host?

moderately likely

***Level of uncertainty:* medium**

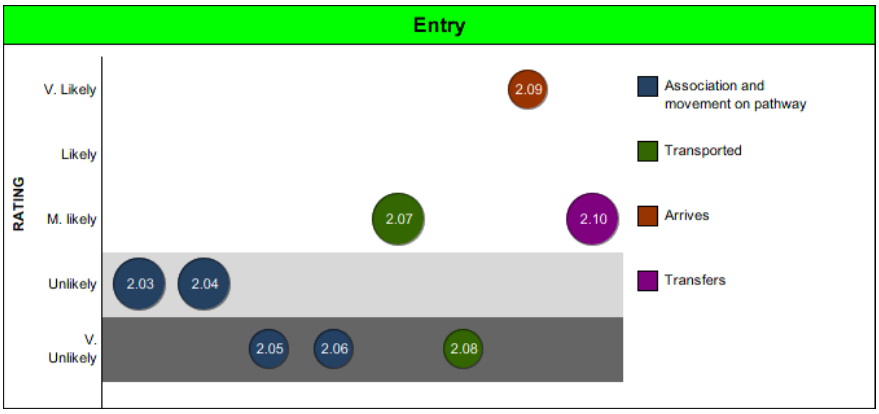
At least one host is likely to be growing in close proximity to places where wood is stored. The likelihood is considered lower than for plants for planting (i.e. moderate instead of likely) as larvae are less likely to complete their development in wood, and adults would have to emerge from wood that may have been exposed to desiccation.

2.11 - The probability of entry for the pathway should be described

very unlikely

***Level of uncertainty:* low**

The answers are visualized below. The likelihood of entry on wood is rated as very unlikely because of the very low volumes of wood imports from New Zealand, and low likelihood of association. Although the probability could increase if volumes increased, this is considered very unlikely as New Zealand is not a major wood exporter (except for *Pinus radiata,* but this is a rare host), and costs of shipping are relatively high.



2.13b - Describe the overall probability of entry taking into account the risk presented by different pathways and estimate the overall likelihood of entry into the PRA area for this pest

moderately likely

***Level of uncertainty:* medium**

The probability of entry on plants for planting is moderately likely, on wood very unlikely, so the overall probability of entry is moderately likely (the maximum of the two ratings).

Probability of establishment

Select the factors that may influence the limits to the area of potential establishment and the suitability for establishment within this area.
For each question which was answered with a "yes", detailed information is provided after the table.

No.	Factor	Is the factor likely to have an influence on the limits to the area of potential establishment?	Is the factor likely to have an influence on the suitability of the area of potential establishment?	Justification for no answers
1	**Host plants and suitable habitats**	**Yes** (see 3.01)	**Yes** (see 3.09)	
2	**Alternate hosts and other essential species**	**No**	**No**	*O. hirta* does not need alternate hosts.
3	**Climatic suitability**	**Yes** (see 3.03)	**Yes** (see 3.11)	
4	**Other abiotic factors**	**No**	**No**	No such abiotic factors have been identified in the literature available
5	**Competition and natural enemies**	**No**	**No**	Competition is not mentioned in the literature. Natural enemies are not likely to have an impact on establishment. They may have an impact on populations of the pest once it is established (see 6.04).
6	**The managed environment**	**No**	**Yes** (see 3.14 / 3.15)	In no part of the area is the managed environment such that it would prevent establishment of longhorn beetles, even when some management measures are applied for example in fruit, forest and ornamental crops. Since damaged and pruned trees are more prone to attack, good management practices will make the host less susceptible.
7	**Protected cultivation**	**Yes** (see 3.07)	**Yes** (see 3.16)	

Host plants and suitable habitats

3.01 - Identify and describe the area where the host plants or suitable habitats are present in the PRA area outside protected cultivation.

Most host species and genera listed in Annex 1 occur in the PRA area. They are grown for fruit production (commercially or in gardens), for ornamental purposes (private and public gardens, landscaping, cities), occur naturally or are planted in forests and plantations. Some of the known host species or related species in the same genera grow in the wild over large areas (e.g. poplar, oak, gorse, broom, birch, etc.) and some are also widely distributed invasive species like *Buddleja davidii*. Some species occur throughout the PRA area (e.g. poplar, willow, oak, apple). Others have a more restricted distribution that excludes the northernmost and easternmost areas (e.g. grapevine, chestnut, walnut, hazelnut). Finally, some hosts (such as *Citrus* spp., persimmon, pomegranate, loquat, eucalyptus) are grown commercially in southern areas, especially in the Mediterranean region and Caucasus, although they may be present in gardens and as ornamentals elsewhere. In general, although there are hosts of *O. hirta* in any parts of the EPPO region, there are more hosts in the southern part of the PRA area, and more under commercial cultivation, than in the northern part.

Some details are given below for hosts that are reported to be frequently attacked under 1.06, as well as for all fruit species. Unless indicated otherwise, the data on production areas are for 2010 and relates to areas in commercial cultivation (extracted from FAOStat, detailed data in Annex 7).

<u>Hosts reported to be frequently attacked in the area of origin as per 1.06</u>

- **citrus** (*Citrus* spp.) is widely cultivated as a commercial crop for fruit production and is also grown in gardens, especially in the Mediterranean area. In total, 833.492 ha are cultivated in the PRA area, about 50% of which is in Spain and Italy (see Table 1 in Annex 7). All species mentioned as hosts in Annex 1 are cultivated, and the most widely grown is orange, for which 6 countries (Spain, Italy, Algeria, Morocco, Turkey and Greece) account for over 90% of the cultivated area.
- **persimmon** (*Diospyros kaki*) is cultivated in a few countries of the PRA area, with 14.500 ha in total in Azerbaijan,

Israel, Italy, Slovenia (small area) Spain and Uzbekistan (See Table 2 in Annex 7). In addition, De Sousa *et al.* (1995) mention ca. 1500 ha in Portugal, with few organized orchards. Lionakis (1995) reports that there are 120.000 trees in Greece, cultivated in gardens or mixed in orchards of other species. Persimmon has been grown commercially in Cyprus since 1995 (Gregoriou, 1995) Walali Loudyi (1995) reports 10 ha of commercial production in Morocco, and that persimmon trees are not widespread in gardens. In Spain the total area was estimated to be 5827 ha in 2010 and is growing with over 9000 ha in 2012. Finally, in Turkey, Aksoy (1995) reports 370.000 trees for a production of 10.000 tonnes. The situation may be similar in other Mediterranean and Caucasus countries (i.e. small areas in commercial cultivation, but large numbers of trees outside commercial production).

- **grapevine** (*Vitis vinifera*). Grapevine is grown in a large part of the PRA area, with 4.530.132 ha in total in the PRA area: The largest areas are in Spain, France, Italy and Turkey (67% of the total), with substantial areas also in Portugal, Romania, Moldova, Uzbekistan (13% of the total) (see Table 3 in Annex 7). In recent years, the northern limit of grapevine growing has moved further north with increasing production in countries including UK and Belgium.
- **apple** *(Malus* spp.). Apple trees are grown in all countries of the PRA area, commercially and in gardens *(M. domestica*). Commercial cultivation occupies 1.474.114 ha, with more than 50% in 6 countries (Poland, Russia, Turkey, Ukraine, Uzbekistan and Belarus) (See Table 4 in Annex 7). In Russia and the CIS countries (Doronina & Terekhina, 2009), apple trees are grown south of a line joining (roughly) Ladoga lake in the West (60°North) to south of Sakhalin island in the East (circa 45°North). A wide range of other *Malus* spp. are also used in the PRA area as rootstocks for other fruit trees and ornamentals. There are also wild *Malus* spp. in the PRA area (e.g. *M. sylvestris*) and some native and endangered species (see 6.09).
- **poplar** (*Populus* spp.) is widespread, both in indigenous forests and in commercial plantations for wood production, fibre, pulp and biofuel (FAO, 2008). It is also planted for environmental purposes, especially phytoremediation of polluted soils and water, carbon exchange and storage, forest landscape restoration, rehabilitation of degraded lands and combating desertification. According to the information provided by countries that are members of the International Poplar Commission (Annex 7, Tables 21 & 23), there were 22.520.900 ha of indigenous and planted poplar in 2007 (of which over 95% is in Russia). Of the *Populus* species mentioned specifically as hosts for *O. hirta*, *P. nigra* and *P. alba* occur in natural forests and riverine woodlands, *P. nigra* being also an important plantation species (FAO, 2008). Other *Populus* spp. and hybrids such as P. x canadensis occur in the PRA area, some widespread and abundant (e.g. *P. tremula*, *P. canescens*), others rare and endangered (see 6.09). In the PRA area, poplars are commonly planted in rows to provide a windbreak around gardens, fields and orchards (Tertyshnyi, 1991; Bulir *et al.*, 1984).
- **gorse** (*Ulex europaeus*) grows in the wild, mainly in the oceanic part of the PRA area. It commonly colonizes abandoned farmland and forests, and is a part of oceanic coastal landscapes (Portugal to Ireland and Scotland). No map or quantitative data were found on the distribution of gorse in the PRA area.

<u>Fruit species</u>

The table below summarizes the areas under commercial cultivation in the PRA area for the fruit and nut species in Annex 1 (detailed data in Annex 7). Fruit species detailed above are in bold. It should be noted that countries with the largest areas are not necessary those which have the biggest production (e.g. for plums).

Fruit crop	Total ha in the PRA area in 2010	Countries with largest areas
Grapevine	**4.530.132**	Spain, France, Italy,Turkey
Apple	**1.474.114**	Poland, Russia, Turkey, Ukraine, Uzbekistan and Belarus
Almond	1.027.577	Spain, Tunisia, Morocco, Italy, Algeria, Portugal
Citrus	**833.492**	Spain, Italy, Algeria, Morocco, Turkey and Greece
Plums and sloe	567.732	Serbia, Bosnia & Herz., Romania, Russia, Croatia, Poland
Hazelnut	561.153	Turkey, Italy, Azerbaijan, Spain
Peach and nectarine	362.687	Italy, Spain, Greece, Turkey, Algeria, Tunisia
Apricot	283.962	Turkey, Uzbekistan, Algeria, Italy, Spain
Figs	277.737	Portugal, Algeria, Turkey, Morocco, Tunisia, Spain, Albania
Pears	269.427	Italy, Spain, Algeria Turkey, Ukraine, Tunisia, Poland, Uzbekistan, Portugal, Serbia
Walnut	248.840	Turkey, Poland, France, Ukraine, Serbia, Greece
Cherries	244.042	Turkey, Italy, Spain, Russia, Bulgaria, Ukraine, Poland
Sour cherries	189.952	Poland, Russia, Serbia, Turkey, Ukraine, Hungary
Chestnut	123.861	Turkey, Portuga,l Italy, Spain, Greece, France
Avocado	30.954	Portugal, Spain, Israel, Morocco
Persimmon	**24.500**	Azerbaijan, Israel, Italy, Spain and Uzbekistan
Gooseberry	27.122	Russia, Germany, Poland, Ukraine
Blueberries	12.153	Sweden, Poland, Germany, Lithuania

FAOStat does not contain data on the other fruit species: pomegranate, loquat, tamarillo and macadamia. These are minor crops in the PRA area:

- **pomegranate** (*Punica granatum*) is grown in the Mediterranean Basin and Caucasus. The total area of pomegranate cultivation (only for some countries, based on a few publications; see Table 19 in Annex 7) is of the same order as for some minor crops in the table above. Major pomegranate producers in the PRA area are: Turkey, Azerbaijan and Spain, but it is also grown in Greece, Cyprus, Italy, Portugal and Tunisia. It is also grown in Morocco and Israel (no quantitative data are available; Walali Loudyi, 1995; Blumenfeld *et al.*, 2000). Pomegranate is also likely to be grown in other countries of the Mediterranean, Near East or Caucasus.
- **loquat** (*Eriobotrya japonica*) (see Table 20 in Annex 7). The publications found in relation to the cultivation of loquat in the PRA area indicate a small production area (ca. 6.400 ha in total for the countries found, i.e. Turkey, Spain, Italy, Morocco, Israel, Greece, Portugal, Cyprus). Loquat may also be cultivated in other countries of the Mediterranean Basin, Near East and Caucasus.
- **tamarillo** (*Solanum betaceum*) is cultivated in Madeira, Portugal (throughout the island, commercial crops of approx. 2 ha, mainly in the municipalities of Santana and Santa Cruz, for the local market, grown from sowing of local plants) (Silva, pers. comm., 2010-10 in the draft EPPO PRA on Ca. *Liberibacter solanacearum*). It is also cultivated in gardens in mainland Portugal. No data were found for other countries of the PRA area, but it is sold as a garden plant.
- **macadamia** (*Macadamia* spp.) was grown commercially in Israel in the past, but it is not anymore (EPPO, 2011c). No EPPO countries are listed amongst producers of macadamia nuts (FAO-CIHEAM, 2004).

Climatic suitability

3.03 - Does all the area identified as being suitable for establishment in previous question(s) have a suitable climate for establishment?

Yes

In New Zealand, *O. hirta* is present throughout the country, from the cool temperate areas of the South Island to the subtropical areas of the North Island. The maps of degree-day accumulation accumulation (in excess of 10°C) for New Zealand and the PRA area in Fig. 1 & 2 indicate similarities between parts of the PRA area and the areas of origin. The location (where *O. hirta* is recorded) with the lowest degree-days accumulation is Otatara (461 DD). This was taken as threshold in Europe which would indicate a possible northern limit (in dark blue) based on the major assumptions that:
1) *O. hirta* is not in colder locations in NZ and
2) Day degrees are a good way of describing where the beetle will survive.

The location where *Oemona hirta* has been recorded that experiences the maximum amount of degree-day accumulation is at Cape Reinga in the far north of the North Island of New Zealand (2273 DD).

Fig 1: Map of degree-days accumulation (in excess of 10°C) in New Zealand. Red dots indicate place where *O. hirta* was reported to occur (see Annex 2)

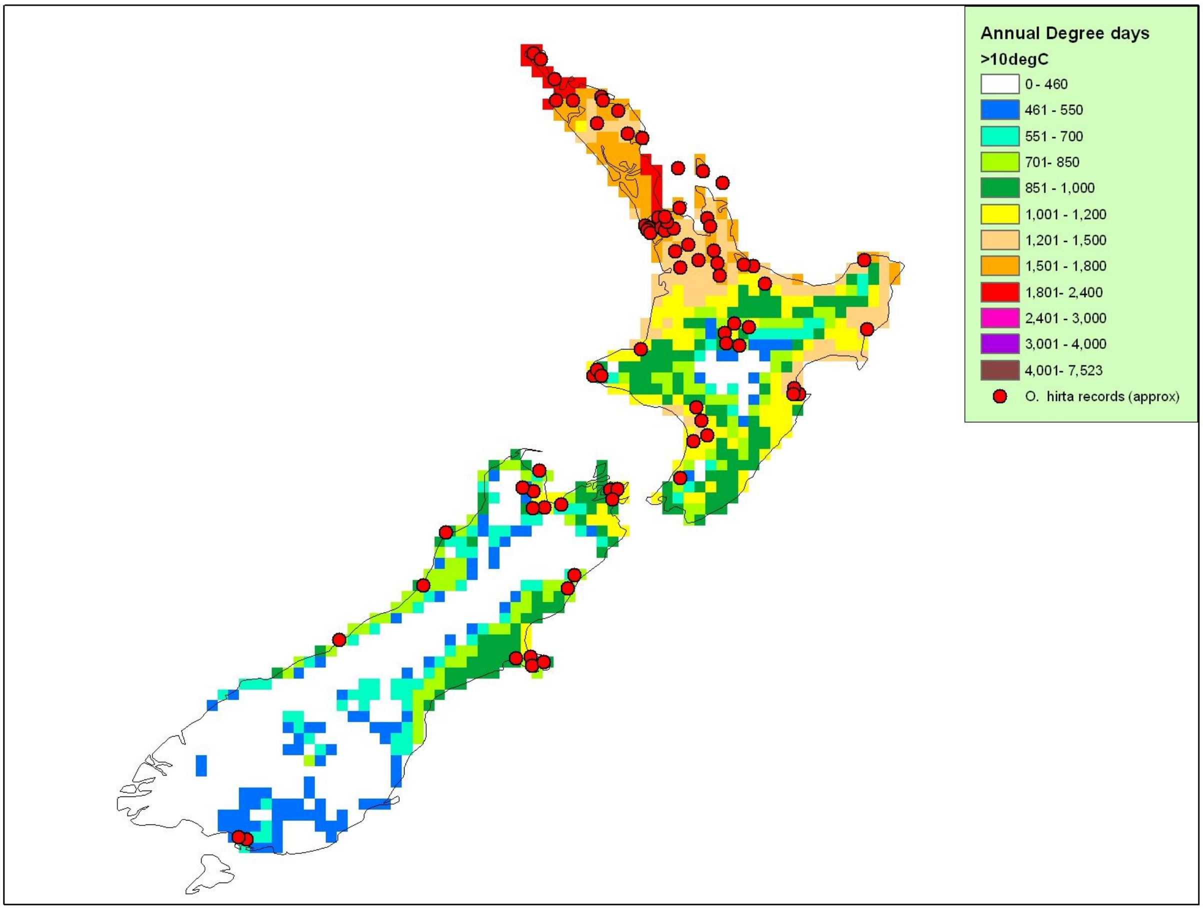
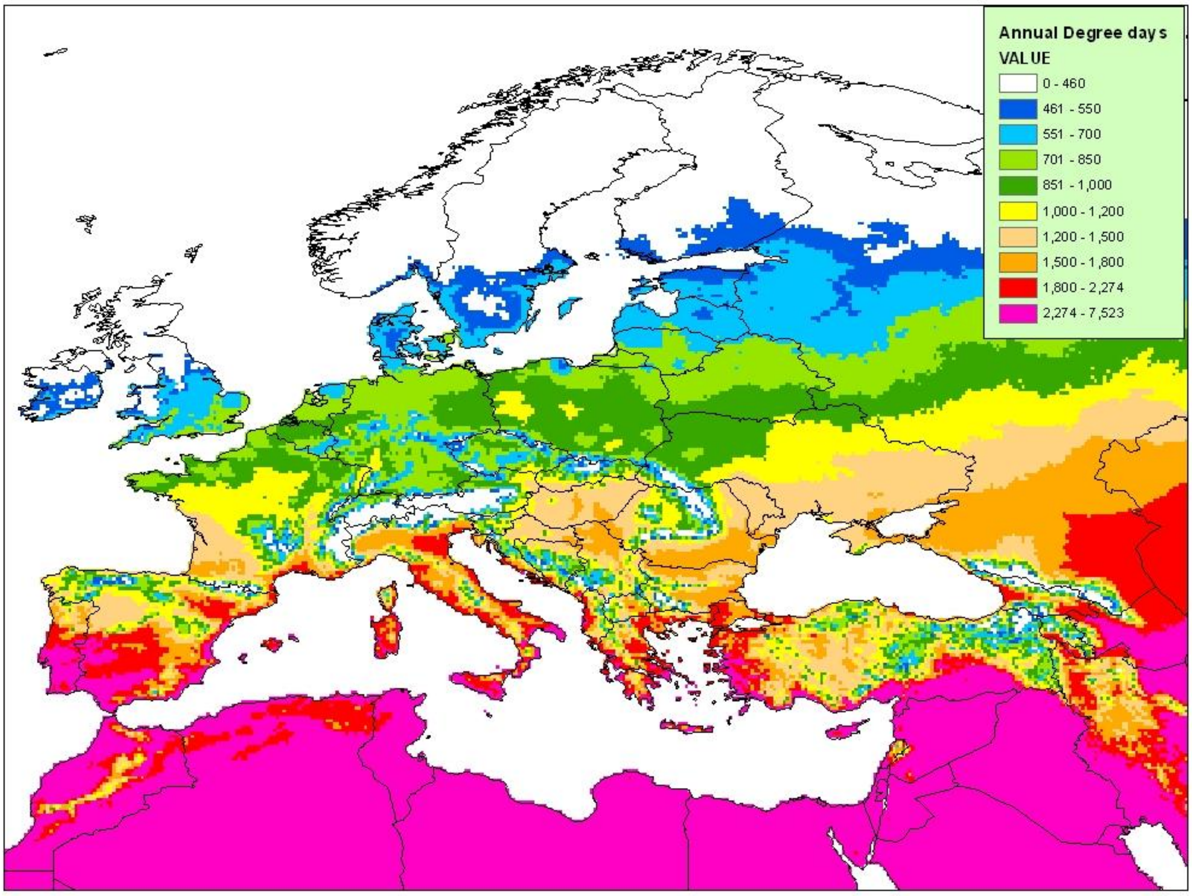


Fig 2: Map of degree-days accumulation (in excess of 10°C) in the EPPO region.



The similarities between the climate in areas of New Zealand in which *Oemona hirta* has been recorded and the climate in the EPPO region, suggest that large parts of the EPPO region would be climatically suitable for the pest.

There are no published studies on the climatic tolerances of *Oemona hirta* therefore it is difficult to make confident predictions about whether the beetle would be able to survive in areas which do not have a similar climate to New Zealand.
New Zealand does not include any areas which experience hot and dry conditions during several months as do occur in some Mediterranean countries. In areas with warmer climates than in New Zealand, it is expected that adults would emerge earlier in spring and may be able to survive as larvae within the host plants during the warm summer. It is considered possible that the life cycle could be completed within one year in warm areas, and a new generation started in the same year (Q. Wang, Massey University & J. Bain, New Zealand Forest Research Institute Ltd., NZ, 05-2012, personal communications).
It is possible that climate could be limiting in the hot and dry areas in the southern part of the PRA area, but this would not be relevant in irrigated crops such as some citrus crops. It is also possible that climate could be limiting in the far north of the PRA area where summers may be too cool for full pest development.

In summary, we would expect large parts of the PRA area to be climatically suitable for *O. hirta* and based on day degree data this would cover at least part of all EPPO member states. There is no data to allow confident predictions outside of the areas that have a similar climate to the area where *Oemona hirta* is known to be present in New Zealand.

Protected Cultivation

3.07 - Are the hosts grown in protected cultivation in the PRA area?

Yes

Some hosts are cultivated under protected conditions as part of nursery production, and some ornamental plants would be grown in glasshouses or conservatories because of their tropical / sub-tropical requirements. No mention of the pest under protected conditions was found in the literature in areas where it occurs.

3.08 - By combining the cumulative responses to previous questions with the response to question 3.07, identify the part of the PRA area where the presence of host plants or suitable habitats and other factors favour the establishment of the pest.

Hosts are present across the PRA area so all areas that are climatically suitable should favour the establishment of the pest. It is uncertain whether the pest would be able to establish in the northernmost part of the PRA area, and in hot and dry areas in the southern part of the PRA area because of climatic conditions.

Host plants and suitable habitats

3.09 - How likely is the distribution of hosts or suitable habitats in the area of potential establishment to favour establishment?

very likely

***Level of uncertainty:* low**

Areas with high densities of host plants are more favourable than areas of low density. For example, it is expected that higher populations of *O. hirta* will occur in hardwood forests and monocultures of *Citrus*, than in forests with mainly conifers. It is not known whether there are differences of reproductive rate between hosts.

Climatic suitability

3.11 - Based on the area of potential establishment already identified, how similar are the climatic conditions that would affect pest establishment to those in the current area of distribution?

largely similar

***Level of uncertainty:* low**

The warmer parts of the PRA area are expected to allow more rapid build-up of populations (Wang *et al.*, 2002). This is also supported by the fact that, in New Zealand, more damage is reported on the North Island than on the South Island, where hosts such as apple or grapevine are also commercially grown.

The managed environment

3.14 - How favourable for establishment is the managed environment in the area of potential establishment?

Highly favourable

***Level of uncertainty:* low**

Pruning and high host density in orchards will favour establishment.

3.15 - How likely is the pest to establish despite existing pest management practice?

very likely

***Level of uncertainty:* medium**

It could establish in unmanaged environments, and in managed environments it is likely that current pest management practices will not prevent establishment as the timing of application may not coincide with the susceptibility period of *O. hirta* as most of the life cycle is hidden.

Protected Cultivation

3.16 - Is the pest likely to establish in protected cultivation in the PRA area?

No

***Level of uncertainty:* low**

Climatic conditions in glasshouses are probably favourable for establishment. However, host plants will usually stay less than one year in protected cultivation (e.g. in nurseries), so if outside conditions are not suitable, *O. hirta* will not be able to end its life cycle.

3.17 - How likely are the reproductive strategy of the pest and the duration of its life cycle to aid establishment?

moderately likely

***Level of uncertainty:* low**

O. hirta has a long life cycle (reported as being 2 years, but may be shorter in warmer areas), which may reduce the probability of establishment. Details of the life cycle are given in the *Introduction*.

Adults have a relatively long life (30-50 days at 24°C in the laboratory; Wang *et al.*, 2002). Females lay moderate numbers of eggs, about 50 (Wang *et al.*, 1998). Oviposition occurs over several days (17 in Wang *et al.*, 1998; 30 in Dye, 1950) and a female may therefore lay eggs on several host plants, therefore increasing the number of infested plants and decreasing the probability of detecting all individuals. Most of the life cycle is hidden, which protect the larvae from predation.

However, there is no asexual reproduction, and there is no evidence of a long-range sex pheromone.

Wang *et al.* (2002) report that adults are less fertile if they have received insufficient nutrition as larvae (as may happen under conditions of degrading quality of the wood as in cut twigs).

The reproductive strategy is moderately likely to aid establishment (according to the rating guidance of the EPPO PRA scheme).

3.18 - Is the pest highly adaptable?

Yes, highly or very highly adaptable

***Level of uncertainty:* low**

O. hirta is considered as highly adaptable (according to the rating guidance of the EPPO PRA scheme):

- Originally attacking native New Zealand plants, it has adapted to many exotic species from many families. Although this PRA is conducted on the known hosts, it is likely that the pest could attack other species (especially woody dicotyledons) once at destination.
- It is present in different types of climate in New Zealand from cool temperate areas of the South Island to the subtropical areas of the North Island.

3.19 - How widely has the pest established in new areas outside its original area of distribution?

Not established in new areas

***Level of uncertainty:* low**

There are no records of *O. hirta* establishing in new countries.

3.20 - The overall probability of establishment should be described.

high

***Level of uncertainty:* medium**

Climatic conditions are considered appropriate in most of the PRA area and there are numerous hosts in a variety of habitats, including in commercial cultivation. *O. hirta* is also highly adaptable, especially to new hosts. However, the pest biology (e.g. length of the life cycle, no asexual reproduction, no evidence of long-range sex pheromone) will not favour rapid buildup of populations. In addition, there is no evidence that *O. hirta* has ever established outside New Zealand. The probability of establishment was therefore rated as high (and not very high).

Stage 2: Pest Risk Assessment Section B: Conclusion of introduction

c1 - Conclusion on the probability of introduction.

The probability of entry was rated as moderate, and the probability of establishment as high. The probability of introduction is therefore considered as moderate (the minimum of the two ratings).

Probability of spread

4.01 - What is the most likely rate of spread by natural means (in the PRA area)?

Low to moderate rate of spread

***Level of uncertainty:* medium**

No indication was found in the literature of flight distances for *O. hirta*. The only indication in the literature is that *O. hirta* is reported as a “good flier”, without any indication of flight distances. Estimation of flight distances of Cerambycidae is very difficult as it depends on many parameters. Low to moderate spread seems most likely (10 m - 10 km). This is consistent with studies on movement of adult Cerambycidae and also consistent with the assessment in the EPPO PRA for *Saperda candida* (EPPO, 2011a). In the case of *A. glabripennis* and *A. chinensis,* several studies have shown that most beetles stay within 500 m from the trees from which they emerge although mark-recapture studies also indicate flight distances of 1 -3 km (Adachi, 1988; Smith *et al.*, 2001, 2004; Van der Gaag *et al.*, 2008; Haack *et al.*, 2010). In a mark-recapture study, Drag *et al.* (2011) found that *Rosalia alpina,* a European Cerambycidae whose host plants are *Fagus* spp., could disperse to distances of up to 1.6 km.

4.02 - What is the most likely rate of spread by human assistance (in the PRA area)?

very high rate of spread

***Level of uncertainty:* low**

Plants for planting, cut branches, and to a lesser extent wood (including firewood, bark and untreated wood packaging material), can be infested with larvae, pupae or eggs of *O. hirta.* Exchange of such material within the PRA area may spread the pest (bark and cut branches could transport the pest over short distances, and are therefore mentioned here). There is a large trade of plants for planting between countries of the PRA area. The pest may also be a potential hitch-hiker, e.g. moving on cars, etc. The main risk of spread would be by the movement of infested plants for planting (including cuttings) between nurseries. In the UK, FERA (2010) estimates that infested plants could spread *O. hirta* to any part of the country within 1-2 days.

Note that the rating level (very high) indicates over the distances over which the pest can be distributed. It does not indicate the rate by which the infested area will increase (see 4.03 for further explanation).

4.03 - Describe the overall rate of spread

moderate rate of spread

***Level of uncertainty:* high**

The overall rate of natural spread is low-moderate and the spread by human means is very high. Satellite populations may be established in multiple locations through human spread, but natural spread from these outbreaks will be relatively slow. The overall rate of spread (i.e. increase in infested area) is rated as moderate with a high uncertainty as it is difficult to know if spread will occur naturally or via human assistance.

4.04 - What is your best estimate of the time needed for the pest to reach its maximum extent in the PRA area?

***Level of uncertainty:* low**

O. hirta would be expected to take at least 100 years to reach its maximum extent in the PRA area, considering that its maximum extent covers at least part of every country in the whole PRA area.
Some studies on the movement of adult Cerambycidae over longer periods of time have been made. In Canada, *Tetropium fuscum* spread to eighty kilometres beyond the point of introduction over 20 years (Rhainds *et al.*, 2011).

4.05 - Based on your responses to questions 4.01, 4.02, and 4.04 while taking into account any current presence of the pest, what proportion of the area of potential establishment do you expect to have been invaded by the organism after 5 years?

***Level of uncertainty:* medium**

Because of a long life cycle and moderate rate of spread, *O. hirta* would occupy only a very small part of the area of potential establishment after 5 years, and may only have spread over 1-20 km during these 5 years under favourable conditions. Many outbreaks of for example *A. glabripennis* were detected several years after the pest’s introduction and the outbreak areas were still relatively small at time of detection, e.g. less than 1 km in diameter (e.g. Hérard *et al.*, 2005). *Oemona hirta,* however, mainly attacks small twigs and branches and many kinds of shrubs. Therefore, the pest may more easily be spread by human assistance (movement of small plants or prunings that are infested) than longhorned beetles that mainly attack trunks and large branches. In addition, females are able to lay eggs on different trees, therefore it can be assumed that spread is more efficient than for *A. glabripennis.*

Stage 2: Pest Risk Assessment Section B: Eradication, containment of the pest and transient populations

5.01 - Based on its biological characteristics, how likely is it that the pest could survive eradication programmes in the area of potential establishment?

likely

***Level of uncertainty:* medium**

Early detection is the key factor for a successful eradication. This would be difficult as there are no specific traps and attractants (pheromones), the symptoms are not very distinctive and most life stages are hidden.

In favourable conditions, the pest would spread over many different hosts in many habitats, including gardens, natural areas or forest, or in the wild, which would complicate eradication. Removing all potential hosts around an outbreak would be technically possible only for small-scale outbreaks.

In addition adults fly and may spread before eradication is completed (although natural spread is rated as low to moderate). The eradication programme would require large quarantine areas and buffer zones to cover the potential flight of the adults, similarly to eradication campaigns against other Cerambycidae (e.g. *Saperda candida*, EPPO, 2011a), with prohibitions on the movement of host plants.

The behaviour described in 4.01 (i.e. *O. hirta* is a good flier, but it may not use this in all circumstances) complicates the determination of surveillance areas as it needs to rely on an extensive monitoring in a small radius, and a targeted monitoring in a much larger radius (C. Cocquempot, INRA, FR, 03-2012, personal communication).

Eradication may be possible in some limited circumstances, such as entry under protected conditions (e.g. glasshouse facility or nursery), or entry and early detection in a nursery outdoors. It is assumed that overall eradication might be as difficult as for *Anoplophora* spp. (eradication efforts of *Anoplophora* spp. are summarized by Haack *et al.*, 2010).

5.02 - Based on its biological characteristics, how likely is it that the pest will not be contained in case of an outbreak within the PRA area?

likely

***Level of uncertainty:* medium**

Small outbreaks can probably be eradicated, and larger outbreaks not. In case of large outbreaks, containment is unlikely to be practical because of the resources required to survey and remove infested or potentially infested trees. It might be possible to slow the spread by taking measures to reduce the movement of plants for planting from infested areas.

5.03 - Are transient populations likely to occur in the PRA area through natural migration or entry through man's activities (including intentional release into the environment) or spread from established populations?

No

***Level of uncertainty:* low**

This is not relevant for this pest.

Assessment of potential economic consequences

6.01 - How great a negative effect does the pest have on crop yield and/or quality of cultivated plants or on control costs within its current area of distribution?

moderate

***Level of uncertainty:* low**

The economic importance of *O. hirta* in New Zealand is due to attacks on exotic plants grown in orchards, and plantations, and in gardens (such as citrus, poplar, persimmon, grapevine, apple, etc.). It was considered as very destructive when citrus orchards were first established and the pest started attacking citrus (Hudson, 1934). Dumbleton (1937) indicated that borer damage was not widespread or serious, except in the case of citrus. However, in professionally managed citrus orchards, the infestation levels are generally very low without specific management measures against *O. hirta* (Q. Wang, Massey University, NZ, 05-2012, personal communication). In two documented cases of outbreaks, one in grapevine, one in apple, the impact was massive (destruction of plants) (Wang & Shi, 1999).

Nature of the damage

The damage is caused only by larvae, which bore into the wood soon after hatching, creating tunnels in the branches or stems. The main types of damage are (Hosking, 1978; Clearwater, 1981):

- Small twigs are mined and killed by young larvae, resulting in clusters of dead leaves in summer;
- Older larvae mine in larger branches and, to a lesser extent, main stem. This may cause branch breaking, with wind or fruit load, as well as stem death in some cases (e.g. poplar, Wilkinson, 1997);
- Larvae may girdle branches, by creating galleries around it, sometimes causing death or breakage (Hudson, 1934). Duffy (1963) notes that larvae frequently tunnel round the branch under the bark when they reach a point where the diameter exceeds 1.5 inch (approx. 4cm), before constructing their pupal chamber. This type of gallery is uncommon and galleries are generally longitudinal in the branches and stems.

Damage to large branches rarely kills them, but generally degrades the conditions of the tree. Damage becomes apparent 2-3 months after hatching (small branches begin to die) (Dye, 1950). *O. hirta* attacks both healthy trees (Cottier, 1938; Clearwater & Muggleston, 1985) and stressed trees, and the latter may suffer heavier damage (e.g. hazelnut, HGANZ, 2008; plum, Fraser *et al.*, 2003).

Mortality is rarely reported in the literature, but branches may break, compromising fruit production, and the pest may compromise the structure of the tree (Morton & Proebst, 2003). Wang & Shi (2001, citing unpublished data) note that one or a few larvae can kill or severely weaken a tree or vine. The entry of fungi and pathogens into the galleries can cause decay and favours tree decline. It affects the fruit-bearing wood, can compromise fruit production and affect the longevity, vigour and yield of the tree (e.g. Wang, 1998; persimmon, Rohitha *et al.*, 1992). Tree species that, once mature, have a large trunk diameter are very unlikely to be killed by *O. hirta*.

Details on damage on different hosts

Generally *O. hirta* is not important in New Zealand, except in *Citrus* spp., where it has, at most, a moderately negative effect (J. Bain, New Zealand Forest Research Institute Ltd., & Q. Wang, Massey University, NZ, 05-2012, personal communications). Reports of damage are mostly from the North Island. *Citrus* is grown on a commercial scale only on the North Island, and damage to orchards affects fruit production (Q. Wang, Massey University, NZ, 05-2012, personal communication).

The following sections describe damage as reported in the literature for those host plants that are reported as more frequently attacked by *O. hirta.* Most publications give general statements about damage. A few publications give information about infestation rates for specific sites, but do not give data on yield losses.

- **citrus.** All commercial varieties are reported to be attacked, and lemon and orange are mentioned in many publications (Cottier, 1938; Dumbleton, 1937; Clearwater, 1981; Wang & Shi, 1999; Lu & Wang, 2005; Landcare Research, 2011). *O. hirta* was named in 1980 as the major insect problem on citrus in New Zealand (Clearwater & Wouts, 1980). It is a pest both for orchards and domestic gardens (Watt, 1983). Major damage to citrus occurs in the North Island, particularly in Northland and Gisborne regions (Wang & Shi, 1999). The same article reports 100% of trees infested in an orchard with many branches dead or dying, and an infestation level of 30% in 14500 mixed citrus trees. In the Gisborne region in the 1990s, the level of damage varied between sites, with infestations of 10-50% in some sites, and 100 % in others (Wang, 1998). *O. hirta* is identified as a pest problem for organic citrus (Morton & Proebst, 2003). There is advice on the Internet to garden owners regarding damage to citrus. Once established in the garden it causes damage and can destroy plants (Waikato Times, 2009).

- **grapevine**. *O. hirta* is a pest of grapevine (Charles, 1979; Wang *et al.*, 2002; Lu & Wang, 2005). Clarke & Pollock (1980) indicate that, on vines, *O. hirta* rarely becomes a major problem even where no control measures are applied.

However, *O. hirta* can have debilitating effects on vines and will be an increasing problem for maturing vineyards (Wearing *et al.*, 2001). Almost 100 % of plants were infested in a vineyard area of Hawke's Bay in 1996, with some blocks of plants having to be pulled out in 1996-1997 because of this damage (Wang & Shi, 1999; Q. Wang, Massey University, NZ, 05-2012, personal communication). In Gisborne, some vineyards were not attacked while others reported to be 10-50% infestation (Wang, 1998). Landcare research (2011) notes that attacks are more frequent on citrus and grapes than on apples and pears.

- **persimmon**. *O. hirta* is a pest of persimmon (Glucina, 1980; Wang *et al.*, 2002). Attacks are occasional but may cause major damage (Kitagawa & Glucina, 1984). It is reported that commercial cultivation of persimmon started at the beginning of the 1980s. *O. hirta* caused severe damage in 1984 when 41% of the trees were found infested in an orchard. The pest attacked mostly mature wood, which is important for the productivity of the tree; new wood was not damaged. Most (95%) of damaged branches had a diameter between 30-40 mm (Rohitha *et al.*, 1992).

- **apple (*Malus* spp.)**. *O. hirta* is mentioned in the literature as a pest of apple (e.g. Wang & Shi, 1999; Wang *et al.*, 2002; Biosecurity Australia, 2004; Lu & Wang, 2005), but there are few details of the level of damage. Landcare Research (2011) notes that attacks are more frequent on citrus and grapes than on apples and pears, while Wang & Shi (1999) considers *O. hirta* as an important pest of citrus, apple and grapes. In the 1990s, major damage was reported in the Waikato area, with some orchards taken out because of severe damage to trees (Wang & Shi, 1999). However nowadays *O. hirta* is not a major concern on apple (Q. Wang, Massey University, NZ, 05-2012, personal communication).

- **poplar.** Poplar is highly susceptible to *O. hirta* but is not economically important in New Zealand (Q. Wang, Massey University, NZ, 05-2012, personal communication). According to Wilkinson (1997), *O. hirta* is the main insect pest of poplars in New Zealand and has caused losses in both poplar and tree willow pole production nurseries. It usually tends to attack trees under water stress on drier or free-draining soils. *O. hirta* may attack poplar nurseries, girdling the living stumps used for the production of cuttings (Hosking, 1978). Occasionally it girdles young stems, causing breakage (Wilkinson, 1997). Shelterbelt species such as poplar and hakea support populations that may invade orchards (Clearwater, 1981). *O. hirta* also severely affected willow shelterbelts (matsuda willow) in several areas with 50% of trees affected at Opotiki, 10% of a group of 4-year old trees affected at another location (Baker, 1982; Baker *et al.*, 1982). From the available literature, no damage is reported in plantations.

6.02 - How great a negative effect is the pest likely to have on crop yield and/or quality of cultivated plants in the PRA area without any control measures?

major

***Level of uncertainty:* medium**

In areas where *O. hirta* would establish outdoors, it could attack many host species in the natural environment, commercial orchards, gardens, plantations and amenity areas. It is expected that the potential damage will be higher in areas of fruit production and plantations, especially if it can also establish in the wild on hosts that grow extensively with or without management. Even if *O. hirta* does not generally kill its hosts, it may cause a degradation of the productivity of fruit trees over several years. In the southern part of the PRA area, the pest may have an annual life cycle, which will increase damage. The impact has the potential to be massive for individual growers in case of outbreaks in vulnerable crops such as citrus, grapevine or apple.

In New Zealand, it has been suggested that natural enemies contribute to keeping populations under control. However, only three natural enemies have been specifically identified (see 6.04). They are not known to occur in the PRA area.

6.03 - How great a negative effect is the pest likely to have on yield and/or quality of cultivated plants in the PRA area without any additional control measures?

moderate

***Level of uncertainty:* medium**

Orchards, nurseries and plantations may be subject to control measures against other pests in the PRA area, which may allow a certain control of *O. hirta (see below)*. However, it is not expected that they will affect the impact of the pest. In addition, hosts also occur in a wide variety of environments which are subject to minimal control measures (e.g. forests, parks, gardens).

In orchards of citrus, stone fruit or pome fruit, or in nurseries, pest management may be applied, but the timing of application of insecticides may not coincide with the susceptibility period of *O. hirta* as most of the life cycle is spent within the plant. In addition, pest control in fruit crops will target mostly fruit pests or defoliators, and not wood borers.EPPO Standards PP2 on Good Plant Protection Practices for Pome fruits (PP2/18,), Citrus (PP2/27) and Stone fruits (PP2/33) (http://archives.eppo.org/EPPOStandards/gpp.htm) give an indication of the main pests and their

control in the PRA area. Most are foliar and fruit pests. *Xyleborus dispar* (Coleoptera: Scolytidae) (pome fruits and various fruit trees) and *Synanthedon myopaeformis* (Lepidoptera: Sesiidae) (pome fruits, especially apple) are the only wood borers for which control measures are mentioned. *Zeuzera pyrina* and *Cossus cossus* (both Lepidoptera, Cossidae) are also noted as pests in Southern Europe. Preventive measures such as prevention of wounds on the tree and treatment with wound-protecting products would have an effect on *O. hirta* but not the other control methods which rely on mating disruption or trapping (as they are specific of the species targeted).
In general pest management is restricted to fruit pests, such as *Ceratitis capitata* and leaf pests for citrus. Wood borers may be a problem in arid and semi-arid areas, where broad spectrum insecticides may be applied. However, in regular conditions, chemical treatments against other pests will not affect wood borers (P. Milonas, Benaki Phytopathological Institute, GR, 05-2012, personal communication).

For poplar and willow (FAO, 2008), some pest management measures are taken, especially in plantations and nurseries. A common practice in Greek nurseries would be a chemical treatment with a broad spectrum insecticide at regular intervals all year round (P. Milonas, Benaki Phytopathological Institute, GR, 05-2012, personal communication). Pruning, trimming and thinning occurs (Croatia, Turkey, Romania). There is a range of damaging pests on poplar in the PRA area and insecticides are applied in some countries (FAO, 2008) in nurseries or young plantations. Aerial spraying against *Lymantria dispar* is used in Romania, and mechanical and chemical treatments in Serbia. Control methods are applied against poplar woolly aphid and *Operophtera brumata* in Spain. Monitoring is carried out for several pests. In Italy, 30% of the cost of poplar protection was due to wood borers such as *Cryptorhynchus lapathi* with other important pests being *Saperda carcharias* and *Cossus cossus*.

The nature and periods of potential damage of *O. hirta* in the PRA area are unknown, and it is therefore difficult to know what the optimal control timing would be, even if it is likely that the pest will adapt to the phenology of its new host plant where introduced (C. Cocquempot, INRA, FR, 03-2012, personal communication).

Consequently, it is considered here that existing control measures would only have a limited impact on the pest.

6.04 - How great a negative effect is the pest likely to have on yield and/or quality of cultivated plants in the PRA area when all potential measures legally available to the producer are applied, without phytosanitary measures?

moderate

***Level of uncertainty:* medium**

Few control measures are used against *O. hirta* in New Zealand and control of this pest is considered to be difficult (Wang & Davies, 2005). It relies mostly on the removal of infested material, which is labour intensive (Clearwater & Wouts, 1980; Wang & Shi, 1999; Shaw & Christeller, 2009). Chemical control of wood borers is difficult, in particular because of the hidden life stages. The best control strategies include a combination of preventive and curative measures (C. Cocquempot, INRA, FR, 03-2012, personal communication). The nature and periods of potential damage of *O. hirta* in the PRA area are not known, and it is difficult to determine the optimal timing for control. However, it is likely that the pest will adapt to the phenology of its new host plant where it is introduced. There is no widely used and tested chemical control in New Zealand.

The combination of the control methods used in New Zealand (as well as the presence of natural enemies) seem effective in reducing populations, but these methods could not be applied in the wild or unmanaged environments in the PRA area. Measures applied in organic agriculture are similar to measures in conventional agriculture. Control measures that could be applied in the PRA area include:

Monitoring - to detect signs of larval presence (excretion holes, wilting foliage, frass).
Plants can be inspected visually to detect the presence of the pest, especially of larvae. Excretion holes can be observed on branches and trunks. However, these may be difficult to detect in hidden places, on larger trees and at early stages of infestation. Wilting foliage or dying branches may also be a sign of infestation.

Note: trapping of adults using Malaise traps is mentioned in some publications (Clearwater & Muggleston, 1985; Toft, 2001; Lu & Wang, 2005), but this trapping method is not specific and not reliable. Light traps are also considered to be unreliable for monitoring or mass trapping. Attractivity to light seems to be occasional and, as for other Cerambycidae, the parameters of attractivity to light are not well understood. *O. hirta* is likely to be attracted to light in certain conditions, especially climatic conditions, but this could not be used as a reliable trapping option (C. Cocquempot, INRA, FR, 03-2012, personal communication) (see also Introduction).

Chemical control
Options for chemical control are limited. FERA (2010) notes that a systemic insecticide (such as imidacloprid) could be applied to the soil. This substance is approved in the EU (EU, 2011) but soil applications are not approved and may not be used in all EPPO countries. In the Netherlands for example, drip application is only allowed in greenhouse

grown crops which have a completely closed system (http://www.ctgb.nl/; last access 5 April 2012). Sprays of pyrethroids and to a lesser extent neonicotinoids are expected to have an effect against adults (EPPO PRA on *Saperda candida,* EPPO 2011a). For example deltamethrin is registered for use in citrus in Greece. However, broad spectrum insecticides (such as pyrethroids) will negatively affect natural enemies and disrupt IPM systems. In some countries (e.g. in Spain), applying pyrethroids in spring in citrus orchards is not possible in IPM systems.
As stated in the EPPO PRA on *Saperda candida* (EPPO 2011a), there is a tendency in Europe to more integrated control strategies due to the development of insecticide resistance of pest like *Cydia pomonella* in apple orchards. Alternative methods targeting specifically a pest (e.g. *Bacillus thurengensis,* mating disruption) have no action on other pests. This could result in secondary pests to become more damaging: Balazs *et al.(*1996) noted that the apple clearwing (*Synanthedon myopaeformis,* a European borer of apple trees) that has been regarded until the 1960's in whole Europe as one of the secondary pest of apple trees became a significant pest in some orchards because of changes in apple production technology (intensive plantations, rootstocks with low growing capacity) as well as effect of some environmentally friendly preparations applied in the IPM orchard.

Chemical control does not seem to be widely used against this pest in New Zealand. Wang & Shi (1999) notes that once larvae enter plants, chemical control becomes impractical. The use of systemic insecticides was also not considered possible because of the cost and the need to repeat applications (Hosking, 1978). Recent New Zealand publications do not indicate whether systemic insecticides are used against *O. hirta*.

Cultural control methods
The following methods may be used, but are all labour intensive:

- Ensuring good management of orchards and keeping the trees in a good condition will possibly limit damage.
- The main cultural control method in New Zealand is removal of infested twigs, branches and treatment of wounds to prevent entrance of diseases (Dumbleton, 1937; Cottier, 1938; Hosking, 1978; Clearwater & Wouts, 1980; HGANZ, 2008) and felling trees if they are heavily infested.
- Preventing pruning wounds at the time of adult flight, as these are attractive to females (Clearwater & Muggleston, 1985).
- Eliminating the insect on alternate hosts in the vicinity of the orchard (Cottier, 1938).

Biological control - There is no biological control used in New Zealand. Injection of a solution containing the nematode *Steinernema* (*Neoaplectana) feltiae* was investigated by Clearwater & Wouts (1980) and Wouts & Clearwater (1980) with promising results. This nematode is a biocontrol agent commercially available in the EPPO region according to EPPO Standard PM 6/3 *List of biological control agents widely used in the EPPO region.*
Morton & Proebst (2003) indicate that damage to citrus may be reduced when native trees are included in hedges and windbreaks, as these support natural enemies; no experimental data were found that supports this claim (Q. Wang, Massey University, NZ, 05-2012, personal communication). *O. hirta* has a few recorded/studied natural enemies in New Zealand although it is likely to have more (ichneumonids *Xanthocryptus novozealandicus* and *Campoplex* sp., braconid *Apsicolpus hudsoni;* Wang and Shi, 1999 & 2001; parasitic fungus *Cordyceps aemonae,* Hosking, 1978).

6.05 - How great an increase in production costs (including control costs) is likely to be caused by the pest in the PRA area in the absence of phytosanitary measures?

moderate

***Level of uncertainty:* medium** (difficult to estimate which additional costs would be incurred)
Optimal control management strategies will need to be defined and will cause increased costs in terms of surveillance, equipment, labour, and possibly plant protection products. This is most likely to happen for *Citrus* spp. or high value plants. Costs could also be associated with monitoring, pruning and removal of preferred hosts. Control in forests would be limited, but may involve surveillance and destruction of infested trees.

The costs to local governments of managing roadside and urban trees may increase when they present a risk for pedestrians or houses. In New Zealand, this is not a concern because the pest usually attacks small branches that would not present a risk. However, attacks may be more severe once introduced into a non-native area.

6.06 - Based on the total market, i.e. the size of the domestic market plus any export market, for the plants and plant product(s) at risk, what will be the likely impact of a loss in export markets, e.g. as a result of trading partners imposing export bans from the PRA area?

moderate

***Level of uncertainty:* medium**
O. hirta is listed as a quarantine pest for the Republic of Korea (Anon, 2006), Chile (Anon, 2007) and Peru (MAF, 2010), and similar restrictions as imposed on New Zealand exports could be expected if the pest was introduced in the PRA area. The impact may be locally high in some countries. There is trade in poplars as plants for planting from Italy

to South America (S. Augustin, INRA, FR, 12-2011, personal communication, draft EPPO PRA on *Apriona* spp.). Within the PRA area, some countries may take measures to prevent introduction of *O. hirta* from other countries of the region, and there is a large trade of plants for planting within the PRA area. Such trade may be affected.

O. hirta could also have an impact on fruit production and hence quantities available for export from countries where *O. hirta* became established. Although there is no technical justification for additional requirements on fruit from host plants, as the pest does not attack fruit, such regulations are in place for fruit exports from New Zealand to some countries. For example cherries to Korea are subject to a compliance programme to ensure absence of a list of pests, which includes *O. hirta* (MAF, 2011a).

6.07 - To what extent will direct impacts be borne by producers?

major extent

***Level of uncertainty:* medium**

It is expected that the economic impact of *O. hirta* will be mainly local, and that the pest will hardly affect production at the country level. The affected producers will probably have to bear the cost. In New Zealand, some heavily infested orchards have been observed in areas where the infestation level was generally low.

Environmental impact

6.08.0A - Do you consider that the question on the environmental impact caused by the pest within its current area of invasion can be answered?

no, but there is some evidence that the environmental impact may be significant in the PRA area

Some of the most frequently attacked species in New Zealand are native in the PRA area, such as gorse (*Ulex europaeus*), broom and poplar.

6.08 - How important is the environmental impact caused by the pest within its current area of invasion?

Not appropriate: *O. hirta does not have a "current area of invasion".*

***Level of uncertainty:* low**

O. hirta does not cause environmental damage in New Zealand. It is a natural component of ecosystems including forest and mangrove areas, and of the fauna of many native plants. It does not appear to have a major impact on natural habitats.

Note: In the case of gorse and broom, *O. hirta* is considered as beneficial in New Zealand where these exotic plants are considered as invasive. However, its use as a biological control agent is not encouraged because of potential damage to its many other hosts (Clearwater, 1981; Landcare Research, 2006; Gourlay, 2007).

6.09.01 - What is the risk that the host range of the pest includes native plants in the PRA area?

High risk

***Level of uncertainty:* low**

Many exotic hosts used as ornamentals, fruit trees or forest species in New Zealand are native in the PRA area and occur also in natural / semi-natural habitats, including forests (e.g. oak, birch), riverbanks (e.g. poplar, willow), heathland and poor pasture areas (e.g. *Erica*, gorse and broom), various habitats (nut trees, wild *Prunus* and *Malus, Fraxinus angustifolia,* etc.). In New Zealand, *O. hirta* has expanded its host range to many species that were introduced, and is likely to expand its host range if it is introduced in the PRA area.

6.09.02 - What is the level of damage likely to be caused by the organism on its major native host plants in the PRA area?

Medium level

***Level of uncertainty:* medium**

O. hirta only occasionally causes mortality in New Zealand, where the levels of damage seem moderate. However it cannot be excluded that higher levels of damage could occur in the PRA area. It is not known how natural enemies occurring in the PRA area will affect *O. hirta* populations. If it is introduced in the PRA area, there could be heavy levels of infestation on some plants that are grown over large areas without management (e.g. poplar, oak, chestnut, walnut, *Crataegus*, *Sorbus*, gorse and broom), as what happened when the pest started attacking citrus crops in New Zealand. It is possible that the impact would be greater in the PRA area as these plants are grown on a larger scale than in New Zealand. In addition many hosts of *O. hirta* are widespread in the environment and the natural enemies of this pest in New Zealand probably do not occur in the PRA area.

Note: gorse and broom may be considered invasive or weed in some countries of the PRA area, e.g. Poland for gorse (http://www.issg.org/database/species/impact_info.asp?si=69&fr=1&sts=&lang=EN) and Romania for broom (http://www.cabi.org/isc/?compid=5&dsid=17610&loadmodule=datasheet&page=481&site=144).

Impact on ecosystem patterns and processes

6.09.03 - What is the ecological importance of the host plants in the PRA area?

High importance

***Level of uncertainty:* low**

O. hirta attacks species that are important in forest ecosystems in Europe, such as *Quercus robur*, *Q. ilex*, *Fagus sylvatica*, *Betula pendula*, *Castanea sativa* etc. These species are the backbone of many plant communities as illustrated by the name of several plant associations within the European deciduous forests: *Querco roboris-Fagetea sylvaticae*, *Quercetalia robori-petraeae* or within the Mediterranean Oak Forest: *Quercion ilicis*

Conservation impacts

6.09.04 - To what extent do the host plants occur in ecologically sensitive habitats (includes all officially protected nature conservation habitats)?

High extent

***Level of uncertainty:* low**

Many hosts occur in forests (oak, poplar, birch, etc.), and these are often part of nature reserves or conservation areas. Especially for *Betula pendula* which occurs in Bog woodland (91D0*) which is a priority habitat in the Directive 92/43/EEC on the Conservation of natural habitats

Others may occur in specific areas such as poplar and willow used on river banks for flood prevention.

6.09.05 - What is the risk that the pest would harm rare or vulnerable species?

Low risk

***Level of uncertainty:* high** (whether endangered species would be attacked, and the extent of damage)

O. hirta is a very polyphagous species and is also likely to harm rare or vulnerable species, although it is not likely to kill plants on a large scale.

Examples of endangered or near threatened species in known host genera of *O. hirta* are:

- *Zelkova sicula* (http://www.globaltrees.org/tp_zelkova.htm), S*alix tarraconensis* (IUCN, 2011), are registered as being endangered in the area of potential establishment.
- *Populus berkarensis* and *P. pruinosa, Malus niedzwetzkyana* and *M. sieversii, Crataegus darvasia, C. necopinata* and *C. knorringiana, Pyrus cajon, P. korskinskyi and P. tadshikistanica* (Red list of trees of Central Asia http://www.globaltrees.org/download/RedListCentralAsia.pdf).

Impact of pesticides

6.09.06 - What is the risk that the presence of the pest would result in an increased and intensive use of pesticides?

Low risk

***Level of uncertainty:* low**

Chemical control does not seem to be the best control option against *O. hirta*, and its use will probably be limited, although some systemic insecticides will probably be investigated if the pest is introduced in the PRA area (see 6.04). The use of broad spectrum insecticides (e.g. pyrethroids) may increase locally where the pest is having a significant impact.

6.09 - How important is the environmental impact likely to be in the PRA area?

Moderate

***Level of uncertainty:* low**

If it is introduced and spreads to natural environments, *O. hirta* is expected to have moderate environmental impact in the PRA area. Many hosts of *O. hirta* are native in the PRA area and are common in the environment. If it is introduced in the PRA area, *O. hirta* could attack plants that are grown over large areas without management (e.g. poplar, oak, chestnut, walnut, *Crataegus*, *Sorbus*, gorse and broom), as it did when it started attacking citrus crops in New Zealand (Cottier, 1938). It is possible that the impact would be greater in the PRA area as these plants are grown on a larger scale than in New Zealand. *O. hirta* may have an impact on environmentally sensitive areas (such as river banks where poplar or willow may be used for flood prevention). Any impact on the indigenous gorse and broom, both indigenous and mostly wild, would be a negative environmental impact in the PRA area, unlike in New Zealand. However, it is not expected to kill plants on a large scale.

Social impact

6.10 - How important is social damage caused by the pest within its current area of distribution?

minimal

***Level of uncertainty:* low**

This is not recorded specifically in the literature available.

6.11 - How important is the social damage likely to be in the PRA area?

minor

***Level of uncertainty:* medium**

O. hirta may damage host plants in amenity areas and affect the recreational value of the area. It may also affect the aesthetic value of such areas when branches or plants are killed or have to be removed (e.g. gorse on oceanic coasts of Europe, or broom in the wild in more southern areas). There might be a social impact upon specific uses of the host plants, especially where fruit production is affected. Many fruit trees are grown in gardens for fruit consumption. Such impacts will be minor at the scale of the whole PRA area but may be moderate to major at the local level (e.g. in citrus producing areas because of the already low profits of producers and the potential impact of the pest).

6.12 - To what extent is the pest likely to disrupt existing biological or integrated systems for control of other pests?

minor

***Level of uncertainty:* medium**

It is not expected that pesticides will be used extensively, but control programmes using broad spectrum insecticides may be used locally. In such cases, biological or integrated systems (e.g. in fruit trees) will be disrupted. It may be possible to adjust existing integrated pest management programmes to cover *O. hirta*, but this may take some years.

6.13 - How great an increase in other costs resulting from introduction is likely to occur?

moderate

***Level of uncertainty:* medium**

Such costs would be linked to the need for additional research on host plants, management, biological control agents, plant protection products, economic thresholds, and monitoring programmes, especially in natural environments.
If eradication programmes are applied, cost will be major because of the large host range of the pest and the intensive surveys needed.

6.14 - How great an increase in the economic impact of other pests is likely to occur if the pest can act as a vector or host for these pests or if genetic traits can be carried to other species, modifying their genetic nature?

minimal

***Level of uncertainty:* low**

No such effect is documented in the literature.

6.15a - Describe the overall economic impact

moderate

***Level of uncertainty:* medium**

O. hirta is likely to have moderate to major economic impact for *Citrus* spp. and persimmon. On other crop species, it is expected to have less economic impact. However in the case of local outbreaks on crops such as grapevine, major impacts cannot be excluded. The pest is likely to have moderate environmental impact. The uncertainty of the impact is medium because of the differences of impact reported in different periods and on different crops, and also because of the lack of know ledged on the natural enemies of *O. hirta* in New-Zealand.

6.15b - With reference to the area of potential establishment identified in Q3.08, identify the area which at highest risk from economic, environmental and social impacts. Summarize the impact and indicate how these may change in future.

moderate

***Level of uncertainty:* medium**

The whole area of potential establishment is at risk of an economic impact. *O. hirta* is likely to have moderate to major economic impact for *Citrus* spp. and persimmon. On other crop species, it is expected to have generally minor economic impact, although major impacts cannot be excluded in the case of local outbreaks on crops such as grapevine. The southern part of the PRA area where *Citrus* sp. are grown is most endangered. The area under commercial citrus cultivation in the PRA area was over 830.000 ha in 2010, with 90 % in Spain, Italy, Algeria, Morocco, Turkey and Greece (see 3.01).

The pest is likely to have moderate environmental impact throughout the PRA area. The social impact is likely to be minor at the scale of the PRA area.

Degree of uncertainty and Conclusion of the pest risk assessment

c2 - Degree of uncertainty: list sources of uncertainty

The main uncertainties are:

- Whether the impact in the warmest parts of the PRA area on *Citrus* spp. could be worse than in New Zealand because of a faster rate of development of *O. hirta*, and because of hot and dry conditions.
- Hosts: if certain native cultivated species in the PRA area will be very susceptible.
- The contribution of natural enemies to the control in New Zealand, and the possible natural enemies in the PRA area.
- Ecoclimatic conditions: whether it would adapt to climatic conditions that are present in the PRA area but not in New Zealand (e.g. colder winters, or warmer drier summers)
- The rate of spread and maximum extent in 5 years.
- Actual yield losses in New Zealand, especially on *Citrus* spp.

c3 - Conclusion of the pest risk assessment

The probability of entry is rated as moderate, and the probability of establishment as high. The probability of introduction is therefore considered as moderate (the minimum of the two ratings). The most likely pathway for entry is plants for planting of host species from New Zealand, especially woody dicotyledons. Entry through the pathway "wood" is rated as very unlikely.

The overall rate of natural spread would be low-moderate and the spread by human means (mainly trade of plants for planting) is potentially very high. Satellite populations may be established in multiple locations through human spread, but natural spread from these outbreaks will be relatively slow. Without official intervention, the rate of increase of the PRA area occupied is, therefore, rated as moderate.

The area of potential establishment is considered to cover at least part of each country in the PRA area, except regions where the host plants do not occur, e.g. mountainous areas. It is not known how cold winters, cool short summers or hot dry conditions will affect establishment and impact.

The whole area of potential establishment is at risk of an economic impact. However, the southern part of the PRA area where *Citrus* spp. are grown is most endangered, because *O. hirta* is likely to have moderate economic impact sensu stricto on *Citrus* spp. The area under commercial cultivation of citrus in the PRA area was over 830.000 ha in 2010, with 90 % in Spain, Italy, Algeria, Morocco, Turkey and Greece (see 3.01). On other crop species, *O. hirta* is expected to have minor economic impact, although major impacts cannot be excluded in the case of local outbreaks on crops such as grapevine.

The pest is likely to have a moderate environmental impact throughout the PRA area, because it is highly polyphagous and known to attack numerous native trees and shrubs.

The social impact is likely to be minor at the scale of the PRA area.

Eradication is rated as unlikely because the pest will probably be present for some years before it is first detected.

Stage 3: Pest Risk Management

7.01 - Is the risk identified in the Pest Risk Assessment stage for all pest/pathway combinations an acceptable risk?

no

The risk is not considered acceptable for import of plants for planting other than seeds. Measures were not identified by the EWG for the wood pathways (wood, wood chips and wood waste), as *O. hirta* was considered very unlikely to enter on these pathways currently. However, the Panel on Phytosanitary Measures noted that the main reason for the low probability of entry was because of low volumes of import. As this may change in future, the Panel elaborated management measures for wood commodities.

7.02 - Is natural spread one of the pathways?

no

Pathway 1: Plants for planting (other than seeds) of host species from New Zealand

7.06 - Is the pathway that is being considered a commodity of plants and plant products?

yes

7.09 - If the pest is a plant, is it the commodity itself?

no (the pest is not a plant)

7.10 - Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest?

no

***Level of uncertainty:* low**

O. hirta is not a quarantine pest in countries of the PRA area, and there are no measures in place that would completely prevent its introduction. Requirements in EPPO countries are presented in Annex 8 (Table 1). This annex is based on current requirements for the EU and on older EPPO summaries of phytosanitary regulations for other countries. However it gives an indication of the requirements in place, and overall the pathway seems to be open for all or most countries in the PRA area from all origins.

In most countries, plants for planting would be subject to general requirements (e.g. import permit or phytosanitary certificate); such requirements ensure that inspections are carried out in the country of export, but detection of *O. hirta* would be difficult (even if it was intercepted in the UK on *Wisteria* (FERA, 2010), and other cerambycids are regularly intercepted on similar plants for planting). Some specific requirements apply to hosts of *O. hirta* in some countries and might increase the chance of detection, although they do not directly target *O. hirta*. In some countries (e.g. the EU, Norway, Switzerland), plants for planting are subject to general measures that would imply inspection for signs and symptoms of pests on arrival, but it would not guarantee detection of the pest.

Imports of plants for planting of *Citrus* and *Vitis* are prohibited in the EU and most Mediterranean countries. The import of *Malus* is prohibited from many origins, but it is not prohibited from New Zealand into the EU provided they are dormant and free from leaves and fruit.

Options at the place of production

7.13 - Can the pest be reliably detected by visual inspection at the place of production?

yes in a Systems Approach

***Level of uncertainty:* medium**

Possible measure: visual inspection at the place of production

Infestation by larvae may be detected: excretion holes, frass, wilting foliage or die-back of branches. The frass produced by the larvae throughout their life is ejected through excretion holes created at regular intervals (Lu & Wang, 2005), and can be observed on the leaves and stems. It is possible to detect signs of presence of larvae very early (within few weeks after hatching). Young larvae may nevertheless be less easy to detect, until the foliage starts wilting and several excretion holes are produced. Eggs are relatively large but are not easy to observe. Detection will also be more difficult for larger plants. Consequently, detection by visual inspection is unlikely to be completely effective and needs to be used within a systems approach.

7.14 - Can the pest be reliably detected by testing at the place of production

no

***Level of uncertainty:* low**

Systems for detecting of larvae of Coleoptera (e.g. acoustic methods, sniffer dogs, Goldson *et al.*, 2003) in trees are currently being researched but are not yet available. No specific reference on research on detection methods for *O. hirta* was found.

7.15 - Can infestation of the commodity be reliably prevented by treatment of the crop?

yes in a Systems Approach

***Level of uncertainty:* medium**

Possible measure: specified treatment of the crop

Current control measures rely mostly on detection of signs of infestation followed by cultural control measures (e.g. pruning). However regular sprays with insecticides during the flight period will reduce infestation levels. This will lower pest populations but not eliminate the pest, especially eggs and early larval stages.

7.16 - Can infestation of the commodity be reliably prevented by growing resistant cultivars?

no

***Level of uncertainty:* low**

There is no information on differences in susceptibility between cultivars (neither for fruit nor non-fruit species).

7.17 - Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions such as screened greenhouses, physical isolation, sterilized growing medium, exclusion of running water, etc.)?

Yes in a Systems Approach

***Level of uncertainty:* low**

Growing under complete physical conditions will prevent infestation. This option is considered in a systems approach under 7.21.

Physical isolation during the spring and summer (normal flight period) is not considered sufficient because data indicate that adults can be found all year round (Lu & Wang, 2005), although at low prevalence in some places of New Zealand.

7.18 - Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?

no

***Level of uncertainty:* low**

Larvae may be present in the branches and stems throughout the year.

7.19 - Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?

no

***Level of uncertainty:* low**

Not relevant for an insect.

7.20 - Based on your answer to question 4.01 (low-moderate rate of spread with medium uncertainty), select the rate of spread.

Low-moderate rate of spread

***Level of uncertainty:* medium**

Possible measure: pest-free place of production or pest free area

7.21 - The possible measure is: pest-free place of production or pest free area. Can this be reliably guaranteed?

Yes in countries where the pest is not known to occur

Only PFPP under complete physical protection in New-Zealand
***Level of uncertainty:* medium**
Pest-Free Area
Establishment of PFAs in New Zealand is not considered possible because the pest is present throughout the country.This option is recommended for countries where the pest is not known to occur.

Pest-free place of production/site
The maintenance of pest-free places of production or pest free sites in New-Zealand is possible under complete physical protection (see 7.17). The plants should be under complete protected conditions throughout their life (including rootstock and mother stock from which cuttings are taken). These measures may be appropriate for high value commodities and very small scale production in officially controlled facilities (equivalent to quarantine facilities).
The Panel on Phytosanitary Measures recommended that regular inspections should also be performed during the growing season as well as just prior to export. All plants in the place of production/site should meet the same requirements.

Establishing pest-free places of production outdoors in New-Zealand would not be practical, as it would be impossible to establish permanent buffer zones around places of production because of the large host range. Moreover, there are no data about natural spread rate of *O. hirta*, and no reliable trapping methods.

Options after harvest, at pre-clearance or during transport

7.22 - Can the pest be reliably detected by a visual inspection of a consignment at the time of export, during transport/storage or at import?
yes in a Systems Approach
***Level of uncertainty:* medium**
Possible measure: visual inspection of the consignment
The pest may be detected in consignments of plants for planting by visual inspection at export or at import, because of signs of larval presence (frass and excretion holes). It will most likely be easier to detect than *A. chinensis* because of the presence of excretion holes. However, the measure may not be sufficient on its own. In particular, at low levels of infestation, the pest will be difficult to detect in a large consignment. In addition, plants for planting are generally traded while they are dormant, and transport is usually at cool temperatures, which will keep the larvae quiescent. In UK, the infested Wisteria plants were not detected at import.

The EWG considered that destructive sampling will not increase the chance of detection, because usually external symptoms (frass, excretion holes) are present when late larvae occur. If there are no external symptoms, there is a high probability of missing the young larvae by randomly cutting twigs into sections.

7.23 - Can the pest be reliably detected by testing of the commodity?
no
***Level of uncertainty:* low**
There are methods that can detect wood-boring larvae in branches, stems or roots (e.g. x-rays, acoustic methods, systematic destructive sampling, trained dogs, see Goldson *et al.*, 2003) but they are not fully developed, and are not available at the moment.

7.24 - Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?
no
***Level of uncertainty:* low**
Treatments such as fumigation with methyl bromide may be effective. A USDA treatment with methyl bromide in a vacuum exists against borers in deciduous woody dormant plants (T201-a-2 in USDA treatment manual, 2011). It would need testing (efficacy and phytotoxicity) for *O. hirta* on different host plants. At present there is no specific protocol against *O. hirta*. In addition, methyl bromide will be banned in the future. This measure is not recommended because methyl bromide will be phased out in 2015 and its use is not favoured in many EPPO countries because of its environmental consequences, see IPPC Recommendation *Replacement or reduction of the use of methyl bromide as a phytosanitary measure* (FAO, 2008).

Hot water treatments and irradiation were considered but rejected for *Saperda candida* (EPPO, 2011a); they are not considered as options here either.

7.25 - Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment?

no

***Level of uncertainty:* low**

Larvae are in branches or in the stems.

7.26 - Can infestation of the consignment be reliably prevented by handling and packing methods?

yes in a Systems Approach

***Level of uncertainty:* low**

Possible measure: specific handling/packing methods

Handling and packing methods can prevent infestation after harvest (e.g. packing the plants in facilities with screen houses, transporting the plants in closed containers). It is not likely that the plants would be exported during the main flight period of the adults, except for commodities such as potted plants and bonsais. Infestation is most likely to happen before harvest.

Options that can be implemented after entry of consignments

7.27 - Can the pest be reliably detected during post-entry quarantine?

yes

***Level of uncertainty:* low**

Possible measure: import of the consignment under special licence/permit and post-entry quarantine

The plants should be kept in post-entry quarantine for a sufficient time to detect the symptoms of larval activity especially excretion holes and frass. The plants should be kept at a temperature allowing larval development. The EWG considered that 2 months above 15°C will allow the detection of the larval stages. The Panel on Phytosanitary Measures preferred requiring a period of 3 months with regular inspection for extra-safety. It also stressed that this option should be limited to small consignements (e.g. for scientific purposes). The facility for post-entry quarantine should be officially authorized.

7.28 - Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?

no

***Level of uncertainty:* low**

Plants for planting are destined to be planted, and if adults emerge, they could fly and find hosts in the vicinity.

7.29 - Are there effective measures that could be taken in the importing country (surveillance, eradication, containment) to prevent establishment and/or economic or other impacts?

no

***Level of uncertainty:* low**

The EWG identified some measures that can be put in place (see 5.01), but it is not expected that each outbreak would be detected early enough to make eradication possible. Because of the wide host range and the lack of reliable traps, early detection would be difficult (see 5.01).

7.30 - Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?

yes

Q.	Standalone	Systems Approach	Possible Measure	Uncertainty
7.13		X	visual inspection at the place of production	medium
7.15		X	specified treatment of the crop	medium
7.21	X		pest-free place of production under complete physical protection or pest free area	medium
7.22		X	visual inspection of the consignment	medium
7.26		X	specific handling/packing methods	low

7.27	X		import of the consignment under special licence/permit and post-entry quarantine	low

7.31 - Does each of the individual measures identified reduce the risk to an acceptable level?

no

***Level of uncertainty:* low**

Two measures identified reduce the risk to an acceptable level:

- Pest-free place of production/production site through complete physical protection (including inspections)

or

- Post-entry quarantine

7.32 - For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?

no

***Level of uncertainty:* low**

Other measures, such as visual inspection at the place of production, treatment of the crop, visual inspection of the consignment at export or at import, handling and packing, were identified but their combination will not reduce the risk to an acceptable level.

7.33 - If the only measures available reduce the risk but not down to an acceptable level, such measures may still be applied, as they may at least delay the introduction or spread of the pest. In this case, a combination of phytosanitary measures at or before export and internal measures (question 7.29) should be considered.

-

7.34 - Estimate to what extent the measures (or combination of measures) being considered interfere with international trade.

***Level of uncertainty:* low**

The measures interfere with trade as import of most of the host species is not subject to specific phytosanitary import requirements, with the exception of some fruit species (such as *Citrus* spp., which are prohibited in many EPPO countries).

7.35 - Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.

***Level of uncertainty:* low**

The measures identified (pest-free place/site of production under complete physical protection and post-entry quarantine) would be likely to have a large impact on the trade from New Zealand because the measures will have a high cost in relation to the value of the plants. The measures may only be economically feasible for high value material such as bonsais.

The direct costs of this pest if it became established would be expected to exceed the benefits of the trade.

7.36 - Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?

yes

The measures will probably not be cost-effective for trade but are expected to be cost effective to protect fruit production, horticulture and the environment in the PRA area.

The following measures have been identified, but they are likely to be applicable only in very limited circumstances (see 7.35):

- Pest-free place of production/production site through complete physical protection, including regular inspections of the crop and of the plants prior to export

or

- Post-entry quarantine for 3 months at minimum 15°C (only for small consignments) in the framework of a bilateral agreement

Pathway 2: Wood (round or sawn, with or without bark) of host plants of *O. hirta*

7.06 - Is the pathway that is being considered a commodity of plants and plant products?
yes

7.09 - If the pest is a plant, is it the commodity itself?
no (the pest is not a plant)

7.10 - Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest?
no
Level of uncertainty: **low**
The pathway seems open to most countries of the PRA area. Requirements in countries of the PRA area are given in Table 2 of Annex 8. There are no prohibition that would apply to wood of host species from New Zealand. There are generally few specific requirements applying to wood, and those in place target wood and pests from specific origins, especially North America. Requirements relating to treatment (including debarking that will speed up drying) might have an effect on *O. hirta.* Non-squared wood is generally covered by general requirements (e.g. PC), requirements targeting other pests and, in a few cases, specific requirements for some species (but not directly targeting *O. hirta*). However, most hosts of *O. hirta* in this pathway are not mentioned at all in the phytosanitary import requirements of countries in the PRA area.

Options at the place of production

7.13 - Can the pest be reliably detected by visual inspection at the place of production?
yes in a Systems Approach
Level of uncertainty: **medium**
Possible measure: visual inspection at the place of production
See answer to 7.13 for the pathway of plants for planting.
Detection is difficult on large forest trees, but symptoms of larval presence (e.g. galleries, excretion holes, frass) may be observed at harvest and during transport. No specific trapping method is mentioned for adults. This measure is not sufficient on its own.

7.14 - Can the pest be reliably detected by testing at the place of production?
no
Level of uncertainty: **low**
As for plants for planting.

7.15 - Can infestation of the commodity be reliably prevented by treatment of the crop?
no
Level of uncertainty: **low**
Not possible for wood production.

7.16 - Can infestation of the commodity be reliably prevented by growing resistant cultivars?
no
Level of uncertainty: low
There is no data on resistant cultivars.

7.17 - Can infestation of the commodity be reliably prevented by growing the crop in specified conditions?
no
Level of uncertainty: **low**
This is not feasible for large trees grown in plantations and forests.

7.18 - Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?
no
Level of uncertainty: **low**
Larvae may be present in the stems and branches at any time of the year.

7.19 - Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?
no
***Level of uncertainty:* low**
Not relevant for an insect.

7.20 - Based on your answer to question 4.01 (Low to moderate rate of spread with medium uncertainty), select the rate of spread.
Low to moderate rate of spread
***Level of uncertainty:* Medium**
Possible measure: pest-free place of production or pest free area.

7.21 - The possible measure is: pest-free place of production or pest-free area
Can this be reliably guaranteed?
Yes for Pest-free areas in countries where the pest is not known to occur
No for New-Zealand
***Level of uncertainty:* Medium**
Establishing pest-free area or pest-free places in New Zealand is not considered possible because the pest is present throughout the country. Moreover, there are no data about natural spread rate of *O. hirta*, and no reliable trapping methods. Production under protected conditions is not possible for wood production.

Pest-free area is a possible option for countries other than New Zealand, based on ISPM 4.

Options after harvest, at pre-clearance or during transport

7.22 - Can the pest be reliably detected by a visual inspection of a consignment at the time of export, during transport/storage or at import?
yes in a Systems Approach
***Level of uncertainty:* low**
Possible measure: visual inspection of the consignment.
Inspection of consignments of wood is difficult and the pest has hidden life stages. Larval galleries are visible in cross-section and on cut surfaces of sawn wood, and frass may accumulate on or below the wood, but generally, inspection will not guarantee detection.

7.23 - Can the pest be reliably detected by testing of the commodity?
no
***Level of uncertainty:* low**
As for plants for planting.

7.24 - Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?
yes as stand-alone measure
***Level of uncertainty:* medium** (exact schedule for heat treatment as there are no specific data for this species)
Possible measure: specified treatment of the consignment

The following treatments could be applied:

Heat treatment. According to EPPO Standard PM 10/6(1) *Heat treatment of wood to control insects and wood-borne nematodes* (EPPO, 2008a), Cerambycidae are killed in round wood and sawn wood which have been heat-treated until the core temperature reaches at least 56 °C for at least 30 min.
Although the larvae and pupae of *O. hirta* are reported to die when moisture content of the wood falls, reducing humidity of the wood only by kiln-drying is not considered sufficient as a phytosanitary treatment if the temperature does not reach at least 56°C for 30 min. based on the results from the EUPHRESCO project (PEKID[1]) for other Cerambycidae.

[1] **P**hytosanitary **E**fficacy of **Ki**ln **D**rying **(PEKID).** http://www.euphresco.org/media/project_reports/pekid_report.pdf

Irradiation. According to EPPO Standard PM 10/8(1*) Disinfestation of wood with ionizing radiation* (EPPO, 2008c), Cerambycidae infesting wood are killed after an irradiation of 1kGy.

Heat treatment and irradiation might be applied to quality logs but will be too expensive for low-value products such as firewood.

Processing. Conversion of the wood into sawn timber might destroy larvae and pupae, and cause the wood to dry out more quickly, causing mortality. However, some life stages might survive in larger pieces of sawn wood. Processing the wood will also expose the galleries and make it more likely that infestation is detected.

Note: methyl bromide fumigation of wood is unlikely to be effective, because of the presence of bark and size of the material. According to EPPO Standard PM 10/7(1) *Methyl bromide fumigation of wood to control insects* (EPPO, 2008b), only wood without bark and whose dimensions does not exceed 200 mm cross section can be fumigated to destroy insect pests.In addition, methyl bromide will be phased out in 2015 and its use is not favoured in many EPPO countries because of its environmental consequences, see IPPC Recommendation *Replacement or reduction of the use of methyl bromide as a phytosanitary measure* (FAO, 2008).

7.25 - Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment?

no

***Level of uncertainty:* low**

The larvae are in the wood.

7.26 - Can infestation of the consignment be reliably prevented by handling and packing methods?

no

***Level of uncertainty:* low**

Infestation occurs prior to felling the trees. Wood could be stored in the exporting country under strict control of the NPPO for a sufficient period to allow all life stage to emerge. However there is no data of the length of survival of larvae and pupae in cut wood. In addition, given the difficulty to control the application of this measure in practice, it was not considered as an appropriate option for imported material.

Options that can be implemented after entry of consignments

7.27 - Can the pest be reliably detected during post-entry quarantine?

no

***Level of uncertainty:* low**

This is not a relevant measure for wood.

7.28 - Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?

Yes in the framework of a bilateral agreement

***Level of uncertainty:* medium** (temperature that does not allow emergence of the pests)

Possible measure: import of the consignment under special licence/permit and specified restrictions.
Wood for processing (e.g. furniture, pulpmills, fuel wood for energy production) could be imported during periods of the year outside of the flight period of *O. hirta* species, and be processed before the next flight period of the pest, provided that conditions in storage do not allow emergence of the pest (e.g. temperatures below 10°C as Dye (1950) reported adults to be quiescent at 12.7°C although there are some uncertainty about the exact threshold, see 3.03).
The requirements would need to be adapted to the origin and to the destination. Waste or by-products from this wood should also be managed before the next flight period in such a way as to prevent adult emergence.
It should be stressed that this measure would be difficult to implement and control in practice. It should be as part of a specific agreement between the importing and exporting countries outlining specific requirements. This measure does not apply to wood for furniture because the processing does not guarantee the destruction of the pest. This measure is not appropriate for firewood, which is often stored for some time

before being used.

7.29 - Are there effective measures that could be taken in the importing country (surveillance, eradication, containment) to prevent establishment and/or economic or other impacts?

no

***Level of uncertainty:* low**

There is no specific trapping system for *O. hirta*. Surveillance could be put in place at wood processing facilities, but would be complicated because of the wide range of hosts. In addition, adults fly and surveillance may not be sufficient to detect outbreaks early enough to ensure eradication (see 5.02).

7.30 - Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?

yes

Q.	Stand-alone	Systems Approach	Possible Measure	Uncertainty
7.13		X	visual inspection at the place of production	low
7.21	X		PFA	medium
7.22		X	visual inspection of the consignment	low
7.24	X		specified treatment of the consignment	medium
7.28	X		Import for specific end use and at specific time of the year (part of a bilateral agreement outlining specific requirements)	medium

7.31 - Does each of the individual measures identified reduce the risk to an acceptable level?

no

***Level of uncertainty:* low**

Treatment of the consignment (heat treatment or irradiation) is the only measure identified to reduce the risk to an acceptable level.
PFA for countries other than New Zealand

7.32 - For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?

no

***Level of uncertainty:* low**

Visual inspection at the place of production and at import will not be sufficient to reduce the risk to an acceptable level.

7.34 - Estimate to what extent the measures (or combination of measures) being considered interfere with international trade.

***Level of uncertainty:* low**

The volume of trade between the area of origin and the PRA area is small. Interference will be minimal.

7.35 - Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.

***Level of uncertainty:* low**

Heat treatment or irradiation may not be cost effective in comparison with the value of the wood.

7.36 - Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?

yes

The following measure has been identified:
- treatment of the consignment (heat treatment or irradiation) but this may not be cost-effective for low value wood such as firewood;
- PFA for countries other than New Zealand
- Import for processing at specific time of the year (only in the framework of a bilateral agreement).

Pathway 3: Hardwood particle wood and waste wood

7.06 - Is the pathway that is being considered a commodity of plants and plant products?

yes

7.09 - If the pest is a plant, is it the commodity itself?

no (the pest is not a plant)

7.10 - Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest? (if yes, specify the measures in the justification)

no

Level of uncertainty: **low**

There are no phytosanitary measures applied for particle wood (including wood chips) of host plants of *O. hirta*, or wood waste from New Zealand.

Options at the place of production

7.13 - Can the pest be reliably detected by visual inspection at the place of production ?

yes in a Systems Approach

Level of uncertainty: **low**

Possible measure: visual inspection at the place of production

As for wood.

7.14 - Can the pest be reliably detected by testing at the place of production?

no

Level of uncertainty: **low**

As for wood.

7.15 - Can infestation of the commodity be reliably prevented by treatment of the crop?

no

Level of uncertainty: **low**

Not possible for wood production.

7.16 - Can infestation of the commodity be reliably prevented by growing resistant cultivars?

no

Level of uncertainty: low

As for wood.

7.17 - Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions such as screened greenhouses, physical isolation, sterilized growing medium, exclusion of running water, etc.)?

no

Level of uncertainty: **low**

As for wood.

7.18 - Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?

no

Level of uncertainty: **low**

As for wood.

7.19 - Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?

no

Level of uncertainty: **low**

Not relevant for an insect.

7.20 - Based on your answer to question 4.01 (moderate rate of spread with low uncertainty), select the rate of spread.

moderate rate of spread

***Level of uncertainty:* low**

Possible measure: pest-free place of production or pest free area.

7.21 - The possible measure is: pest-free place of production or pest free area
Can this be reliably guaranteed?

Yes for Pest-free areas in countries where the pest is not known to occur
No for New-Zealand

***Level of uncertainty:* medium**

As for wood.

Options after harvest, at pre-clearance or during transport

7.22 - Can the pest be reliably detected by a visual inspection of a consignment at the time of export, during transport/storage or at import?

No

***Level of uncertainty:* low**

Inspection of consignments of particle wood is difficult.
Even if inspection was carried out, it is unlikely to detect the pests, as:
- particle wood or wood waste might contain several tree species (including non-host, which will make the inspection more difficult)
- signs of presence of the pest in wood (e.g. galleries) would not be easy to observe.

Sampling rates for a possible detection of such pests in wood chips have not been defined but large samples are needed to be confident that a specific pest is not present (Økland *et al.,* 2012).

7.23 - Can the pest be reliably detected by testing of the commodity?

no

***Level of uncertainty:* low**

There are no methods available to detect the wood borers in particle wood.

7.24 - Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?

yes as stand-alone measure

***Level of uncertainty:* medium** (no specific data for this pest)

Possible measure: specified treatment of the consignment

<u>Chipping down to a certain size</u>

Wood pieces below a certain dimension will not allow the survival of any stage of the pest. The Panel on Phytosanitary Measures considered that the current requirements as for *A. glabripennis* would be adequate for *O. hirta* as they are about the same size. It should be noted that there are currently no specific requirements in the EU on wood chips related to *Anoplophora chinensis* or *A. glabripennis* probably because the trade of chips from countries where these pests occur is minimal (van der Gaag *et al.*, 2008).

A small experiment with surrogate larvae of *Anoplophora glabripennis* (plastic and up to 40 mm lengths) indicated that about 94-97.5 % of the larvae may be killed when chipping to down to diameter sizes of 6-10 cm (Wang *et al.* 2000). Chipping the wood to pieces of less than 2.5 cm in any dimension is considered adequate to destroy the pest (Kopinga *et al.*, 2010).

To prevent spread of *A. glabripennis* in Canada, domestic movement of wood chips made of hosts from a demarcated area should be made by “chipping and/or tub grinding to 1.5 cm or less in size in 2 dimensions” (CFIA, 2014). It is considered that this approach provides a similar level of protection than 2.5 cm in all dimensions.

<u>Treatments</u>

Some treatments (heat treatment, fumigation, irradiation) could be effective but their practical implementation should be defined based on further research. The Panel on Phytosanitary Measures considered that heat treatment of the wood chips and waste at 56°C for 30 min throughout the material could be recommended.

Wood could also be treated prior to chipping (see 7.24 for the wood pathway), which will be equivalent to treatment of wood chips.

7.25 - Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment?

no

Level of uncertainty: **low**

The larvae are in the wood.

7.26 - Can infestation of the consignment be reliably prevented by handling and packing methods?

no

Level of uncertainty: **low**

Infestation occurs prior to felling the trees.

Wood chips and wood waste could be stored in the exporting country under strict control of the NPPO for a sufficient period, i.e. 2 years for wood waste and 1 year for wood chips, since only prepupae, and pupae would be likely to survive the chipping process and should have emerged as adults within this period of time.

The Panel on Phytosanitary Measures considered that given the difficulty to control the application of this measure in practice, it was not an appropriate option for imported material.

Options that can be implemented after entry of consignments

7.27 – Can the pest be reliably detected during post-entry quarantine?

No

Level of uncertainty: **low**

This is not a relevant measure for wood chips and wood waste.

7.28 – Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?

Yes in the framework of a bilateral agreement

Level of uncertainty: **medium** (temperature that does not allow emergence of the pests)

Possible measure: import of the consignment under special licence/permit and specified restrictions.

As for wood.

7.29 – Are there effective measures that could be taken in the importing country (surveillance, eradication, containment) to prevent establishment and/or economic or other impacts?

No

Level of uncertainty: **low**

As for wood.

7.30 – Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?

Yes

Q.	Stand alone	Systems Approach	Possible Measure	Uncertainty
7.13		X	visual inspection at the place of production	low
7.21	X		PFA	medium
7.24	X		specified treatment of the consignment	medium
7.28	X		Import for specific end use and at specific time of the year (part of a bilateral agreement outlining specific requirements)	

7.31 - Does each of the individual measures identified reduce the risk to an acceptable level?

no

Level of uncertainty: **low**

Treatment (chipping to pieces of less than 2.5 cm in any dimension (or to or to 1.5 cm in 2 dimensions) or heat treatment) will reduce the risk to an acceptable level.

7.32 - For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?

no

***Level of uncertainty:* low**

Visual inspection at the place of production will not be sufficient to reduce the risk to an acceptable level.

7.34 - Estimate to what extent the measures (or combination of measures) being considered interfere with international trade.

***Level of uncertainty:* low**

The volume of trade between the area of origin and the PRA area is small. Interference will be minimal.

7.35 - Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.

***Level of uncertainty:* low**

Treatment of waste wood or wood chips may not be cost-effective as they may be low quality products.

7.36 - Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?

yes

The following measures have been identified:

- For particle wood: chipping to pieces of less than 2.5 cm in any dimension (or to or to 1.5 cm in 2 dimensions) or heat treatment (56°C for 30 min throughout the material)
- For waste wood: heat treatment (56°C for 30 min throughout the material)
- PFA for countries other than New Zealand)
- Import for processing at specific time of the year (only in the framework of a bilateral agreement)

7.45 - Conclusions of the Pest Risk Management stage.

List all potential management options and indicate their effectiveness.
Uncertainties should be identified.

Because of the wide host range of *O. hirta*, the EWG discussed which plants for planting or categories of plants for planting these measures should be applied to. The EWG recommends that the measures could apply to all woody dicotyledons, because the hosts that are mainly attacked in New Zealand are woody dicotyledons, the pest has a constantly expanding host range within the group of woody dicotyledons, and consequently the current host list is likely to be incomplete. In contrast, the findings on other plant species (including conifers, monocotyledons such as palms and bamboos, non-woody dicotyledons) have been extremely rare; therefore the risk associated with trading these plants is judged to be very low.

Plants for planting (other than seeds) of woody dicotyledons	• For countries other than New Zealand, pest-free area (see requirements above) (ISPM 4, ISPM 29) **OR** • Produced under a pest-free place/site of production under physical isolation (according to EPPO Standard PM 5/8[2]) + regular inspections of the crop + inspection of plants prior to export **OR** • Post-entry quarantine for 3 months at minimum 15°C (only for small consignments) in the framework of a bilateral agreement
Wood of host species	• For countries other than New Zealand, pest-free area (ISPM 4, ISPM 29) **OR** • Treatment (heat, irradiation) **OR** • Import for processing at specific time of the year (only in the framework of a bilateral agreement)
Harwood wood chips Hardwood wood waste	• For countries other than New Zealand, pest-free area (ISPM 4, ISPM 29) **OR** • Treatment (chipped to pieces of less than 2.5 cm in any dimension or to 1.5 cm in 2 dimensions) **OR** • Heat treatment (56°C for 30 min) **OR** • Import for processing at specific time of the year (only in the framework of a bilateral agreement)

Uncertainties in the management part are:

- Natural spread capacity of the pest (and possible buffer zones)
- Efficacy of treatment of the crop or of the consignment (e.g. fumigation insecticides for plants for planting

[2] The Standard PM 5/8 was not available at the time of the PRA. A reference to this Standard is only added to the recommended measures.

Remark: In 2023, the Panel on Quarantine Pests for Forestry (P QPF) noted that there is a risk of reinfestation during transport for potted plants and bonsais because stressed plants are attractive to Cerambycidae beetles (it is not likely that other plants would be exported during the main flight period of the adults). However, in absence of sufficient data concerning the risk of reinfestation, the Panel on Phytosanitary Measures and the P QPF (2024-10) supported that storage/transport requirements are not introduced into the PRA for plants for planting.

EPPO PRA on *Oemona hirta*: references and annexes

REFERENCES

Adachi, I. 1988. Reproductive biology of the white-spotted longicorn beetle, *Anoplophora malasiaca* (Thomson) (Coleoptera: Cerambicidae), in citrus trees. Applied Entomology and Zoology 23: 256-264.

Aksoy U. 1995. Present status and future prospects of underutilized fruit production in Turkey . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 97-107 : 1 table. 26 ref. (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain)

Anon. 2006. List of quarantine pests of the Republic of Korea. From IPP www.ippc.int

Anon. 2007. List of quarantine pests of Chile. From IPP www.ippc.int

Anon. No date. Interim host list for lemon tree borer Oemona hirta. Combination of data from MAFBNZ Plant Protection Database and Spiller & Wise, 1982 [Spiller, D.M., & Wise, K.A.J. (1982) A catalogue of New Zealand insects and their host plants. New Zealand DSIR Bulletin, 213, 1–259.]. Unknown origin, provided by FERA.

APPPC. 1987. Insect pests of economic significance affecting major crops of the countries in Asia and the Pacific region. Technical Document No. 135. Bangkok, Thailand: Regional FAO Office for Asia and the Pacific (RAPA), 56 pp. (extract)

Baker RT. 1982: Entomology. Mon. Circ. Auckland Plant Health Diagn. Stn.: August 1982:4-7

Baker RT, Sunde RG, Kleinpaste R. 1982: Entomology. Mon. Circ. Auckland Plant Health Diagn. Stn.: March/April 1982:10 PP

Balazs K, Bujaki G, Farkas K (1996). Incorporation of Apple Clearwing (*Synanthedon myopaeformis* Bork.) control into the IPM system of apple. Acta Horticulturae 19: 134–139. (abst.)

Biosecurity Australia. 2004. Importation of Apples from New Zealand. Revised Draft IRA Report, Part B, February 2004. Biosecurity Australia, Canberra, Australia.

Biosecurity Australia. 2006. Final Report for the Pest Risk Analysis for Stone Fruit from New Zealand into Western Australia. Biosecurity Australia, Canberra, Australia.

Blumenfeld A, Shaya F, Hillel R. 2000. Cultivation of pomegranate . In Melgarejo-Moreno P. (ed.), Martínez-Nicolás J.J. (ed.), Martínez-Tomé J. (ed.) . Production, processing and marketing of pomegranate in the Mediterranean region: Advances in research and technology . Zaragoza : CIHEAM-IAMZ, 2000. p. 143-147 : 1 table. Summaries (En, Fr). (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 42). Symposium on "Production, processing and marketing of pomegranate in the Mediterranean region: Advances in research and technology", 1998/10/15-17, Orihuela (Spain)

Braithwaite B, Inglis C, Dick MA, Ramsfield TD, Waipara NW, Beever RE, Pay JM, Hill, CF. 2007. Investigation Of Oak Tree Decline In The Auckland Region. New Zealand Plant Protection 60:297-303

Bulir P, Scholz J, Suchara I. 1984. A contribution to the evaluation of windbreaks in the Lednice na Morave areas [Czech] Acta Pruhoniciana 48: 35-66.

Campbell DJ, Moller H, Ramsay GW, Watt JC. 1984: Observations on food of kiore (Rattus exulans) found in husking stations on northern offshore islands of New Zealand. N.Z. J. ECOL.: 7:131-138

CFIA. 2014. D-11-05: Phytosanitary Requirements for Non-Manufactured and Non-Propagative Wood Products to Prevent the Introduction from the Continental United States and Spread Within Canada of the Asian Longhorned Beetle, Anoplophora glabripennis (Motschulsky). http://www.inspection.gc.ca/plants/plant-protection/directives/forestry/d-11-05/eng/1326390329570/1326390421438

Charles JG. 1979: The ecology and control of mealybugs in Auckland vineyards. Unpublished M.Sc. Thesis, University Of Auckland, Auckland: X,110 PP

Clarke AD, Pollock RP. 1980: Viticulture: diseases and insect pests: types and control. Aglink HPP: 119:1-4

Clearwater JR. 1981: Lemon tree borer, Oemona hirta (Fabricius), life cycle. N.Z. Dep. Sci. Ind. Res. Inf. Ser.: 105(33):1-3 . Text republished in 1998 as http://www.hortnet.co.nz/publications/hortfacts/hf401033.htm.

Clearwater JR, Muggleston SJ. 1985: Protection of pruning wounds: favoured oviposition sites for the lemon tree borer. Proc. N.Z. Weed Pest Control Conf.: 38:199-202

Clearwater JR, Wouts WM. 1980. Preliminary trials on the control of lemon tree borer with nematodes. Proceedings of the 33rd New Zealand weed and pest control conference (Tauranga, NZ, 1980-08-12/14), 133-135 (abst.).

Cottier W. 1938: Citrus pests: (2) the citrus borer. N.Z. J. AGRIC.: 57(1):28-29

Davies TH. 1990. List of insects reared and their hosts, from Hawke's Bay, NZ. The Weta, 13: 3–6

De Sousa RM, Gomes Pereira J. 1995. Notes sur quelques espèces fruitières sous-utilisées au Portugal (néflier japonais, figuier, kaki et grenadier) . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 63-67 (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain) http://ressources.ciheam.org/om/pdf/c13/96605641.pdf

Doronina AJ, Terekhina NV. 2009. Malus domestica. Interactive agricultural ecological atlas of Russia and neighboring countries. http://www.agroatlas.ru/en/content/cultural/Malus_domestica_K

Drag L, Hauck D, Pokluda P, Zimmermann K, Cizek L, 2011. Demography and Dispersal Ability of a Threatened Saproxylic Beetle: A Mark-Recapture Study of the Rosalia Longicorn (Rosalia alpina). PLoS ONE, Volume 6 | Issue 6 | e21345 8pp.

Duffy EA. 1963. A monograph of the immature stages of Australasian timber beetles (Cerambycidae). British Museum (Natural History), London.

Dumbleton LJ. 1937: Borers in fruit-trees. N.Z. J. Agric.: 55(5):295-298

Dumbleton LJ. 1957: The immature stages of some New Zealand longhorn beetles (Coleoptera: Cerambycidae). Transactions of the Royal Society of New Zealand 84: 611 - 628.

Dye MH. 1950. Studies on the Anatomy and Biology of Oemona hirta Fabricius (Coleoptera: Cerambycidae). Unpublished M.Sc thesis. Auckland University College. (2 volumes)

Earnshaw A. 1979: Entomology. Mon. Circ. Auckland Plant Health Diagn. Stn.: October 1979:4 PP

Ecroyd CE. 1994. Regeneration of Pittosporum turneri communities. Conservation Advisory Science Notes No. 99, Department of Conservation, Wellington. 34p. Section 5: http://www.doc.govt.nz/upload/documents/science-and-technical/casn099a.pdf

EPPO. 2008a. EPPO Standard PM 10/6(1) *Heat treatment of wood to control insects and wood-borne nematodes. Bulletin OEPP/EPPO Bulletin* **39**, 31

EPPO. 2008b EPPO Standard PM 10/7(1) *Methyl bromide fumigation of wood to control insects Bulletin OEPP/EPPO Bulletin* **39**, 32-33

EPPO. 2008c. EPPO Standard PM 10/8(1) *Disinfestation of wood with ionizing radiation. Bulletin OEPP/EPPO Bulletin* **39**, 34-35

EPPO. 2010. Alert list - Oemona hirta (Coleoptera: Cerambycidae). Lemon tree borer. http://www.eppo.org/QUARANTINE/Alert_List/insects/oemona_hirta.htm

EPPO. 2011a. Pest risk analysis for *Saperda candida.*Available from http://www.eppo.org/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm.

EPPO. 2011b. Pest risk analysis for *Agrilus anxius*. Available from http://www.eppo.org/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm.

EPPO. 2011c. Alert list - Thaumatotibia leucotreta (Lepidoptera: Tortricidae). False codling moth. http://www.eppo.org/QUARANTINE/Alert_List/insects/thaumatotibia_leucotreta.htm

EU. 2011.EU pesticides database. http://ec.europa.eu/sanco_pesticides/public/index.cfm.

FAO. 2008. Poplars, Willows and People's Wellbeing. Synthesis of Country Progress Reports. Activities Related to Poplar and Willow Cultivation and Utilization, 2004 through 2007. International Poplar Commission, 23rd Session, Beijing, China, 27 – 30 October 2008.

FAO. 2009. ISPM 15, Regulation of wood packaging material in international trade. FAO, Rome.

FAO-CIHEAM. 2004. The world macadamia industry and research activities. In NUCIS Newsletter, Information Bulletin of the Research Network on Nuts. Number 12 September 2004. p 36.

FERA. 2010. Rapid assessment of the need for a detailed Pest Risk Analysis for Oemona hirta, the lemon-tree borer. http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/documents/oemonaHirta10.pdf

Fraser T, Morton A, Proebst D. 2003. Organic summerfruit. Ressource guide. Soil & Health Association

Glucina PG. 1980: Persimmons. Orchardist N.Z.: 53(10):336-346

Goldson SL, Frampton ER, Geddes NJ, Braggins TJ. 2003. The potential of sensor technologies to improve New Zealand's border security. In: Goldson SL, Suckling DM ed. Defending the green oasis: New Zealand biosecurity and science. New Zealand Plant Protection Society Symposium. p. 63-71.

Gourlay ES. 1964. Notes on New Zealand Insects and Records of Introduced Species. New Zeland entomologist 2:7–9.

Gourlay H. 2007. Native insects that damage gorse. The biologiclal control of weeds book.

Gregoriou C. 1995. Cultivation of fig (Ficus carica), Loquat (Eriobotrya japonica), Japanese persimmon (Diospyros kaki), Pomegranate (Punica granatum) and Barbary fig (Opuntia ficus-indica) in Cyprus . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 9-12 : 2 tables. (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain).

Grehan JR. 1990. Invertebrate survey of Somes Island (Matiu) and Mokopuna Island, Wellington Harbour, New Zealand. New Zealand Entomologist, 13: 62–75.

Haack RA, Hérard F, Sun J & Turgeon JJ. 2010. Managing invasive populations of Asian longhorned beetle and Citrus longhorned beetle: a worldwide perspective. Ann. Rev. Entomol. 55, 521-546.

Hérard, F., Krehan, H., Benker, U., Boegel, C., Schrage, R., Chauvat, E., Ciampitti, M., Maspero, M., Bialooki, P., 2005. *Anoplophora* in Europe: infestations and management responses. Proceedings of the 16th U.S. Department of Agriculture interagency research forum on gypsy moth and other invasive species 2005 GTR-NE- 337: 35 – 40. http://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/2005/337papers/herard337-2.pdf

HGANZ. 2008. Growing hazelnut in New Zealand. Hazelnut growers association New Zealand.

Hosking GP. 1978. Oemona hirta (Fabricius) (Coleoptera : Cerambycidae) - lemon-tree borer. New Zealand Forest Service, Forest and Timber Insects in New Zealand No.31. 4 pp. http://www.nzffa.org.nz/farm-forestry-model/the-essentials/forest-health-pests-and-diseases/Pests/Oemona-hirta

Hudson GV. 1934: New Zealand beetles and their larvae: an elementary introduction to the study of our native Coleoptera. Ferguson & Osborne, Wellington: 236 pp.

IUCN. 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.

Kitagawa H, Glucina PG. 1984. Persimmon Culture in New Zealand. New Zealand Department of Science and Industrial Research, Science Information Publishing Centre, Wellington. Information series No. 159.74 pp. P45 only (google books)

Kopinga J, Moraal LG, Verwer CC & Clerkx APPM (2010). Phytosanitary risks of wood chips. Alterra report 2059. Wageningen, NL. 80 pp. http://www.alterra.wur.nl/UK/publications/Alterra+Reports/

Landcare Research 2006. What's new in bc of weeds. 38. Nov 2006.

Landcare Research. 2011. Oemona hirta. What is this bug? A guide to common invertebrates of New Zealand. www.landcareresearch.co.nz/research/biosystematics/invertebrates/invertid/English version: Clunie, L. 2004 and updates. Māori version: Clunie, L. and Jacob, H. 2008.

Liebhold A.M., Brockerhoff E.G., Garrett L.J., Parke J.L. and Britton K.O. 2012. Live Plant Imports: the Major Pathway for Forest Insect and Pathogen Invasions of the United States. Frontiers in Ecology and the Environment 10: 135-143

Lionakis SM. 1995. Present status and future prospects of the cultivation in Greece of the plants: fig, loquat, Japanese persimmon, pomegranate and Barbary fig . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 21-30 : 1 ill. 1 graph. 3 tables. 9 ref. (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain)

Llácer G, Martínez-Valero R, Melgarejo P, Romero M, Toribio F. 1995. Present status and future prospects of underutilized fruit tree crops in Spain . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 69-78 : 2 tables. 7 ref. (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain)

Lu W, Wang Q. 2005. Systematics of the New Zealand longicorn beetle genus Oemona Newman with discussion of the taxonomic position of the Australian species, O. simplex White (Coleoptera: Cerambycidae: Cerambycinae)

Maddison PA. 1993. UNDP/FAO-SPEC Survey of Agricultural Pests and Diseases in the South Pacific, Technical report. Vol. 3. Pests and other fauna associated with plants, with botanical accounts of plants. Auckland : Manaaki Whenua B Landcare Research. [File downloaded from http://nzac.landcareresearch.co.nz/]

Maddison PA; Crosby TK. 2009. Summary of plant-animal associations from "Maddison (1993) Pests and other fauna associated with plants, with botanical accounts of plants. Technical report. UNDP/FAO-SPEC Survey of Agricultural Pests and Diseases in the South Pacific, vol. 3. Auckland : Manaaki Whenua B Landcare Research." File downloaded from http://nzac.landcareresearch.co.nz/.

MAF. 2003. New organism records: 24/03/03 – 09/05/03. Biosecurity Issue 44 • 15 June 2003

MAF. 2004a. Biosecurity Issue 49 • 1 February 2004

MAF. 2004b. Biosecurity Issue 50 • 15 March 2004

MAF. 2007. Import risk analysis: Vehicle & Machinery. Biosecurity New Zealand.

MAF. 2008. Pest watch: 9/2/2008 – 14/3/2008. ISSUE 83 | MAF BIOSECURITY NEW ZEALAND

MAF. 2009. Pest watch: 20/12/2008 – 20/02/2009

MAF. 2010. Importing countries phytosanitary requirements. Peru. 13 August 2010. From http://www. biosecurity.govt.nz

MAF. 2011a. Cherries to Korea Export Compliance Programme for the Provision of Additional Declarations for Cydia pomonella and Stigmina carpophila 2011/12. MAF, Version 2

MAF. 2011b. Pest watch: 2 November 2010 – 21 March 2011

Martin N. 2009. Herbivores and pathogens associated with Clianthus species (Fabales: Fabaceae). The Weta, 38: 6–12

McCullough DG, Poland TM, Cappaert D, Clark EL, Fraser I, Mastro V, Smith S, Pell C. 2007. Effects of chipping, grinding, and heat on survival of emerald ash borer, Agrilus planipennis (Coleoptera, Buprestidae), in chips. Forest entomology 100(4): 1304-1315

Moeed A, Meads MJ. 1987. Invertebrate survey of offshore islands in relation to potential food sources for the little spotted kiwi, Apteryx oweni (Aves: Apterygidae). New Zealand Entomologist, 10: 50–64.

Morrisey D, Beard C, Morrison M, Craggs R, Lowe M (2007). The New Zealand mangrove: review of the current state of knowledge. Auckland Regional Council Technical Publication Number 325, 162 pp. Available on line: http://www.arc.govt.nz/albany/fms/main/Documents/Plans/Technical%20publications/301-350/ARCTP%20325%20Mangrove_review_(web).pdf

Morton A, Proebst D. 2003. Organic citrus. Ressource guide. Soil & Health Association

Muggleston SJ. 1992. Bitter lemon: identification and control of lemon tree bcrer. Growing Today 1992: 42—46.

Nicholas I, Brown I. 2002. Blackwood. A Handbook for Growers and Users. Forest Research Bulletin No. 225. http://maxa.maf.govt.nz/sff/about-projects/search/01-002/01-002-growingblackwood.pdf

Nicholas I, Ecroyd C, Barton I. 2007. Chapter 8 – Pests and diseases. In Paulownia. Forest Research bulletin, 1174-5096; no. 231. http://maxa.maf.govt.nz/sff/about-projects/search/L03-022/

NZFFA. No date. No. 24 Establishing native hardwood trees for timber. New Zealand Farm Forestry Association Information Leaflet http://www.nzffa.org.nz/farm-forestry-model/resource-centre/farm-forestry-association-leaflet-series/no-24-establishing-native/

NZWood. 2012. Table of major and minor indigenous wood species. NZ Wood Programme. http://www.nzwood.co.nz/images/uploads/file/Designed%20PDFs/NZW13611%20Major%20Species%20Indigenous.pdf

Økland B, Haack RA, Wilhelmsen G. 2012. Detection probability of forest pests in current inspection protocols – A case study of the bronze birch borer, Scandinavian Journal of Forest Research, 27:285-297.

Ostojá-Starzewski J 2010. The lemon tree borer, another longhorn beetle threat? Plant Clinic News|August-September 2010

Ostojá-Starzewski J, MacLeod A., Eyre D. 2010. Plant Pest Fact Sheet. Lemon tree borer Oemona hirta. http://www.fera.defra.gov.uk/plants/publications/documents/factsheets/lemonTreeBorer.pdf

Plant-SynNZ. 2011. Oemona hirta: Report of hosts associated with this herbivore, reasons for reliability index score and supporting reference. Crop and Food Research. http://plant-synz.landcareresearch.co.nz/

Rhainds M, Mackinnon WE, Porter KB, Sweeney JB, Silk PJ. 2011. Evidence for Limited Spatial Spread in an Exotic Longhorn Beetle, Tetropium fuscum (Coleoptera: Cerambycidae). Forest entomology, 1928-1933.

RNZIH. 2004. Lemon Tree Borer - and how to get rid of it. Garden article. Royal New Zealand Institute of Horticulture. http://www.rnzih.org.nz/pages/Citrus2.htm.

Rohitha BH, Hartley T, Franklin SJ (1992) Lemon tree borer damage on persimmon. Proceedings of the 45th New Zealand Plant Protection Conference, 141-142. Available online: http://www.nzpps.org/journal/45/nzpp_451410.pdf

Shaw BD, Christeller JT. 2009. Characterization of the proteases in the midgut of the xylophagous larvae of Oemona hirta (Coleoptera: Cerambycidae). Insect Science (2009) 16, 381–386.

Shaw WB, Burns BR. 1997. The ecology and conservation of the endangered endemic shrub, Kōwhai NgutukākāClianthus puniceus in New Zealand. Biological Conservation. Volume 81, Issue 3, Pages 233-245.

Smith, M.T., Bancroft, J, Li, G., Gao, R, Teale, S., 2001. Dispersal of *Anoplophora glabripennis* (Cerambycidae). Environmental Entomology 30: 1036 – 1040.

Smith, M.T., Tobin, P.C., Bancroft, J., Guohong, L., Gao, R., 2004. Dispersal and spatiotemporal dynamics of Asian Longhorned Beetle (Coleoptera: Cerambycidae) in China. Environmental Entomology 33: 435 – 442.Syrett P. 1996. Insects for biological control of broom (Cytisus scoparius) in New Zealand. Eleventh Australian Weeds Conference Proceedings

Taylor HS. 1957: Citrus borer. N.Z. J. AGRIC.: 94(4):357-358

Tertyshnyi AS. 1991. Are poplar windbreaks effective? [Russian]. Sadovodstvo i Vinogradarstvo, 2: 18.

Thomas WP. 1981. Pests of blueberries in New Zealand, especially canterbury. In Blueberry Production, Proceedings of a course in "Fruit Production" at Lincoln College in November 1980, with an additional paper from an earlier course in "Alternative Land Uses" held in February 1979. Bulletin 35D, Papers in Fruit and Nut Production, Department of Horticulture Landscape and parks, Lincoln College, University College of Agriculture Rural Development and Extension Centre.

Tillesse (de) V, Nef L, Charles J, Hopkin A, Augustin S. 2007. FAO Damaging poplar insects, internationally important species. FAO, International Poplar Commission. http://www.fao.org/forestry/38255/en/

Toft RJ, Harris RJ, Williams PA. 2001. Impacts of the weed Tradescantia fluminensis on insect communities in fragmented forests in New Zealand. Biological Conservation 102 (2001) 31–46

USDA-Aphis. 2011. Treatment schedule T201-a-2. In Treatment Manual, http://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf

Van der Gaag DJ, Ciampitti M, Cavagna B, Maspero M, Hérard F. 2008. Pest Risk Analysis for Anoplophora chinensis. Plant Protection Service, Wageningen (NL) http://www.vwa.nl/actueel/bestanden/bestand/2000870 (accessed February 2012)

Waikato Times (2009) Ridding your garden of borer may require drastic action. Last updated 2009. Available online at: http://www.stuff.co.nz/waikato-times/life-style/gardening/201598/Ridding-your-garden-of-borer-may-require-drastic-action (Accessed February 2012)

Walali Loudyi D. 1995. Quelques espèces fruitières d'intérêt secondaire cultivées au Maroc . In Llácer G. (ed.), Aksoy U. (ed.), Mars M. (ed.) . Underutilized fruit crops in the Mediterranean region. Zaragoza : CIHEAM-IAMZ, 1995. p. 47-62 : 3 tables. 13 ref. (Cahiers Options Méditerranéennes; v. 13), First meeting of the CIHEAM Cooperative Working Group on Underutilized Fruit Crops in the Mediterranean Region, 1994/11/09-10, Zaragoza (Spain) http://ressources.ciheam.org/om/pdf/c13/96605640.pdf

Wang BV, Mastro C, McLane WH, 2000: Impacts of chipping on surrogates for the longhorned beetle *Anoplophora glabripennis* (Coleoptera: Cerambycidae) in logs. Journal of Economic Entomology 93, 1832-1 836

Wang Q. 1998. Behavioural ecology of lemon tree borer, and possible biological control agents. Annual report 1998, The Massey University Agricultural Research Foundation, pp13-14.

Wang Q, Shi G, Davis LK. 1998. Reproductive potential and daily reproductive rhythms of Oemona hirta (Coleoptera: Cerambycidae). Journal of Economic Entomology 91(6), 1360-1365.

Wang Q, Shi G, Song D, Rogers DJ, Davis LK, Chen X. 2002. Development, survival, body weight, longevity, and reproductive potential of Oemona hirta (Coleoptera: Cerambycidae) under different rearing conditions. Journal of Economic Entomology 95(3), 563-569.

Wang Q, Shi G. 2001. Host preference and sex allocation of three hymenopteran parasitoid species (Ichneumonidae and Braconidae) of a longicorn pest, Oemona hirta (Fabr.) (Col., Cerambycidae). J. Appl. Ent. 125, 463±467.

Wang Q, Shi GL. 1999. Parasitic natural enemies of lemon tree borer. Proceedings of the 52nd New Zealand Plant Protection Conference, 60-64. Available online: http://www.nzpps.org/journal/52/nzpp_520600.pdf

Wang Q, Davis LK. 2005. Mating Behavior of Oemona hirta (F.) (Coleoptera: Cerambycidae: Cerambycinae) in Laboratory Conditions. Journal of Insect Behavior 18,187-191.

Watt JC. 1983: Beetles (Coleoptera) of Auckland. TANE: 28:31-50

Wearing CH, Charles JG, Elmer P, Langford G, McKenna CE, McLaren GF, Manktelow D, Shaw PW, Stevens P, Suckling DM, Walker JTS, Wood P. 2001. Challenges for Plant Protection in Organic Fruit Production. *In* Plant Protection Challenges in Organic Production. Edited by D.M. Suckling and M.R. Butcher (2001). Manaaki Whenua Press

Wilkinson AG. 1997. Pest and diseases of poplar (Populus spp.) in New Zealand. From Ensis publication, FRI bulletin No.124 Introduced Forest Trees in New Zealand. Part 17. The Poplars Populus spp. A.G. WilkinsonFarm Forestry New Zealand. http://www.nzffa.org.nz/farm-forestry-model/the-essentials/forest-health-pests-and-diseases/poplar

Wouts WM, Clearwater JR. 1980. Neoaplectana feltiae, A biological insecticide against the lemon tree borer. N.Z. Society for Parasitology 7, 605.

Zondag R. 1964. 1963. Servicing of timber inspection. N.z. for. Serv. Rep. For. Res. Inst.: 1963:51-52

Zondag R. 1979. A check-list of insects attacking eucalypts in New Zealand. New Zealand Journal of Forestry 24(1), 85-89.

INTERNET REFERENCES (all accessed in January 2012)

Host records in New Zealand

Plant-SyNZ™: an invertebrate herbivore biodiversity assessment tool. Landcare Research. http://plant-synz.landcareresearch.co.nz/index.asp

Sites of institutes, garden centers, nurseries and miscellaneous used to check availability of hosts in the PRA area

http://agriculture.gouv.fr
http://apps.rhs.org.uk
http://arven-pepinieres.com
http://fr.wikipedia.org
http://gardenbreizh.org
http://isaisons.free.fr
http://jardinsetpaysages.blogspirit.com
http://lesbeauxjardins.com
http://nature.jardin.free.fr
http://nothofagus.free.fr
http://www.aspeco.net
http://www.aujardin.info
http://www.burncoose.co.uk/
http://www.countyparknursery.co.uk
http://www.crpf.fr
http://www.ethnoplants.com
http://www.fao.org
http://www.fcba.fr
http://www.florum.fr
http://www.gardenaction.co.uk
http://www.growingontheedge.net

http://www.habitas.org.uk/
http://www.hoecroft.co.uk
http://www.infojardin.com
http://www.jardindupicvert.com
http://www.jardiner-malin.fr
http://www.jardinexotiqueroscoff.com
http://www.jardins-interieurs.com
http://www.lafitte.net
http://www.lesarbres.fr
http://www.lestrem-nature.org
http://www.mailorder.crug-farm.co.uk
http://www.norfolkherbs.co.uk
http://www.parlonsbonsai.com
http://www.pepinieredesavettes.com
http://www.planfor.fr
http://www.plantbase.co.uk
http://www.plante-interieur.com
http://www.plantes-et-jardins.com
http://www.plantes-ornementales.com
http://www.semencesdupuy.com
http://www.shcn.co.uk
http://www.shootgardening.co.uk
http://www.trevenacross.co.uk
http://www.truffaut.com

Trade and production data

EUROSTAT Statistics: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database
FAOSTAT : http://faostat.fao.org.

Endangered species

IUCN. 2011. IUCN Red List of Threatened Species. Version 2011.1. <www.iucnredlist.org>.
Global Trees Campaign. http://www.globaltrees.org.

Annex 1. Host species and genera, and their use in the PRA area

The table below gives references for each host species or genus. Information from the database Plant-SyNZ (http://plant-synz.landcareresearch.co.nz/index.asp) are also indicated, with a reliability score for host (10 = excellent evidence for the association). Data from Plant-SyNZ was extracted on 02-01-2012.

Data from Scion's Forest Health Database were also provided (unpublished records; J. Bain, New Zealand Forest Institute Ltd, NZ, 05-2012, personal communication).

Basic internet searches were done when in doubt on whether certain hosts are available in the PRA area (especially for ornamentals). References to websites are given in some cases.

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Abies alba Mill.	Pinaceae	Scion's Forest Health Database		Forestry, ornamental. Also native
Abies cephalonica Loud.	Pinaceae	Scion's Forest Health Database		Forestry, ornamental. Native in Greece
Abies grandis (Douglas ex D.Don) Lindl.	Pinaceae	Scion's Forest Health Database		Forestry, ornamental
Abies nordmanniana (Steven) Spach	Pinaceae	Scion's Forest Health Database		Forestry, ornamental Native in Turkey, Russia, Georgia
Abutilon sp.	Malvaceae			Ornamental and naturalized weed (e.g. *Abutilon theophrasti*)
Acacia sp.	Mimosaceae	Kuschel, 1990, listing host genera		Ornamental
Acacia dealbata Link	Mimosaceae	PlantSyNZ, 2011 (10; larvae in dead branches of host plant; Ensis forest health database)	Exotic, Wild	Ornamental and invasive in Mediterranean regions
Acacia decurrens Willd.	Mimosaceae	MAF, 2003; PlantSyNZ, 2011 (rating as above)	Exotic, Wild	Ornamental
Acacia floribunda (Vent.) Willd.	Mimosaceae	PlantSyNZ, 2011 (rating as above)	Exotic, Wild	Ornamental
Acacia longifolia (Andrews) Willd.	Mimosaceae	PlantSyNZ, 2011 (rating as above)	Exotic, Wild	Ornamental and locally invasive
Acacia melanoxylon R. Br. (balckwood)	Mimosaceae	Nicholas & Brown, 2002; PlantSyNZ, 2011 (rating as above)	Exotic, Wild	Ornamental
Acacia pycnantha	Mimosaceae	Spiller & Wise, 1982 citing Cottier, 1938 (*Albizzia pycnantha*); Lu & Wang, 2005		
Acer sp.	Aceraceae	Kuschel, 1990, listing host genera; Lu & Wang 2005		Forest, ornamental, bonsai
Acer pseudoplatanus L. (common sycamore)	Aceraceae	PlantSyNZ, 2011 (10; larvae in dead branches of host plant; Ensis forest health database)	Exotic, Wild	Forest, ornamental, bonsai. Native
Aesculus hippocastanum L. (horse chestnut)	Hippocastanacea e	PlantSyNZ, 2011 (rating as above)	Exotic, Wild	Ornamental, forest
Agathis australis (D.Don) Lindl. ex Loudon, (kauri)	Araucariaceae	PlantSyNZ, 2011 (10; larva found in host plant)	Endemic, Wild	Ornamental (indoors in temperate areas)
Albizia sp.	Mimosaceae	Kuschel, 1990, listing host genera		Ornamental
Albizia julibrissin Durazz.	Mimosaceae	Spiller & Wise, 1982 citing Helson, 1952; Lu & Wang, 2005; PlantSyNZ, 2011 (10; insects in wood of host plant; Ensis forest health database)	Exotic, Wild	Ornamental. Native in NE Turkey
Albizia lophanta	Mimosaceae	Dye, 1950; Lu & Wang, 2005		Ornamental
Alectryon excelsus Gaertn.	Sapindaceae	PlantSyNZ, 2011 (10; insects in branches of host plant)	Endemic, Wild	Ornamental (http://www.burncoose.co.uk/site/ plants.cfm?pl_id=231&fromplants=search%3Dalectryon)
Aleurites fordii Hemsl. (*Vernicia fordii*) (tung-oil tree)	Euphorbiaceae	Cottier, 1938 (as tung-oil tree); Spiller & Wise, 1982 citing Cottier 1938; Lu & Wang 2005; PlantSyNZ, 2011 (10; listed as a host plant, Miller 1925 in Duffy 1963)	Exotic, Sometimes present	Ornamental
Alnus glutinosa (L.) Gaertn. (European alder)	Betulaceae	PlantSyNZ, 2011 (10; insects in live branches of host plant)	Exotic, Wild	Forest, ornamental. Native
Alnus incana (L.) Moench, (American alder)	Betulaceae	PlantSyNZ, 2011 (10; beetles found in host plant)	cultivated	Forest, ornamental. Native
Angophora floribunda (Sm.) Sweet	Myrtaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant, name given as Acmena floribunda)	cultivated	?Ornamental (not found)

Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Aristotelia serrata (makomako)	Elaeocarpaceae	Spiller & Wise, 1982 citing Miller, 1925; Lu & Wang, 2005; Waikato Times, 2009; PlantSyNZ, 2011 (10; listed as a host plant)	Endemic, Wild	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-1024-aristotelia-serrata.html)
Asparagus plumosus Baker	Asparagaceae	Scion's Forest Health Database		Ornamental
Asparagus setaceus (Kunth) Jessop [perennial, herbaceaous]	Asparagaceae	PlantSyNZ, 2011 (10; larvae found in host plant)	Exotic, Absent	Ornamental (grown for cut foliage, or as pot plant, or in garden) (http://www.plante-interieur.com/asparagus_setaceus.php)
Avicennia marina supsp. *australasica*, (NZ mangrove, manawa)	Acanthaceae	Morrisey et al., 2007; PlantSyNZ, 2011 (10; insects in live branches of host plant)	Non-endemic, Wild	mangrove tree, unlikely
Azara sp.	Salicaceae	Kuschel, 1990, listing host genera; Lu & Wang 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant)	cultivated	Ornamental
Beaufortia sparsa R.Br. [shrub]	Myrtaceae	PlantSyNZ, 2011 (10; insects in live branches of host plant)	cultivated	Ornamental
Berberis sp.	Berberidaceae	Scion's Forest Health Database		Ornamental, wild. Include native species (e.g. *Berberis vulgaris*)
Betula sp.	Betulaceae	Kuschel, 1990, listing host genera; Lu & Wang 2005		Forest, ornamental
Betula nigra L.	Betulaceae	PlantSyNZ, 2011 (10; listed as a host plant (Morrison 2007)	cultivated	Ornamental
Betula pendula Roth	Betulaceae	PlantSyNZ, 2011 (10; insects in wood of host plant)	Exotic, Wild	Forest, ornamental. Native
Brachyglottis sp. [shrubs]	Asteraceae	Kuschel, 1990, listing host genera		Ornamental
Brachyglottis greyi (Hook.f.) B.Nord.	Asteraceae	PlantSyNZ, 2011 (10; found in host plant as part of Ensis (high-risk site survey) (Walker 2008)	Endemic, Wild	Ornamental
Brachyglottis repanda J.R. et G. Forster (rangiora)	Asteraceae	Hudson, 1934; Cottier, 1938; Lu & Wang, 2005; PlantSyNZ, 2011 (10; insects found in branches of host plant)	Endemic, Wild	Ornamental
Brachyglottis rotundifolia Forster et Forster f.	Asteraceae	Hudson 1934, Cottier, 1938 (as *Senecio rotundifolia*); PlantSyNZ, 2011 (10; listed as a host plant)	Endemic, Wild	Ornamental
Brachychiton acerifolius (A.Cunn ex G.Don) Macarthur	Malvaceae	Scion's Forest Health Database		Ornamental ? (http://www.rhs.org.uk/Plants/RHS-Publications/Journals/The-Plantsman/2007-issues/September/halfhardytrees)
Buddleja davidii Franch.	Buddlejaceae	PlantSyNZ, 2011 (10; insects in live branches of host plant)	Exotic, Wild	Ornamental. Widely naturalized and invasive.
Caesalpinia sp.	Fabaceae	Scion's Forest Health Database		Ornamental
Callistemon citrinus [bush]	Myrtaceae	PlantSyNZ, 2011 (10; larvae found in host plant)	cultivated	Ornamental
Camellia sp.	Theaceae	Shaw & Christeller, 2009 citing Scott, 1984; PlantSyNZ, 2011 (9; insects in live branches of host plant, plant species name not given)	cultivated	Ornamental
Carmichaelia australis R.Br.	Fabaceae	Gourlay, 1960 & 1964 (*C. ovata*); PlantSyNZ, 2011 (10; larvae and pupae in host plant (Gourlay 1964), plant name given as *Carmichaelia ovata*)	Endemic, Wild	Ornamental (http://www.shcn.co.uk/1.htm)
Carya sp.	Juglandaceae	Scion's Forest Health Database		Ornamental
Casimiroa edulis La Llave & Lex. (white sapote)	Rutaceae	MAF, 2009; PlantSyNZ, 2011 (10; larvae found in host plant)	cultivated	Ornamental with edible fruit
Cassinia retorta	Asteraceae	Spiller & Wise, 1982 citing Kirk 1896; Lu & Wang, 2005		Ornamental (http://www.hoecroft.co.uk/gravel_area.htm)
Castanea crenata (Japanese chestnut)	Fagaceae	MAF, 2011b		Fruit, wood, rootstock, ornamental (http://www.lafitte.net/lafitte/chataigners_varietes.asp)
Castanea sativa (European chestnut)	Fagaceae	Shaw & Christeller, 2009 citing Scott, 1984 (as chestnut); PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Fruit, wood, ornamental, wild. Native in SE Europe, W Asia and N Africa
Casuarina sp.	Casuarinaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Ornamental
Casuarina cunninghamiana	Casuarinacea	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental (http://www.infojardin.com/foro/showthread.php?t=19672)
Celtis australis (European hackberry)	Ulmaceae	PlantSyNZ, 2011 (10; insects in branches of host plant)	Exotic, Wild	Ornamental. Native in the Mediterranean
Cestrum elegans (Brongn.) Schltdl. [shrub-like]	Solanaceae	PlantSyNZ, 2011 (10; listed as a host plant, Duffy 1963)	Exotic, Wild	Ornamental
Chaenomeles sp.	Rosaceae	Anon., no date; Ostoja-Starzewski et al., 2010		Ornamental

Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Chaenomeles japonica (Thunb.) Lindl.	Rosaceae	Scion's Forest Health Database		
Chamaecyparis sp. [conifer]	Cupressaceae	Kuschel, 1990, listing host genera; Lu & Wang 2005		Ornamental, hedges, ?forest
Chamaecyparis lawsonia [conifer]	Cupressaceae	Kuschel, 1990		Ornamental, hedges, ?forest
Chamaecytisus palmensis	Fabaceae	PlantSyNZ, 2011 (10; insects found in branches of host plant)	Exotic, Wild	Forage, wild, ?plantations (www.fao.org/ag/AGP/AGPC/doc/Gbase/DATA/PF000473.HTM)
Choisya ternata H. B. K.	Rutaceae	PlantSyNZ, 2011 (10; found in plant)	cultivated	Ornamental (www.gardenaction.co.uk/plantfinder/choisya-ternata_1.asp)
Chrysanthemoides monilifera (L.) T. Norl. supsp. *monilifera* [shrub]	Asteraceae	PlantSyNZ, 2011 (10; larvae in branches of host plant) MAF, 2004	Exotic, Wild	Ornamental (http://www.jardinexotiqueroscoff.com/genre/84/1/chrysanthemoides.html)
Cinnamomum camphora (L.) J.S.Pres.	Lauraceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Ornamental
Citrus sp.	Rutaceae	e.g. Spiller & Wise, 1982 citing Kirk, 1896; Kuschel, 1990, listing host genera		Fruit, ornamental
Citrus aurantifolia (lime)	Rutaceae	Davies, 1990 (as lime)		Fruit
Citrus grandis hybrid (=*Citrus maxima*) (grapefruit)	Rutaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Fruit
Citrus limon (L.) Burm. f. (lemon)	Rutaceae	Spiller & Wise, 1982 citing Broun, 1896; Dumbleton, 1937 (as lemon); Cottier, 1938 (as lemon); Davies, 1990 (as lemon); PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Sometimes present	Fruit
Citrus meyeri Yu Tanaka	Rutaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Mostly ornamental, also fruit
Citrus reticulata Blancho (mandarine, clementine)	Rutaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Sometimes present	Fruit
Citrus sinensis (L.) Osbeck (orange)	Rutaceae	Cottier, 1938 (as orange); PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Fruit
Citrus unshiu (*C. nobilis* var. *unshiu, C. reticulata* var. *unshiu)* (Satsuma mandarin)	Rutaceae	Clearwater & Muggleston, 1985		Fruit
Citrus x tangelo J. Ingram & H. E. Maire (tangelo)	Rutaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Fruit
Clematis paniculata J.F.Gmel.	Ranunculaceae	Scion's Forest Health Database		Ornamental (http://www.crocus.co.uk/plants/_/climbers/clematis/clematis-paniculata-/itemno.PL30002918/)
Clerodendrum trichotomum Thunb. [shrub]	Verbenaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental
Clianthus sp. [shrub]	Fabaceae	PlantSyNZ, 2011 (9; larvae in branches of host plant; plant species given as *Clianthus punceus* but since reclassification, species name is uncertain)	Endemic, Wild	Ornamental
Clianthus puniceus	Fabaceae	Shaw & Burnes, 1997 (see Clianthus above)		Ornamental
Coprosma robusta Raoul	Rubiaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (http://nature.jardin.free.fr/1111/coprosma_robusta.html)
Coprosma parviflora Hook.f.	Rubiaceae	Scion's Forest Health Database		Ornamental (http://www.nzplants.co.uk/Coprosma-parviflora)
Coriaria sp.	Coriariaceae	Kuschel, 1990, listing host genera; PlantSyNZ, 2011 (9; plant genus listed as a host plant)	Endemic	Include some native species (*C. myrtifolia*; http://fr.wikipedia.org/wiki/Coriaria_myrtifolia); also ornamental (http://www.shootgardening.co.uk/plant/coriaria-terminalis-var-xanthocarpa)
Cornus nuttallii Aud. ex T.& G., (mountain dogwood)	Cornaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental (http://www.jardindupicvert.com/4daction/w_partner/cornouiller_nutali_cornus_nuttallii.4512)
Corokia buddleioides Cunningham	Cornaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (http://www.jardinexotiqueroscoff.com/genre/98/1/1/corokia/corokia-buddleioides.html)

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Corylus sp.	Corylaceae	Anon, 1982		Fruit, wild
Corylus avellana	Corylaceae	HGANZ, 2008 (practical guide on hazelnut growing, presumably also referring to *C. avellana*)	cultivated	Fruit, wild. Native.
Corylus maxima Mill.	Corylaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Fruit, wild
Corymbia ficifolia (F.Muell.) K.D.Hill & L.A.S.Johnson	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental (http://fr.wikipedia.org/wiki/Corymbia_ficifolia)
Corynocarpus laevigatus J.R. & G. Forst.	Corynocarpaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (sensitive to cold) (http://www.jardins-interieurs.com/v3/plante.php?id_plante=260)
Crataegus sp. (hawthorn)	Rosaceae	FERA, 2010; PlantSyNZ, 2011 (9; larvae in branches of host plant, plant species not given)	naturalised	Ornamental, forest, wild
Crataegus monogyna	Rosaceae	Anon, 1982		Ornamental, forest. Native in Europe
Cryptomeria japonica (Thunb. ex L.f.) D.Don [conifer]	Taxodiaceae	Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Forest, ornamental,
Cupressus sp. – [conifer]	Cupressaceae	Kuschel, 1990, listing host genera, Lu & Wang, 2005		Ornamental, forest, hedges, wild,
Cupressus macrocarpa [conifer]	Cupressaceae	Kuschel, 1990		Ornamental, hedges, forest?
Cyphomandra crassicaulis (= C. betacea = Solanum betaceaum) (tree tomato, tamarillo)	Solanaceae	Cottier, 1938 (as tree tomato); Clearwater, 1981; Lu & Wang, 2005; PlantSyNZ, 2011 (10; listed as a host plant, plant name given as tree tomato);	Exotic, Wild	Fruit
Cytisus prolifer L. f.	Fabaceae	Spiller & Wise, 1982 citing Miller, 1925; Lu & Wang, 2005		Native in Canary Islands. Wild? Ornamental (=*Chamaecytisus prolifer (L. f.) Link subsp. prolifer var. prolifer*
Cytisus scoprarius (L.) Link (broom)	Fabaceae	Syrett, 1996; Landcare research, 2006; Gourlay, 2007; PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Wild, ornamental. Native in Europe
Dahlia excelsa	Asteraceae	Spiller & Wise, 1982 citing Cottier, 1938 (*Dahlia imperialis*?); Lu & Wang, 2005		Ornamental (http://www.mailorder.crug-farm.co.uk/default.aspx?pid=11075)
Dahlia imperialis Roezel ex Ortgies [shrub, cane-like stems]	Asteraceae	Cottier, 1938 (as tree dahlia); PlantSyNZ, 2011 (10; listed as a host plant, Miller 1925 in Duffy 1963)	naturalised	Ornamental
Dais cotinifolia L.	Thymelaeaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental (http://www.plantes-ornementales.com/d-cotonifolia.html)
Diospyros kaki L. f (persimmon)	Ebenaceae	Glucina, 1980; Kitagawa & Glucina, 1984; Rohitha et al., 1992; PlantSyNZ, 2011 (9; listed as a host plant, Rohitha et al 1992)	cultivated	Fruit
Dodonaea viscosa Jacq. supsp. *viscosa* Jacq.	Sapindaceae	PlantSyNZ, 2011 (10; listed as a host plant (Miller 1925 in Duffy 1963)	Non-endemic, Wild	Ornamental (http://www.plantes-ornementales.com/d-viscosa.html)
Elaeocarpus dentatus (J.R.Forst. & G.Forst) Vahl	Elaeocarpaceae	Scion's Forest Health Database		?
Entelea arborescens R. Br.	Tiliaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (http://www.jardinexotiqueroscoff.com/genre/146/1/entelea.html)
Erica sp.	Ericaceae	Scion's Forest Health Database		Wild, ornamental. Several native and widespread species
Eriobotrya japonica (Thunb.) Lindl. (loquat)	Rosaceae	Dye, 1950; Lu & Wang, 2005; MAF, 2011b; PlantSyNZ, 2011 (10; found on host plant)	Exotic, Wild	Fruit
Erythrina caffra Thunb.	Fabaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Ornamental (http://nature.jardin.free.fr/1104/erythrina_caffra.html)
Erythrina corallodendrum	Fabaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	not found, more tropical?
Erythrina indica Lam.	Fabaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental (sensitive to cold) (http://www.ethnoplants.com/culture%20de%20l'Erythrina%20indica.html)
Eucalyptus sp.	Myrtaceae	Zondag, 1964; Earnshaw, 1979 (as gum trees); Zondag, 1979		Ornamental, forest
Eucalyptus botryoides Sm.	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	? (not found for PRA area)
Eucalyptus camaldulensis Dehnh.	Myrtaceae	PlantSyNZ, 2011 (10; larvae found in host plant)	cultivated	Ornamental, forest, plantations?

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				(http://fr.wikipedia.org/wiki/Eucalyptus_camaldulensis)
Eucalyptus delegatensis R.T.Baker	Myrtaceae	Scion's Forest Health Database		Ornamental (http://www.eukalyptus.dk/ArtAlpinEukalyptus.htm)
Eucalyptus fastigata H.Deane & Maiden	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental (http://www.aspeco.net/plante10686/ eucalyptus_fastigata.htm), ?forest, plantations
Eucalyptus globulus Labill.	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, forest, plantations (one of the main eucalyptus species in Europe) (http://www.fcba.fr/biotechnologie/fiches_essences/ culiexa_eucalyptus2.pdf)
Eucalyptus macarthurii H.Deane & Maiden	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Ornamental, forest
Eucalyptus nicholii Maide & Blakley	Myrtaceae	Scion's Forest Health Database		Ornamental (http://www.eukalyptus.dk/_AndreArter.htm)
Eucalyptus nitens (H.Deane & Maiden) Maiden	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, forest? http://gardenbreizh.org/modules/gbdb/plante-774-eucalyptus-nitens.html
Eucalyptus regnans F. Muell.	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, forest? (http://gardenbreizh.org/modules/gbdb/plante-679-eucalyptus-regnans.html)
Eucalyptus saligna	Myrtaceae	Anon, 1982		Not checked
Euonymus japonicus Thunb.	Celastraceae	Dye, 1950; MAF, 2009; PlantSyNZ, 2011 (10; larvae found in host plant)	naturalised	Ornamental and naturalized
Fagus sylvatica L.	Fagaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present,	Forest, ornamental. Native
Ficus	Moraceae	Clearwater, 1981 (as fig, no species name); FERA, 2010		Fruit, ornamentals
Ficus carica	Moraceae	Dye, 1950; EPPO 2011		Fruit
Ficus macrophylla Desf. Ex Pers.	Moraceae	Scion's Forest Health Database		Ornamental (http://www.jardinexotiqueroscoff.com/site/genre/421/1/ficus.html)
Fraxinus sp.	Oleaceae	Kuschel, 1990, listing host genera Lu & Wang, 2005		Forest, wild, ornamental
Fraxinus angustifolia Vahl	Oleaceae	Scion's Forest Health Database		Wild (native), ornamental
Fraxinus excelsior L. (European ash)	Oleaceae	PlantSyNZ, 2011 (10; larvae found in branch of host plant)	Exotic, Wild	Forest, wild, ornamental. Native
Freycinetia sp. [vine]	Pandanaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005;		Ornamental (unlikely, tropical vines?) (http://apps.rhs.org.uk/hortic ulturaldatabase/summary2.asp?crit=Freycinetia&Genus=Freycinetia)
Freycinetia banksii A.Cunn.	Pandanaceae	PlantSyNZ, 2011 (10; plant genus listed as a host plant, given as Freycinetia, but only one species in New Zealand	Endemic, Wild	Same as above
Fuchsia excorticata (J.R.Forst. & G.Forst.) L.f.	Onagraceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.jardinexotiqueroscoff.com/site/genre/164/1/3/fuchsia/fuch sia-excorticata.html)
Gahnia sp. [sedges]	Cyperaceae	Kuschel, 1990, listing host genera		Unlikely, probably rare, quite tropical. Ornamental (Gahnia sieberiana http://www.plantbase.co.uk/list%20of%20all%20plants.htm)
Gahnia setifolia (sedge)	Cyperaceae	Kuschel, 1990		Unlikely, quite tropical. Ornamental? (not found)
Gahnia xanthocarpa (Hook. f.)Hook.f.	Cyperaceae	PlantSyNZ, 2011 (10; adult beetles reared from stems of host plant)	Endemic, Wild	Unlikely, quite tropical. Ornamental? (not found)
Geniostoma rupestre var. *ligustrifolium*	Loganiaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant, plant species given as Geniostoma lingustrifolium)	Endemic, Wild	Unlikely, quite tropical. Ornamental?
Gleditsia triacanthos L. (honey locust)	Caesalpiniaceae	PlantSyNZ, 2011 (10; found on host plant); MAF, 2011b	Exotic, Sometimes present	Ornamental and naturalized in the wild (http://nature.jardin.free.fr/arbre/nmauric_gleditsia_triacanthos.html)
Grevillea robusta R.Br.	Proteaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental (http://nature.jardin.free.fr/arbre/ft_grevillea_robusta.html)
Griselinia littoralis Raoul	Griseliniaceae	Scion's Forest Health Database		Ornamental (http://www.hedgesdirect.co.uk/acatalog/griselinia_littoralis.html)

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*Griselinia lucida*G.Forst.	Griseliniaceae	Scion's Forest Health Database	endemic	?
Hakea sp.	Myrtaceae	Clearwater, 1981; Kuschel, 1990, listing host genera; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given)	naturalised	Ornamental, South only (http://www.lesarbres.fr/hakea.html)
Hakea salicifolia	Proteaceae	Cottier, 1938 (as *Hakea saligna*); Spiller & Wise, 1982 citing Cottier, 1938; Lu & Wang, 2005		Naturalized in the wild, locally considered as invasive
Hebe salicifolia (Forst. f.) Pennell	Plantaginaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Non-endemic, Wild	Ornamental (http://jardinsetpaysages.blogspirit.com/tag/hebe%20salicifolia)
Hedycarya sp.	Monimiaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Ornamental? (not found)
Hedycarya arborea	Monimiaceae	PlantSyNZ, 2011 (10; plant genus listed as a host plant (Kuschel 1990), given as Hedycaria, but only one species in New Zealand)	Endemic, Wild	Ornamental? (not found)
Hibiscus rosa-sinensis L.	Malvaceae	Dye, 1950; MAF, 2003; PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental
Hoheria sp.	Malvaceae	Spiller & Wise, 1982 citing Helson, 1952; Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given	endemic	Ornamental (http://www.jardinexotiqueroscoff.com/genre/191/1/3/hoheria/hoheria-sexstylosa-stardust.html)
Hoheria populnea	Malvaceae	Dye, 1950		Ornamental (http://www.jardinexotiqueroscoff.com/genre/191/1/2/hoheria/hoheria-populnea.html)
Hoheria sexstylosa Colenso	Malvaceae	Scion's Forest Health Database		Ornamental (http://www.bluebellnursery.com/catalogue/trees/Hoheria/H/5203305)
Idesia sp.	Flacourtiaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Ornamental
Idesia polycarpa Maxim.	Flacourtiaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Ornamental (http://www.pepinieredesavettes.com/pepiniere/idesia-polycarpa,535)
Jacaranda sp.	Bignoniaceae	Scion's Forest Health Database		Ornamental
Juglans sp. Juglandaceae	Juglandaceae	Kuschel, 1990, listing host genera		Fruit, ornamental, wood
Juglans ailantifolia Carrière (Japanese walnut)	Juglandaceae	PlantSyNZ, 2011 (10; insects found in branch of host plant)	Exotic, Wild	Ornamental
Juglans nigra L. (black walnut) Juglandaceae	Juglandaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Wood, ornamental
Juglans regia (common walnut)	Juglandaceae	Dye, 1950; Spiller & Wise, 1982 citing Helson, 1952; Clearwater, 1981;(walnut); Lu & Wang, 2005; Shaw & Christeller, 2009 citing Scott, 1984 (as walnut)		Fruit, wood
Knightia excelsa R. Br. Proteaceae (rewarewa)	Proteaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Endemic, Wild	Ornamental (http://www.burncoose.co.uk/site/plants.cfm?pl_id=2429&fromplants=search%3Dknightia)
Koelreuteria paniculata Laxm. Sapindaceae	Sapindaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Ornamental (http://www.jardindupicvert.com/4daction/w_partner/savonnier_koelreuteria_paniculata.2467)
Kunzea ericoides (A. Rich.) J. Thompson. Myrtaceae	Myrtaceae	PlantSyNZ, 2011 (10; listed as a host plant (Worley 1929 in Duffy 1963), plant name given as Leptospermum ericoides	Non-endemic, Wild	Ornamental (http://www.countyparknursery.co.uk/plant.php?p=502)
Laburnum anagyroides Medik. Fabaceae	Fabaceae	Dye, 1950; PlantSyNZ, 2011 (9; listed as a host plant (Duffy 1963), plant name given as *Cystus laburnum*)	Exotic, Wild	Ornamental (http://nature.jardin.free.fr/arbre/ft_laburnum.html). Native in SE Europe
Laurus nobilis L. (bay laurel)	Lauraceae	Scion's Forest Health Database		Ornamental, and cultivated for its leaves, also naturalized
Leptospermum sp.	Myrtaceae	Spiller & Wise, 1982 citing Broun, 1896; Lu & Wang, 2005		Ornamental (http://www.truffaut.com/conseils/encyclopedie-plantes/fiche-plante_plantes-m%C3%A9dit%C3%A9ran%C3%A9ennes_leptospermum-species-rouge/type_plante/8/id_plante/1085.html)

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Leptospermum scoparium J.R. et G. Forst. (manuka)	Myrtaceae	Spiller & Wise, 1982 citing Miller, 1925; Dye, 1950; Lu & Wang 2005; Waikato Times, 2009; PlantSyNZ, 2011 (10; listed as a host plant (Worley 1929 in Duffy 1963)	Non-endemic, Wild	Ornamental (http://www.planfor.fr/achat,arbre-a-the,9136,31,list,FR,31)
Leycesteria formosa Wall.	Caprifoliaceae	Scion's Forest Health Database		Ornamental (http://www.havenyt.dk/artikler/prydhaven/traeer_og_buske/929.html)
Ligustrum sp.	Oleaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given	naturalised	Ornamental, bonsai (http://www.aujardin.info/plantes/troene.php), includes at least one native species: *L. vulgare*
Liriodendron tulipifera L.	Magnoliaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Sometimes present	Ornamental (http://www.plantes-et-jardins.com/catalogue/catalogue4.asp?id_variations=4553)
Lonicera sp. (honeysuckles)	Caprifoliaceae	Scion's Forest Health Database		Ornamental, includes several native species
Lophostemon confertus (R.Br) P.G. Wlison & J.T. Waterhouse	Myrtaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Ornamental
Lupinus sp.	Fabaceae	Scion's Forest Health Database		Ornamental, cropped for its pods, includes several native species especially in the Mediterranean
Macadamia tetraphylla L.A.S.Johnson	Proteaceae	Clearwater, 1981; Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae in branch of host plant)	Exotic, Wild	Fruit
Macropiper sp.	Piperaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Unlikely (warmth enedded, botanical gardens
Macropiper excelsum (G.Forst.) Miq.	Piperaceae	PlantSyNZ, 2011 (10; plant genus listed as a host plant, only 1 species in NZ)	Endemic, Wild	Ornamental (but warm needed) http://www.jardinexotiqueroscoff.com/genre/407/1/macropiper.html
Magnolia sp.	Magnoliaceae	PlantSyNZ, 2011 (9; larvae found in branches of host plant, plant species name not given	cultivated	Ornamental (http://www.lesarbres.fr/magnolia.html)
Malus sp.	Rosaceae	Dumbleton, 1937 (as apple); Cottier, 1938 (as apple); Clearwater, 1981; Kuschel, 1990, listing host genera; Shaw & Christeller, 2009 citing Scott, 1984 (as apple)		Fruit, ornamental
Malus domestica	Rosaceae	It is assumed that references to "apple" and damage to commercial apple orchards refer mostly to *Malus domestica*		Fruit
Malus sylvestris (L.) Miller	Rosaceae	Spiller & Wise, 1982 citing Miller, 1925 (with note that occurrence is questionable); Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae found in branch of host plant)	cultivated	Fruit, wild, rootstock for *M. domestica*. Native
Melicytus sp.	Violaceae	Kuschel, 1990, listing host genera Lu & Wang, 2005		Ornamental
Melicytus lanceolatus Hook.f.	Violaceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.intergardening.co.uk/a-z-plants/garden-plants-m/melicytus.html)
Melicytus ramiflorus J. R. et G. Forst. (mahoe, whitey-wood)	Violaceae	Clearwater, 1981; PlantSyNZ, 2011 (10; larvae found in branch of host plant)	Non-endemic, Wild	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-1123-melicytus-ramiflorus.html)
Metrosideros excelsa Sol. ex Gaertn.	Myrtaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Endemic, Wild	Ornamental (http://www.florum.fr/metrosideros-excelsa/66699/arbre-de-noel-de-nouvelle-zelande-arbre-de-rata-metrosideros-zp.html#entretien)
Metrosideros kermadecensis W.R.B.Oliv.	Myrtaceae	Scion's Forest Health Database		Ornamental (http://www.jardinexotiqueroscoff.com/site/genre/343/1/4/metrosideros/metrosideros-kermadecensis-tahiti.html)
Muehlenbeckia sp. [vine]	Polygonaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given)	endemic	Ornamental (http://nature.jardin.free.fr/1102/nmauric_muehlenbeckia_complexa.html)
Muehlenbeckia astonii Petrie	Polygonaceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.slbi.org.uk/garden.htm)
Myoporum laetum Forst. f.	Myoporaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Endemic, Wild	Ornamental (http://www.jardinexotiqueroscoff.com/genre/241/1/2/myoporum/myoporum-laetum.html)
Nerium oleander L. (oleander)	Apocynaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Ornamental (http://www.aujardin.info/plantes/laurier-rose.php), native

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				in some parts of the south of the PRA area (warmer parts of the Mediterranean)
Nothofagus fusca (Hook.f.) Oerst. (NZ red beech)	Nothofagaceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.goodnestoneparkgardens.co.uk/the-gardens.php)
Nothofagus solandri var. cliffortioides (Hook.f.) Poole	Nothofagaceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.jardinexotiqueroscoff.com/site/genre/431/1/3/nothofagus/nothofagus-solandri-var-cliffortioides.html)
Nothofagus solandri (Hook. f.) Oerst. var. *solandri* (Hook. f.) Oerst. (black beech)	Nothofagaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Endemic, Wild	Ornamental (but probably limited) (not found)
*Nothotsgus truncata (*assumed to be *Nothofagus truncata*? – hard beech)	Nothofagaceae	Lu & Wang, 2005		Ornamental (but probably limited (http://nothofagus.free.fr/culturentruncata.htm)
Nyssa sylvatica Marshall	Cornaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Ornamental (http://www.jardindupicvert.com/4daction/w_partner/tupelo_nyssa_sylvatica.5023)
Olearia sp.	Asteraceae	Kuschel, 1990, listing host genera		Ornamental (
Olearia laxiflora Kirk	Asteraceae	PlantSyNZ, 2011 (10; listed as a host plant (ES Gourlay in Duffy 1963)	Endemic, Wild	Ornamental (http://www.trevenacross.co.uk/plant-centre/coastal/coastal-one-star-/olearia-virgata-laxifolia/)
Olearia solandra	Asteraceae	Spiller & Wise, 1982 (as *O. solandri*) citing Kirk, 1896; Lu & Wang, 2005		Ornamental (http://gardenbreizh.org/modules/gbdb/plante-1082-olearia-solandri.html)
Olearia traversii (= O. traversiorumi(F.Muell.) Hook.f.)	Asteraceae	Spiller & Wise, 1982 citing Miller, 1925; Hudson, 1934, Cottier, 1938 (as Chatham island ake-ake); Lu & Wang, 2005; Scion's Forest Health Database		Ornamental (http://www.florum.fr/olearia-traversii/43711/aster-en-arbre-zp.html)
Ozothamnus leptophyllus (G. Forst.) Breitw. & J.M. Ward (tauhinu) (*Cassinia vauvilliersii*)	Asteraceae	Hudson, 1934; Cottier, 1938; Lu & Wang 2005 (as *Cassinia leptophylla*); PlantSyNZ, 2011 (10; insects in live branches of host plant, plant species given as Cassinia leptophylla)	Endemic, Wild	Ornamental (http://arven-pepinieres.com/spip.php?article14)
Paraserianthes lophantha (Willd.) J. Nielsen	Mimosaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Ornamental (http://www.plantes-ornementales.com/p-lophantha.html)
Parsonsia sp.	Apocynaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given)	endemic	Ornamental (http://www.countyparknursery.co.uk/list.php#PARSONSIA)
Paulownia sp.	Scrophulariaceae	Nicholas et al., 2007		Ornamental, plantation
Paulownia tomentosa (Thunb.) Steud.	Scrophulariaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Ornamental, plantation
Pennantia corymbosa J.R.Forst. & G.Forst.	Icacinaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Endemic, Wild	Ornamental (http://arven-pepinieres.com/spip.php?article14)
Pericopsis elata (Harms) Meeuwen (African teak)	Fabaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	cultivated	Unlikely? (tropical wood)
Persea americana Mill. (avocado) -	Lauraceae	PlantSyNZ, 2011 (10; larvae found in branch of host plant (Ministry of Agriculture and Fosestry PPIN database July 2007)	Exotic, Wild	Fruit
Phoenix sp. (palm)	Arecaceae	Scion's Forest Health Database		Ornamental
Photinia sp.	Rosaceae	Scion's Forest Health Database		Ornamental
Phyllostachys sp. (bambus)	Poaceae	PlantSyNZ, 2011 (9; larvae in host plant; plant species name not known, given as sp. near aurea	naturalised	Ornamental and naturalized
Phyllostachys aurea Rivière & C.Rivière	Poaceae	Scion's Forest Health Database		Ornamental and naturalized (http://www.junglegiants.co.uk/acatalog/Phyllostachys_aurea.html)
Phytolacca octandra L.	Phytolaccaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Wild	Ornamental? (Not found)

Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Pinus contorta Loudon (beach pine) [conifer]	Pinaceae	PlantSyNZ, 2011 (10; larvae found in branch of host plant)	Exotic, Wild	Forest, ornamental (http://agriculture.gouv.fr/IMG/pdf/pin_tordu.pdf)
Pinus patula	Pinaceae	Anon, 1982		Ornamental (http://apps.rhs.org.uk/rhsplantfinder/pfregions.asp?ID=13115)
Pinus radiata D. Don (Monterey pine) [conifer]	Pinaceae	PlantSyNZ, 2011 (10; larvae found in branch of host plant)	Exotic, Wild	Forest, ornamental (http://www.crpf.fr/Bretagne/pdf-fiches-essences/PinDeMonterey.pdf)
Pittosporum sp.	Pittosporaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Ornamental (http://www.jardiner-malin.fr/fiche/pittosporum-taille-plantation.html)
Pittosporum crassifolium (karo)	Pittosporaceae	Dye, 1950; PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-245-pittosporum-crassifolium.html)
Pittosporum eugenioides A. Cunn.	Pittosporaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Endemic, Wild	Ornamental (http://www.semencesdupuy.com/1F567-Pittosporum-Eugenioides.html)
Pittosporum ralphii Kirk	Pittosporaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Endemic, Wild	Ornamental (http://nature.jardin.free.fr/arbuste/ft_pittosporum.html)
Pittosporum tenuifolium Sol. ex Gaertn. (kohuhu)	Pittosporaceae	Waikato Times, 2009; PlantSyNZ, 2011 (10; insects in dead branches of host plant); Scion's Forect Health Database	Endemic, Wild	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-555-pittosporum-tenuifolium.html)
Pittosporum turneri Petrie	Pittosporaceae	Ecroyd, 1994; PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Endemic, Wild	? (endangered in NZ)
Plagianthus regius (Poit.) Hochr.	Malvaceae	Scion's Forest Health Database	Endemic	Ornamental (http://www.bigplantnursery.co.uk/Plagianthus-regius.html)
Platanus ×hispanica Mill. ex Münchh. (=P. x acerifolia) (plane tree)	Platanaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Wild	Ornamental
Platanus orientalis L. (oriental plane)	Platanaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Present in captivity/cultivation	Ornamental (http://nature.jardin.free.fr/arbre/nmauric_platanus_orientalis.html)
Pomaderris apetala Labill.	Rhamnaceae	PlantSyNZ, 2011 (8; insects in dead branches of host plant, tentative identification of the insects)	Non-endemic, Wild	Ornamental (http://arven-pepinieres.com/spip.php?article14)
Populus sp. (poplars)	Salicaceae	Cottier, 1938; Clearwater, 1981; Wilkinson, 1997; Shaw & Christeller, 2009 citing Scott, 1984; Hudson, 1934		Forest, ornamental, plantations, hedges
Populus alba L. (white poplar)	Salicaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Wild	Forest, ornamental. Native
Populus nigra L. (black poplar)	Salicaceae	Spiller & Wise, 1982 citing Miller, 1925; Lu & Wang, 2005; PlantSyNZ, 2011 (9; insects in dead branches of host plant), plant name given as *Populus flevo*, which is recorded elsewhere as a hybrid or cultivar of *P. nigra*)	Exotic, Wild	Forest, ornamental. Native
Populus trichocarpa Hook.	Salicaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Wild	Forest, ornamental
Populus yunnanensis Dode	Salicaceae	PlantSyNZ, 2011 (10; insects in dead branches of host plant)	Exotic, Wild	Forest, ornamental
Prunus sp.	Rosaceae	Kuschel, 1990, listing host genera		Fruit, ornamentals
Prunus armeniaca (apricot)	Rosaceae	Spiller & Wise, 1982 citing Helson, 1952; Lu & Wang, 2005		Fruit
Prunus avium (L.) L. (cherry)	Rosaceae	Dye, 1950; Spiller & Wise, 1982 citing Helson, 1952; Clearwater, 1981; Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae found in branches of host plant)	Exotic, Wild	Fruit
Prunus domestica L. (plum)	Rosaceae	Spiller & Wise, 1982 citing Helson, 1952; Clearwater, 1981; Lu & Wang, 2005; PlantSyNZ, 2011 (10; listed as a host plant (Clearwater 1981)	cultivated	Fruit
Prunus dulcis (Mill.) D.A.Webb (almond)	Rosaceae	Spiller & Wise, 1982 (as *P. amygdalus*) citing Miller, 1925; Dumbleton, 1937 (as almond); Cottier, 1938 (as almond); Clearwater, 1981; Lu & Wang, 2005 (as *P. amygdalus*); PlantSyNZ, 2011 (10; listed as a host plant)	Exotic, Sometimes present,	Fruit

Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Prunus persica (L.) Batsch. (peach)	Rosaceae	Dye, 1950; Clearwater, 1981; Lu & Wang, 2005; Shaw & Christeller, 2009 citing Scott, 1984; PlantSyNZ, 2011 (10; larvae found in branch of host plant)	Exotic, Wild	Fruit
Prunus persica (L.) Batsch. var. *nucipersica* (Suckow) C.K. Scheider (nectarine)	Rosaceae	Spiller & Wise, 1982 (as P. persica var. nectarina) citing Helson, 1952; Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae found in branch of host plant)	cultivated	Fruit
Prunus salicina (Chinese plum)	Rosaceae	Dye, 1950 (given as plum although not Japanese plum)		Fruit?
Prunus serrulata (Japanese flowering cherry)	Rosaceae	Dye, 1950 (as *P. lannesiana*)		Ornamental, but considered with other Prunus
Pseudopanax laetus (Kirk) Philipson	Araliaceae	PlantSyNZ, 2011 (10; insects in branches of host plant)	Endemic, Wild	Ornamental (http://www.hardyexotics.co.uk/hardyexotics/frameset.htm)
Psidium cattleianum Sabine	Myrtaceae	Scion's Forest Health Database		?unlikely, warmer conditions (http://www.fleppc.org/ID_book/psidium%20cattleianum.pdf)
Psoralea pinnata L.	Fabaceae	PlantSyNZ, 2011 (10; insects in branches of host plant)	Exotic, Wild	Ornamental? (not found)
Punica sp., *Punica granatum* (pomegranate)	Punicaceae	Dye, 1950 (Punica granatum); Clearwater, 1981; Kuschel, 1990, listing host genera; Lu & Wang, 2005; FERA, 2010; PlantSyNZ, 2011 (9; plant genus listed as a host plant (Kuschel 1990), species not given). In this PRA: assumed to be *P. granatum* as the only other species, *P. protopunica* is endemic to Soqotra island, Yemen, and not cultivated.	cultivated	Fruit, ornamental
Pyrus sp.	Rosaceae	Kuschel, 1990, listing host genera; EPPO, 2011		Fruit, ornamental. Includes native species, e.g. *Pyrus spinosa*
Pyrus communis L. (pear)	Rosaceae	Spiller & Wise, 1982 citing Helson, 1952; Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae found in host plant)	Exotic, Wild	Fruit
Pyrus pyrifolia (Burm. f.) Nakai (Japanese pear)	Rosaceae	PlantSyNZ, 2011 (10; larvae found in branch of host plant)	cultivated	Fruit
Quercus sp.	Fagaceae	Kuschel, 1990, listing host genera Lu & Wang, 2005		Ornamental, forests, wild
Quercus coccinea (scarlet oak)	Fagaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Ornamental, forests, wild (http://lesbeauxjardins.com/jardinons/arbres/chene.htm)
Quercus ilex L. (evergreen oak)	Fagaceae	PlantSyNZ, 2011 (10; insects in branches of host plant)	Exotic, Wild	Ornamental, forests, wild. Native
*Quercus palustris (*swamp oak)	Fagaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Ornamental (http://www.plantes-et-jardins.com/catalogue/catalogue4.asp?id_variations=1900)
Quercus robur L. (pedunculate oak)	Fagaceae	Braithwaite et al., 2007; PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, forests, wild. Native
Quercus rubra L. (northern red oak)	Fagaceae	PlantSyNZ, 2011 (9; insect associated with host plant)	Exotic, Wild	Ornamental, forests, wild. Locally considered as potentially invasive
Raukaua simplex (G.Forst.) A.D.Mitch., Frodin & Heads	Araliaceae	Scion's Forest Health Database	endemic	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-1125-raukaua-simplex-var-simplex.html)
Ribes uva-crispa L. (= *Ribes grossularia*) (gooseberry)	Grossulariaceae	Spiller & Wise, 1982 citing Miller, 1922; Cottier, 1938; Clearwater, 1981; Lu & Wang, 2005; PlantSyNZ, 2011 (10; listed as a host plant)	Exotic, Wild	Fruit
Ripogonum scandens J.R.Forst. & G.Forst. (kareao) [vine]	Smilacaceae	Kuschel, 1990; PlantSyNZ, 2011 (10; plant genus listed as a host plant (Kuschel 1990), given as *Ripogonum*, but only one species in New Zealand	Endemic, Wild	Unlikely (not found)
Rhododendron sp.	Ericaceae	Scion's Forest Health Database		Ornamental
Robinia pseudoacacia L.	Fabaceae	Scion's Forest Health Database		Ornamental, forest, plantations and widely naturalized and invasive
Rosa sp. 'cultivated' (rose)	Rosaceae	Spiller & Wise, 1982 citing Helson, 1952; Lu & Wang, 2005; PlantSyNZ, 2011 (9; insect associated with stem of host plant, plant species not given)	cultivated	Ornamental

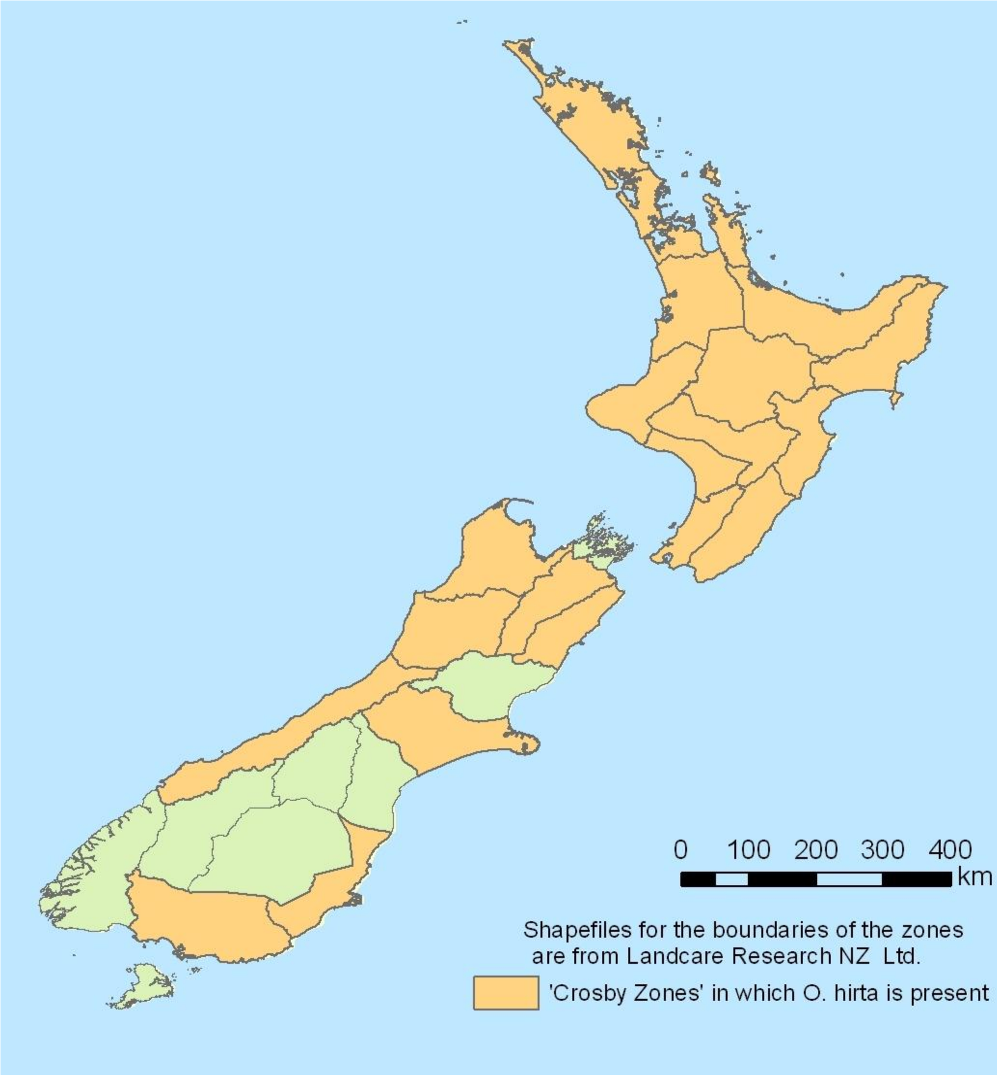
Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Rubus schmidelioides A.Cunn.	Rosaceae	Scion's Forest Health Database		Ornamental?
Salix sp.	Salicaceae	Kuschel, 1990, listing host genera; Shaw & Christeller, 2009 citing Scott, 1984		Wild, ornamental, forest
Salix xfragilis L.	*Salicaceae*	Scion's Forest Health Database		Ornamental and naturalized
Salix ×reichardtii A.Kern (*S. caprea* x *S. cinerea*?)	Salicaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant, plant species name given as Salix caprea, a species not in New Zealand, and name used in New Zealand for pussy willow	Exotic, Wild	Ornamental, wild (http://www.habitas.org.uk/flora/species.asp?item=4656; http://www.lestrem-nature.org/invflormontber.htm)
Salix babylonica L. (weeping willow)	Salicaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, wild
Salix caprea (goat willow)	Salicaceae	Spiller & Wise, 1982 citing Miller, 1925; Hudson, 1934; Lu & Wang, 2005		Ornamental, wild (http://isaisons.free.fr/saule%20Marsault.htm). Native
Salix matsudana Koidzumi	Salicaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant); Matsudana willow: Baker 1982 a & b	Exotic, Wild	Ornamental (http://www.jardindupicvert.com/4daction/w_partner/calix_matsudana_toryuosa.4748)
Salix vitellina (=*Salix alba subsp. vitellina*?)	Salicaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental (http://nature.jardin.free.fr/arbre/ft_salix_alb.html) Native
Sambucus nigra L.	Caprifoliaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental, wild, use of fruits. Native
Schefflera sp.	Araliaceae	Kuschel, 1990, listing host genera Lu & Wang, 2005		Mostly used indoors as ornamentals, but not S. digitata below
Schefflera digitata J. R. et G. Frost	Araliaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Endemic, Wild	Ornamental (sensitive to cold) (gardenbreizh.org/modules/gbdb/plante-430-schefflera-digitata.html)
Senecio renoldii	Asteraceae	Spiller & Wise, 1982 citing Hudson, 1924 (1934?); Lu & Wang, 2005		?species not found
Senecio rotundifolia	Asteraceae	Hudson, 1934		?species not found
Sequoia sempervirens (D.Don) Endl.	Cupressaceae	Scion's Forest Health Database		Ornamental
Solanum sp.	Solanaceae	Kuschel, 1990, listing host genera		
Solanum aviculare G.Forst.	Solanaceae	PlantSyNZ, 2011 (10; larvae found in host plant (Martin 1999)	Non-endemic, Wild	Ornamental (http://nature.jardin.free.fr/arbuste/mc_solanum_vescum.htm)
Solanum betaceum Cav. (tamarillo/tree tomato)	Solanaceae	See *Cyphomandra betaceaum*		Fruit
Solanum mauritianum Scop.	Solanaceae	Dye, 1950; Lu & Wang, 2005 (both as *S. auriculatum*); PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Naturalized in Madeira, Azores, casual in France, Spain, Portugal
Sophora sp.	Fabaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005		Ornamental
Sophora japonica (*Styphnolobium japonicum*)	Fabaceae	Dye, 1950; PlantSyNZ, 2011 (10; larvae found in host plant)	cultivated	Ornamental
Sophora microphylla sens. lat. Aiton	Fabaceae	Kuschel, 1990; PlantSyNZ, 2011 (9; larvae in branches of host plant, plant spp not certain since genus was revised)	non-endemic	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-655-sophora-microphylla.html)
Sophora tetraptera J.S. Miller	Fabaceae	PlantSyNZ, 2011 (10; larvae in branch of host plant)	Endemic, Wild	Ornamental (http://www.jardinexotiqueroscoff.com/genre/302/1/3/sophora/sophora-tetraptera.html)
Sorbus aucuparia L. (common rowan)	Rosaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Forest, wild, ornamental, marginal use of fruit. Native
Syringa vulgaris L. (lilac)	Oleaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant) MAF, 2004b	Exotic, Wild	Ornamental. Naturalized
Syzygium floribundum F.Muell.	Myrtaceae	Scion's Forest Health Database		Ornamental?
Syzygium paniculatum Gaertn.	Myrtaceae	Scion's Forest Health Database		Ornamental (http://apps.rhs.org.uk/rhsplantfinder/pfregions.asp?ID=48993)
Syzygium smithii (Poiret) Merr. & Perry	Myrtaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant, plant name given as Eugenia smithii	Exotic, Wild	Ornamental?, bonsai (http://www.parlonsbonsai.com/Syzygium.html)

Annex 1. Host species and genera

Host genera/species	Family	References and reliability of host records (Plant-SyNZ database)	Status in NZ (when in PlantSyNZ)	Use and status in PRA area (availibility for sale checked by basic internet searches to see which may be used as ornamentals)
Tabebuia sp.	Bignoniaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given)	cultivated	Ornamental (http://nature.jardin.free.fr/arbre/nmauric_tabebuia_rosea.html)
Tamarix ramosissima Ledeb.	Tamaricaceae	PlantSyNZ, 2011 (9; beetle found in host plant)	cultivated	Ornamental (http://nature.jardin.free.fr/arbuste/ft_tamarix_ra.html). Naturalized and locally considered as invasive
Telopea oreades F.Muell.	Proteaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Wild	Ornamental (http://www.plantbase.co.uk/list%20of%20all%20plants.htm)
Tilia cordata Mill	Tiliaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Ornamental. Native
Toxicodendron succedanea (L.) (=*Rhus succedana*) Kuntze	Anacardiaceae	Anon, 1982; MAF, 2003; PlantSyNZ, 2011 (10; larvae in branches of host plant); as *Rhus succedanea*	Exotic, Wild	?Unlikely (several *Rhus* sp. available, but not *succedana* http://apps.rhs.org.uk/rhsplantfinder/plantfinder2.asp?crit=toxicodendron&Genus=Rhus)
Ulex sp.	Fabaceae	Kuschel, 1990, listing host genera		Several indigenous species in the PRA area, wild, ornamental
Ulex europaeus L. (gorse)	Fabaceae	Dye, 1950; Dumbleton, 1957; Butler, 1979; Clearwater, 1981; Lu & Wang, 2005; Gourlay, 2007; PlantSyNZ, 2011 (10; listed as a host plant (Duffy 1963)	Exotic, Wild	Wild, ornamental. Native
Ulmus sp.	Ulmaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; Shaw & Christeller, 2009 citing Scott, 1984 (as elm)		Forest, wild, ornamental, bonsai
Ulmus glabra Mill. (mountain elm)	Ulmaceae	RNZIH, 2004; PlantSyNZ, 2011 (10; larvae in branches of host plant)	Exotic, Sometimes present	Forest, wild, ornamental. Native
Ulmus minor Mill. (common elm)	Ulmaceae	PlantSyNZ, 2011 (10; larvae in branches of host plant)	cultivated	Wild, ornamental, bonsai. Native
Ulmus parvifolia Jacq.	Ulmaceae	MAF, 2008; PlantSyNZ, 2011 (10; beetle found in wood of tree)	cultivated	Ornamental, but mostly bonsai?
Ulmus procera Salisb. (=*U. minor* var. *vulgaris*)	Ulmaceae	PlantSyNZ, 2011 (10; larvae found in branches of host plant)	cultivated	Ornamental, common as bonsai
Urtica ferox G.Forst	Urticaceae	Scion's Forest Health Database	Endemic nettle	Unlikely (weed). Not recorded in Europe
Vaccinium spp. (blueberry)	Ericaceae	Clearwater, 1981; FERA, 2010;		Fruit. Bush types likely to be suitable for *O. hirta* are only cultivated Wild species are low plants with small stems
Vella sp.	Brassicaceae	PlantSyNZ, 2011 (9; insects in live stems of host plant), plant name given as *Pseudocytisus* sp.	cultivated	Wild, ornamental
Verbascum thapsus L. (common mullein) [perennial herbaceaous]	Scrophulariaceae	PlantSyNZ, 2011 (10; larvae in stem of host plant)	Exotic, Wild	Wild, ruderal in part of the PRA area, but also available through nurseries (http://www.norfolkherbs.co.uk/EnglishCatalogue/CatalogueM.html).Native
Veronica stricta Banks & Sol. Ex Benth.	Plantaginaceae	Scion's Forest Health Database		Not found. Ornamental?
Virgilia sp.	Fabaceae	Kuschel, 1990, listing host genera; Lu & Wang, 2005; PlantSyNZ, 2011 (9; plant genus listed as a host plant, species not given)	cultivated	Ornamental (http://www.semencesdupuy.com/1F741-Virgilia-Capensis.html)
Vitex lucens (pururi)	Lamiaceae	Spiller & Wise, 1982 citing Helson, 1952; Lu & Wang, 2005	endemic	Unlikely. Not found for nurseries, but grown by amateurs (http://www.growingontheedge.net/viewtopic.php?p=15870)
Vitis vinifera L. (grapevine)	Vitaceae	Spiller & Wise, 1982 citing Helson, 1952; Charles, 1979; Clarke & Pollock, 1980; Clearwater, 1981; Wearing et al., 2000; Lu & Wang, 2005; PlantSyNZ, 2011 (10; larvae and pupae in stem/branches of host plant)	Exotic, Wild	Fruit
Weinmannia racemosa L. f.	Cunoniaceae	PlantSyNZ, 2011 (10; larvae in branch of host plant)	Endemic, Wild	Ornamental (http://gardenbreizh.org/modules/gbdb/plante-1105-weinmannia-racemosa.html)
Wisteria sp.	Fabaceae	Shaw & Christeller, 2009 citing Scott, 1984; WaikatoTimes,2009; FERA, 2010 (intercepted in UK on Wisteria)		Naturalised, ornamental
Zelkova sp.	Ulmaceae	PlantSyNZ, 2011 (9; larvae in branch of host plant, species name not given)	cultivated	Wild, ornamental, bonsai

Annex 2. Distribution of *Oemona hirta* in New Zealand



Prepared by D. Eyre, FERA, UK, from information provided by J. Bain, New Zealand Forest Research Institute Ltd, NZ, 05-2012, personal communication. From records in the Scion's Forest Health Database (except from RI and WD: Lu & Wang, 2005).

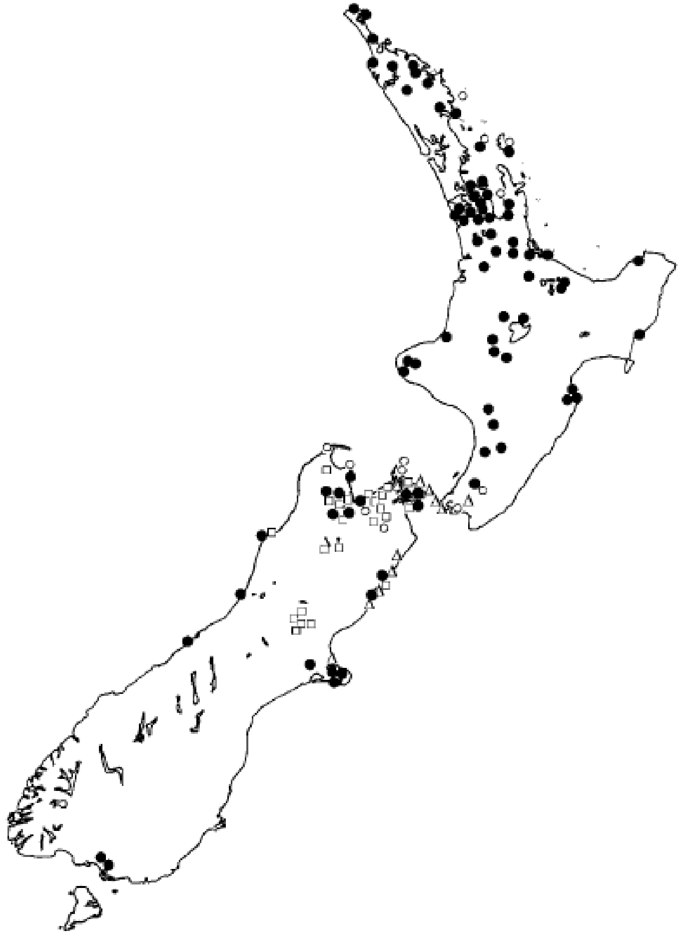
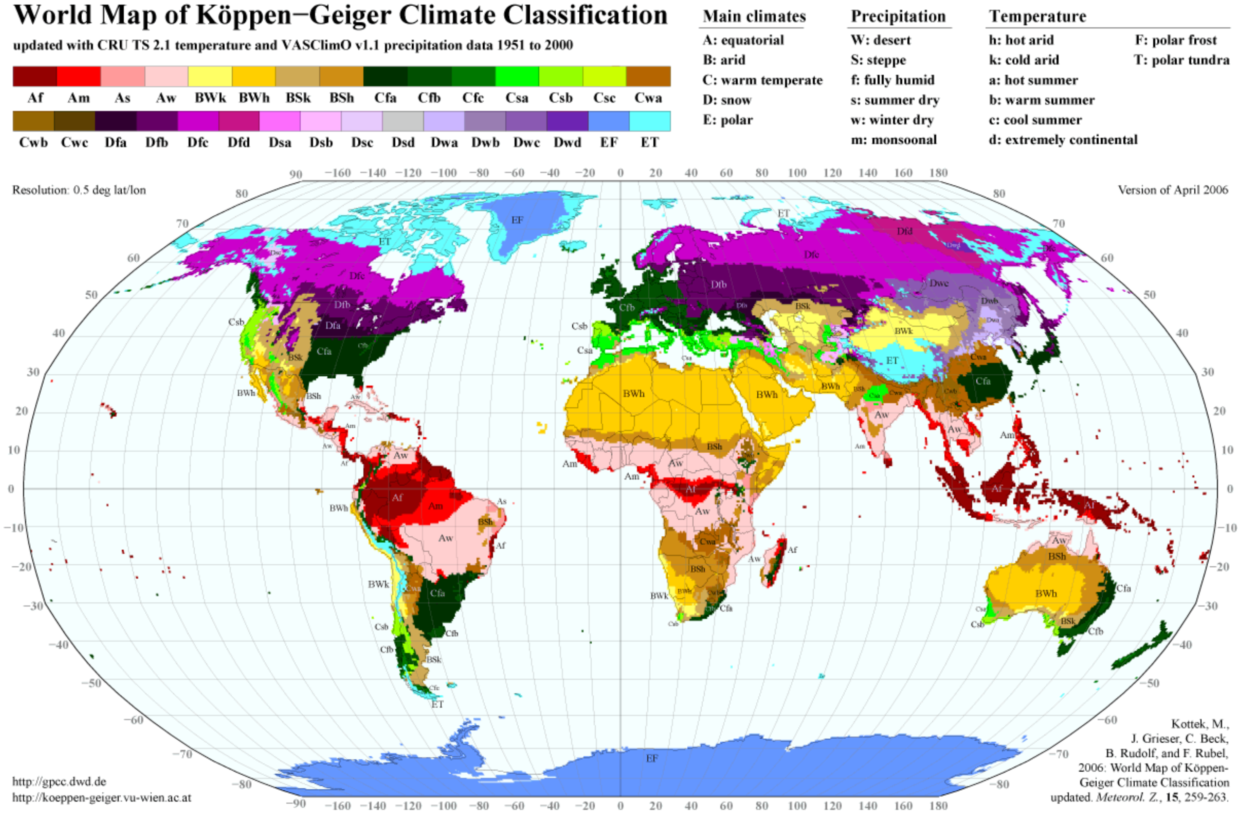


FIGURE 49. Known distribution of *Oemona*: □, *O. separata*; △, *O. simplicicollis*; ●, *O. hirta*; ○, *O. plicicollis*.

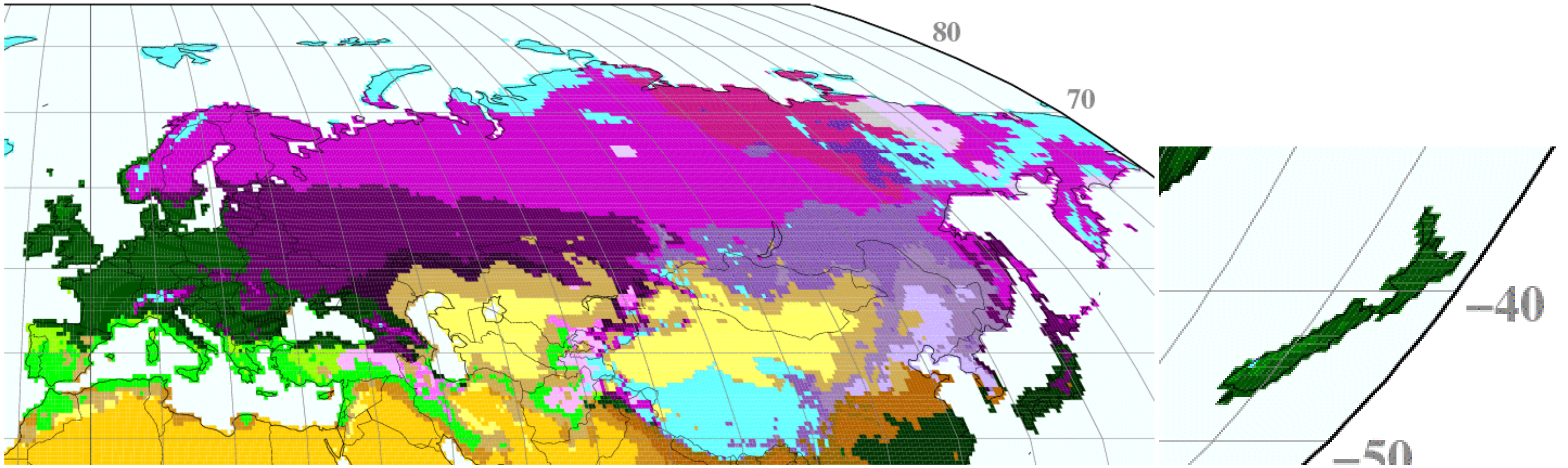
From Lu & Wang, 2005

Annex 3. Köppen-Geiger map

Annex 3. Köppen-Geiger map



Enlarged below for the PRA area and New Zealand



Annex 4. Imports of cut branches and cut roses from New Zealand

Table 1. Foliage, branches and other parts of plants, without flowers or flower buds, and grasses being goods of a kind suitable for bouquets or for ornamental purposes, fresh (other than Christmas trees and conifer branches) (06049190) (host and non-hosts plants) into EU Member States in 2003-2010 (quantity in 100 kg) (Eurostat, accessed 05-01-2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010
Germany	:	0	:	:	:	:	:	:
United Kingdom	:	262	2.044	772	1	:	:	:
Hungary	10	12	13	1	:	:	:	:
Netherlands	0	13	3	7	5	1	4	8
Slovakia	:	0	:	:	:	:	:	:
Total	**10**	**287**	**2060**	**780**	**6**	**1**	**4**	**8**

Table 2. Fresh cut roses and buds, for bouquets or ornamental purposes (06031010) into EU Member States in 2003-2010 (quantity in 100 kg) (Eurostat, accessed 05-01-2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010
Netherlands	0	1	:	:	:	:	:	:

Annex 5. Imports of wood from New Zealand

Table 1. Fuelwood (4401) into EU Member States in 2002-2010 (quantity in 100 kg) (Eurostat, accessed 05-01-2012). Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne.
Note: EU countries without imports were deleted from the table below.

		2002	2003	2004	2005	2006	2007	2008	2009	2010
fuelwood (44011000)	Ireland	21	3	:	:	:	:	17	:	:
non coniferous wood in chips or particles (44012200)	Denmark	:	:	:	:	:	0	:	:	:

Table 2. Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared (4403) into EU Member States in 2002-2010 (quantity in 100 kg) (Eurostat, accessed 05-01-2012).
Note: EU countries without imports were deleted from the table below.

		2002	2003	2004	2005	2006	2007	2008	2009	2010
eucalyptus (44039930)	Ireland	:	:	:	60	:	:	:	:	:
birch (44039959)	UK	:	:	:	:	:	:	:	45	:

Table 3 Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness exceeding 6 mm (4407) into EU Member States in 2002-2010 (quantity in 100 kg) (Eurostat, accessed 05-01-2012).
Note: EU countries without imports were deleted from the table below.

		2002	2003	2004	2005	2006	2007	2008	2009	2010
coniferous sanded, end-jointed (44071015)	Spain	:	:	9.957	962	421	:	621	419	217
	UK	:	:	:	235	:	:	:	:	:
	Italy	:	:	:	:	:	:	:	:	75
	Netherlands	:	:	216	:	:	:	:	:	:
oak sanded, end-jointed (44079115)	UK	:	:	:	:	:	18	:	:	:
poplar other than end jointed (44079991)	UK	:	286	:	:	:	:	:	:	:

Table 4. Frequency of import of rough wood: eucalyptus (44039930) to Ireland in 2005; birch (44039959) to UK in 2009 (quantity in 100 kg) (Eurostat, accessed March 2012)

Note: "0" indicates quantities below 1 tonne.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
44039930	Ireland / 2005	:	:	:	:	:	60	:	:	:	:	:	:
44039959	UK / 2009	:	20	:	:	:	:	:	:	:	:	:	25

Table 5. Sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms (code 440130) into EU Member States in 2002-2010 (quantity in 100 kg). Note: EU countries without imports were deleted from the table below.

REPORTER/PERIOD	2006	2007	2008	2009	2010	2011
EU27	:	:	1	:	214 700	314 800
FRANCE	:	:	:	:	:	13 820
UNITED KINGDOM	:	:	1	:	:	131 010
ITALY	:	:	:	:	14 370	169 970
NETHERLANDS	:	:	:	:	200 330	:

Annex 6. Imports of plants for planting of host species from New Zealand

No imports of host plants for planting was recorded for Norway (H. Paulsen, Norwegian NPPO, pers. comm., 2013).

Table 1. Trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (except vines) (06022090) (host and non-hosts plants) into EU Member States in 2003-October 2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012).
Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
Austria	:	0	:	:	:	:	:	:	
Czech Republic	:	:	:	:	:	:	:	:	2
Germany	:	:	:	1	:	0	0	:	
Spain	12	:	:	:	:	:	:	:	
France	:	:	13	:	65	35	38	44	29
United Kingdom	:	1	0	:	:	:	:	2	
Ireland	1	:	:	:	:	48	48	45	99
Italy	38	29	55	:	:	:	:	:	
Total	**51**	**30**	**68**	**1**	**65**	**83**	**86**	**101**	**130**

Table 2. Outdoor rooted cuttings and young plants of trees, shrubs and bushes (excl. fruit, nut and forest trees) (06029045) (host and non-hosts plants) into EU Member States in 2003-2011 (quantity in 100 kg) (Eurostat, accessed 05-01-2012). Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
Austria	:	2	8	:	4	7	1	5	6
Belgium	:	:	:	:	1	:	:	:	
Cyprus	:	:	:	:	:	1	:	:	
Czech Republic	:	:	:	:	:	:	:	1	
Germany	1	0	4	18	6	3	:	1	
Spain	:	6	3	4	2	2	3	:	
France	31	22	12	53	70	81	54	74	19
United Kingdom	141	3.051	261	6	2	123	49	166	13
Hungary	:	:	:	:	:	:	2	1	7
Ireland	59	164	68	24	20	6	8	1	
Italy	55	69	20	7	:	2	:	:	
Netherlands	76	1	:	:	5	0	0	:	
Poland	:	:	2	4	2	2	3	3	3
Portugal	:	1	:	:	:	:	1	:	
Total	**363**	**3316**	**378**	**116**	**112**	**227**	**121**	**252**	**48**

Table 3. Outdoor trees, shrubs and bushes, with roots (excl. cuttings, slips and young plants, and fruit, nut and forest trees) (06029049) (host and non-hosts plants) into EU Member States in 2003-Oct-2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012). Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
Austria	:	:	:	0	:	:	:	:	
Belgium	:	1	:	:	:	:	:	:	
Czech Republic	:	0	:	2	7	1	2	3	
Germany	:	50	20	:	9	1	:	1	6
Spain	:	3	:	7	:	:	19	:	4
France	20	:	1	2	:	:	:	4	22
United Kingdom	104	3	6	162	2	1	:	87	69
Ireland	59	:	:	34	:	:	:	:	
Italy	:	:	4	:	2	0	1	3	
Netherlands	:	39	:	:	:	:	:	:	28
Portugal	:	:	:	:	1	3	:	:	
Slovenia	:	:	7	:	:	:	:	:	8
Total	**183**	**96**	**38**	**207**	**21**	**6**	**22**	**98**	**137**

Table 4. Forest trees (06029041) (host and non-hosts plants) into EU Member States in 2003-Oct-2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

	2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
Germany	0	22	31	61	23	41	44	62	64
France	:	:	:	:	:	4	2	:	
Hungary	:	:	:	:	:	0	:	:	
Ireland	:	17	:	:	:	:	:	:	
Italy	:	:	:	30	:	:	:	:	
Netherlands	:	50	:	:	:	:	:	:	
Total	**0**	**89**	**31**	**91**	**23**	**45**	**46**	**62**	**64**

Table 5. Unrooted cuttings and slips (other than vine) (06021090) (host and non-hosts plants) into EU Member States in 2003-Oct-2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012) . Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

		2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
06021090	Belgium	:	:	:	4	:	3	1	:	
06021090	Germany	:	:	:	0	16	0	77	0	0
06021090	Denmark	3	0	:	:	:	:	:	:	
06021090	Spain	2	3	:	:	:	:	:	0	
06021090	France	:	:	:	:	:	:	:	0	0
06021090	UK	40	142	924	2.026	1	640	:	:	
06021090	Ireland	:	29	27	58	15	:	:	:	
06021090	Italy	:	1	:	0	:	:	:	0	1
06021090	Netherlands	843	645	21	34	19	21	25	18	17
06021090	Sweden	:	0	:	:	:	:	:	:	
Total		**888**	**820**	**972**	**2122**	**51**	**664**	**103**	**18**	**18**

Table 6. Indoor plants - Rooted cuttings and young plants, excluding cacti (06029070) (host and non-host plants) into EU Member States in 2003-Oct-2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

		2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
06029070	Germany	:	:	:	:	:	:	2	3	
06029070	France	0	:	:	0	:	4	:	:	
06029070	UK	1	0	0	:	:	:	2	:	14
06029070	Greece	:	:	:	:	2	:	:	:	
06029070	Ireland	:	:	:	:	:	1	:	:	
06029070	Italy	:	:	0	0	0	5	:	:	
06029070	Netherlands	57	27	115	96	67	82	53	57	83
Total		**58**	**27**	**115**	**96**	**69**	**92**	**57**	**60**	**97**

Table 7. Roses as plants for planting (Budded or grafted: 06024090; grafted or not: 06024000; not grafted: 06024010) into EU Member States in 2003-Oct-2011 (quantity in 100 kg) (Eurostat, accessed 12 January 2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne.

		2003	2004	2005	2006	2007	2008	2009	2010	01-10/2011
06024000	France	:	:	:	:	:	:	:	:	0
06024000	Netherlands	:	:	:	:	:	0	:	:	
06024090	Netherlands	:	2	:	:	:	:	:	:	
06024010	Netherlands	0	:	0	:	0	:	:	:	
Total		**0**	**2**	**0**	**:**		**0**	**:**	**:**	**0**

Table 8. Plants for planting of non-fruit host species of *Oemona hirta* in trade from New Zealand to some EU Member States (number of plants)
2005: data available for 1 country only
2006-2008: 2 countries
2009: 4 countries but limited data for some countries
2010: 4 countries but not complete for some countries

Genus/species	2005	2006	2007	2008	2009	2010
Acer		8953	3832	8355	11388	27632
Acer japonicum					5	45
Acer palmatum					10565	56497
Acer pseudoplatanus					10	
Acer shirasawanum					40	643
Acer + *Magnolia grandiflora* (mixed consignment)						2820
Acer + others (not specified in data) (mixed consignment)						1302
Cassinia		300				
Clematis						1508
Clianthus puniceus						100&
Coprosma			100	6		800
Cornus			2	11	116	144
Corokia	25*		10^			10
Dahlia		2100	4095	1500	188	
Eucalyptus	4226*+525^					
Griselinia			10^			1
Hebe					592	1075
Hibiscus syriacus						150&
Knightia			10^			
Leptospermum	15*					100*
Magnolia		60	20^+150	2417	2229	4125
Malus		23§	4§	3§		
Metrosideros					610	100&
Pittosporum	25*			500		2
Prunus		5§			18§	
Pseudopanax	30*			100		220*
Rosa			99^		71^	
Wisteria						76125#

* specified as rooted plants
^ specified as unrooted plants
& Propagation material to one country. Similar data was not available for 2009.
# this included two consignments of 75075 units in total.
§ only to one country.

Table 9. Frequency of import for 2010 of various categories considered in Tables 1 to 6 above (host and non-hosts plants) into EU Member States (quantity in 100 kg) (Eurostat, accessed March 2012).
Note: Only the main importing countries according to Tables 1-5 are indicated. "0" indicates quantities below 1 tonne.

06022090: trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (except vines)
06029045. Outdoor rooted cuttings and young plants of trees, shrubs and bushes (excl. fruit, nut and forest trees)
06029049. Outdoor trees, shrubs and bushes, with roots (excl. cuttings, slips and young plants, and fruit, nut and forest trees)
06029041. Forest trees
06021090. Unrooted cuttings and slips (other than vine)
06029070. Indoor plants - Rooted cuttings and young plants, excluding cacti

	2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
06022090	France	:	:	:	:	5	10	29	:	:	:	:	:
06022090	United Kingdom	:	:	:	:	:	:	2	:	:	:	:	:
06022090	Ireland	:	:	:	3	16	1	22	3	:	:	:	:
6029045	France	:	:	:	:	26	12	35	1	:	:	:	:
6029045	United Kingdom	:	0	:	0	22	25	:	119	0	:	:	:
6029049	France	:	:	:	:	:	:	4	:	:	:	:	:
6029049	United Kingdom	:	:	:	:	:	:	:	87	:	:	:	:
6029041	Germany	:	:	:	:	:	:	60	2	:	:	:	:
6021090	Netherlands	:	5	4	:	5	4	:	:	:	:	:	:
6029070	Germany	:	:	:	:	:	:	:	:	:	3	:	:
6029070	Netherlands	:	0	2	1	2	0	45	7	0	:	0	:

Annex 7. Areas (ha) grown in some countries of the PRA area for some host plants

List of tables (between bracket, the total area harvested in ha for the PRA area countries in 2010)

Table 1. Citrus, grapefruit, lemons and lime, oranges, tangerine, mandarine and clementine (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012) (note: not all countries differentiate between the different citrus species)

	citrus					grapefruit					lemons and lime					oranges					tangerine, mandarine, clementine				
Countries	**2006**	**2007**	**2008**	**2009**	**2010**	**2006**	**2007**	**2008**	**2009**	**2010**	**2006**	**2007**	**2008**	**2009**	**2010**	**2006**	**2007**	**2008**	**2009**	**2010**	**2006**	**2007**	**2008**	**2009**	**2010**
Albania											100	200	400	200	210	660	770	800	802	800	104	113	112	260	500
Algeria	400	418	424	438	450	94	91	93	86	90	3283	3376	3501	3568	3800	30864	32300	34586	35085	37100	11618	11803	11832	11828	12500
Azerbaijan	250	350	800	800	840						360	541	290	315	329	809	1050	654	660	690	800	1500	1000	865	862
Bosnia & Herz.											2	2	2	2	4	240	243	250	254	250	220	100	1	3	5
Croatia											135	110	110	110	110	1540	1650	1680	1700	705	8000	8403	9200	7500	10000
Cyprus	41	42	35	41	36	531	485	446	518	449	840	714	657	764	662	2924	2632	2420	2812	2435	778	740	680	790	684
France						236	236	364	363	370	38	36	35	34	40	44	45	44	43	50	1564	1575	2143	2069	2013
Greece	109	105	100	106	120	292	289	100	101	200	10409	10306	7200	7200	7200	40719	39891	39500	40000	37900	6915	6986	6900	7114	6500
Israel	619	650	726	749	750	3570	5340	4310	4180	3800	1520	1735	1760	1670	1640	5030	5540	5120	5140	4700	5295	5320	5340	5300	5300
Italy	1567	1535	1500	1533	1500	261	255	300	303	303	30000	29000	30100	30080	28854	104000	104000	102301	102033	103313	36000	36124	38000	38640	38648
Jordan	0	0	0	0	0	227	535	524	543	553	1781	1703	1797	1805	1742	2326	2587	2546	2556	2609	2075	1948	1936	1937	1949
Kazakhstan	26	50	53	40	40																				
Kyrgyzstan	5	5	30	8	5						2	2	2	2	2										
Malta	70	60	43	46	50	1	1	1	1	1	34	40	40	40	40	70	75	80	81	75	4	6	6	6	6
Morocco	1800	2500	1900	2000	1500	100	91	100	100	95	1300	1300	1300	1334	2258	49100	55000	63000	51681	44900	29500	29000	27000	23287	25873
Portugal						205	203	210	220	180	1023	1000	979	979	980	19900	19900	20100	20067	16300	4219	4230	4237	4237	2300
Russian Fed.																100	100	40	71	31					
Spain	4663	3794	2242	3000	3000	1235	1232	1640	1500	1500	43247	41996	46809	42500	41900	140039	145856	153429	146000	127500	121292	121727	119875	122000	90900
Tunisia	8486	8500	8600	9800	9900	3999	3677	3778	3914	3700	1900	2200	2600	2900	2900	11000	9500	13000	10000	9700	4300	4200	4400	5400	5600
Turkey	203	180	170	180	213	3730	3730	3750	3780	6063	20800	20820	20930	21160	25360	40920	40730	43480	44650	53236	31520	29790	29920	30770	33289
Uzbekistan	100	139	100	150	140	100	105	100	120	130	66	70	100	92	100						150	157	180	180	160
Total	**18339**	**18328**	**16723**	**18891**	**18544**	**14581**	**16270**	**15716**	**15729**	**17434**	**116840**	**115151**	**118612**	**114755**	**118131**	**450285**	**461869**	**483030**	**463635**	**442294**	**264354**	**263722**	**262762**	**262186**	**237089**

Table 2. Persimmon (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012), except for Spain: Encuesta sobre Superficies y Rendimientos Cultivos (ESYRCE) http://www.magrama.gob.es/es/estadistica/temas/estadisticas-agrarias/agricultura/esyrce/

Countries	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**
Azerbaijan	4956	6672	6917	7178	7704	
Israel	2500	3800	4500	3800	4000	
Italy	2837	3000	2700	2745	2700	
Slovenia	25	32	32	41	46	
Spain					5827	9651
Uzbekistan	3125	3200	3000	4000	4200	
Total	**13443**	**16704**	**17149**	**17764**	**24477**	

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 3. Grapes (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	6915	7497	8061	8532	8500
Algeria	75187	76754	73739	69110	73000
Austria	43949	44202	45622	45098	43700
Azerbaijan	7496	6518	8856	10138	11166
Belgium	60	10	10	10	10
Bosnia and Herzegovina	5300	5100	5500	5800	5500
Bulgaria	128857	120341	110816	101434	82675
Croatia	30766	32454	33741	34380	33833
Cyprus	12289	15045	8448	8892	6811
Czech Republic	15519	17008	16302	16089	15991
France	885165	828885	814697	793615	787133
Germany	99172	99702	99744	100101	99907
Greece	112800	108000	86800	90000	99300
Hungary	75634	75260	75776	75933	73922
Israel	5640	5700	5820	5820	5720
Italy	786000	782000	788100	801900	777500
Jordan	3646	3089	3110	3138	3199
Kazakhstan	8700	8400	8700	9500	9500
Kyrgyzstan	6583	6622	6331	6100	6000
Luxembourg	1386	1386	1400	1400	1200
Malta	2100	1000	1900	1800	1700
Morocco	56900	57400	47271	45600	51200
Netherlands	100	160	180	190	200
Portugal	222621	222655	222700	222700	181200
Republic of Moldova	140387	138266	136474	135501	132813
Romania	190294	174323	187038	183814	175953
Russian Federation	44300	42890	41900	43000	42900
Serbia	62151	59068	58324	57540	50000
Slovakia	11781	11507	9650	9340	8152
Slovenia	16428	16086	16086	16086	16351
Spain	1135230	1131320	1109050	1100000	1002100
Switzerland	14885	14847	14841	14820	14970
Tunisia	29000	25000	28400	27700	30000
Turkey	513830	484610	482789	479024	477786
Ukraine	75800	71200	70900	71000	67600
United Kingdom	1013	700	717	647	640
Uzbekistan	101176	99200	102200	120000	132000
Total	**4929060**	**4794205**	**4731993**	**4715752**	**4530132**

Table 4. Apple (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	5500	7000	8800	9400	10400
Algeria	28658	31904	33206	36616	38700
Austria	6060	6061	6029	6051	6100
Azerbaijan	19196	22498	22846	23258	23934
Belarus	64857	63600	63836	62900	62009
Belgium	7424	7215	7229	7067	6900
Bosnia and Herzegovina	14861	16000	15000	20000	19900
Bulgaria	5708	5443	5400	5190	5239
Croatia	8500	8000	8700	8900	9500
Cyprus	1278	1062	943	1218	928
Czech Republic	9033	8614	8754	10000	9200
Denmark	1536	1486	1500	1450	1400
Estonia	5118	4331	4039	4222	3319
Finland	635	649	668	653	679
France	55174	53775	42073	41201	39951
Germany	32504	31721	31800	31813	31819
Greece	13291	13207	12000	12149	13500
Hungary	39136	40501	43100	36644	34030
Ireland	2000	2100	1930	1865	1800
Israel	3970	3200	3050	2980	2910
Italy	57143	56020	59000	58445	57907
Jordan	3856	2291	2291	2307	2291
Kazakhstan	26200	24400	25800	26100	29700
Kyrgyzstan	24500	24500	20800	26100	26500
Latvia	9446	7369	5138	4138	3257
Lithuania	14856	13312	11655	11553	12091
Luxembourg	1020	1020	990	990	900
Malta	14	15	15	15	20
Morocco	25000	25936	26752	27334	31571
Netherlands	9562	9400	9300	9100	8700
Norway	1645	1652	1682	1704	1427
Poland	161989	175595	171963	173607	188245
Portugal	20674	20488	20600	20625	13200
Republic of Moldova	63627	62693	61069	58413	57355
Romania	59298	59017	54704	52637	56373
Russian Federation	363800	355000	195000	192000	186000
Serbia	35000	37000	36000	45000	35000
Slovakia	3345	3244	3426	3600	3200
Slovenia	3099	2874	2874	2722	2765
Spain	37844	36902	33362	30000	31700
Sweden	1600	1400	1400	1500	1500
Switzerland	4280	4235	4195	4226	4218
Tunisia	25410	25000	23600	22700	27000
Turkey	121480	127700	129700	133200	165078
Ukraine	124100	116000	113500	110000	105200
United Kingdom	15560	14960	15516	15550	15698
Uzbekistan	66163	70000	63000	80000	85000
Total	**1604950**	**1606390**	**1414235**	**1437143**	**1474114**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 5. Cherries (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	1500	1400	1500	2100	2000
Algeria	2440	2508	2582	2754	2900
Austria	3009	3045	2400	2700	2600
Azerbaijan	1662	1535	1511	1617	1641
Belarus	160	177	300	300	300
Belgium	1246	1256	1224	1212	1200
Bosnia and Herzegovina	5000	5800	5500	5595	5000
Bulgaria	11339	12092	11800	12500	14961
Croatia	1910	3000	3100	2800	2000
Cyprus	270	232	162	321	235
Czech Republic	750	785	862	842	835
Denmark	69	60	44	42	40
Estonia	397	350	341	338	276
France	11830	11148	10664	10175	9940
Germany	5561	5443	5449	5440	5389
Greece	9591	9654	8200	8000	9800
Hungary	1197	1711	1795	1928	5873
Israel	330	300	350	349	407
Italy	28876	28868	28900	29726	30020
Jordan	190	130	130	130	130
Kazakhstan	1900	1700	1700	1700	1700
Kyrgyzstan	2000	2000	3000	2200	2200
Latvia	759	737	224	173	71
Lithuania	2475	1515	1141	1123	1105
Luxembourg	120	120	120	120	110
Morocco	1400	1435	1477	1558	2086
Netherlands	610	700	700	700	800
Norway	271	275	280	279	243
Poland	9674	10289	9903	10625	11275
Portugal	6350	6267	6255	6258	5700
Republic of Moldova	2097	2148	2121	2208	2191
Romania	7240	7688	7628	6846	6930
Russian Federation	28000	27000	16000	16000	16000
Serbia	7700	9500	9000	9108	7500
Slovakia	1130	1160	1160	1200	1100
Slovenia	107	92	92	110	114
Spain	24326	24144	24671	26000	23800
Sweden	160	135	143	147	130
Switzerland	448	460	454	466	486
Tunisia	1000	800	850	980	1300
Turkey	30331	34400	35800	37900	42054
Ukraine	13200	13000	12600	12600	12600
United Kingdom	400	447	447	456	500
Uzbekistan	7214	7500	7000	8000	8500
Total	**236239**	**243006**	**229580**	**235626**	**244042**

Table 6. Sour cherries (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	2700	2500	2549	2589	2600
Austria	740	749	700	690	680
Azerbaijan	2425	2505	2634	2768	3084
Belarus	6056	6097	6165	6277	6381
Bosnia and Herzegovina	2100	1600	1593	1900	1900
Bulgaria	3593	3706	3600	3900	2711
Croatia	1665	2500	2400	2488	2400
Czech Republic	1818	1827	1789	1750	1720
Denmark	1630	1600	1500	1354	1400
Germany	4202	3426	3405	3259	2908
Greece	217	216	300	305	340
Hungary	10392	11359	13073	13511	13536
Italy	1700	1689	1500	1600	1600
Kazakhstan	25	30	32	40	40
Poland	36608	37634	36176	35464	35942
Portugal	450	470	479	486	380
Republic of Moldova	2992	3045	2909	5891	2931
Russian Federation	58000	58000	35000	35000	35000
Serbia	35000	40000	35000	38000	28000
Slovakia	450	450	400	400	250
Slovenia	58	36	36	16	14
Turkey	17380	19500	19800	20110	22335
Ukraine	20400	20300	20100	20000	20000
Uzbekistan	3093	3200	3000	3500	3800
Total	**213694**	**222439**	**194140**	**201298**	**189952**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 7. Almond (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Algeria	59137	40890	39787	39313	30200
Azerbaijan	470	403	411	426	430
Bosnia and Herzegovina	120	123	122	118	220
Bulgaria	1571	1921	1900	500	1171
Croatia	281	400	460	500	200
Cyprus	5100	5032	3550	4171	3175
France	1315	1293	1273	1293	1261
Greece	17291	16675	14500	14800	15400
Hungary	221	207	206	215	189
Israel	2700	2000	1800	3400	2600
Italy	81737	79955	79518	80300	77100
Jordan	480	313	313	313	313
Kazakhstan	120	106	100	104	80
Kyrgyzstan	700	600	612	634	600
Morocco	143000	145087	144228	136200	104700
Portugal	37900	37900	38170	38444	26800
Republic of Moldova	300	300	300	300	500
Slovenia	0	0	0	0	0
Spain	578717	563770	566869	650000	542100
Tunisia	165000	180000	160000	190000	197000
Turkey	16180	17585	17150	17040	17148
Ukraine	200	100	100	100	90
Uzbekistan	6811	6000	6119	6342	6300
Total	**1119351**	**1100660**	**1077488**	**1184513**	**1027577**

Table 8. Peaches and nectarines (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	900	976	1100	1300	1300
Algeria	15913	16684	17039	17750	18800
Austria	206	197	190	194	200
Azerbaijan	2116	2247	2406	2480	2760
Bosnia and Herzegovina	1600	1679	1700	2000	1900
Bulgaria	5907	6241	6000	6000	5524
Croatia	1117	1409	1536	1602	1700
Cyprus	750	764	635	724	592
Czech Republic	1212	1032	948	960	962
France	16586	15508	15118	14577	13747
Germany	104	105	110	107	100
Greece	43141	43318	36900	38849	37000
Hungary	6662	6740	6487	6525	5873
Israel	2280	2300	2160	2140	3296
Italy	85812	86017	86062	93061	90259
Jordan	1706	1357	2357	2357	2357
Kazakhstan	400	300	300	350	500
Kyrgyzstan	1000	1300	3500	1000	1000
Malta	120	50	103	107	70
Morocco	4600	4992	4900	5316	6112
Poland	3210	3310	3176	3354	3610
Portugal	5925	5779	5770	5763	3700
Republic of Moldova	5977	5807	5641	5306	5036
Romania	1973	1785	1610	1711	1964
Russian Federation	9000	9000	5400	5500	5500
Serbia	9000	10000	9943	12000	11000
Slovakia	751	718	710	694	700
Slovenia	643	513	513	509	442
Spain	80258	80587	75425	72000	73000
Switzerland	12	13	13	12	10
Tunisia	17000	17000	16800	16500	16900
Turkey	27700	29400	28200	27900	28773
Ukraine	8000	7500	6700	6100	6000
Uzbekistan	8836	8500	8400	10000	12000
Total	**370417**	**373128**	**357852**	**364748**	**362687**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 9. Plums and sloe (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	2000	2500	2466	2700	2500
Algeria	12157	13816	14753	15049	15900
Austria	348	348	242	242	200
Azerbaijan	3456	3399	3454	3518	3593
Belarus	7849	7766	7933	7995	7985
Belgium	95	71	91	59	60
Bosnia and Herzegovina	62000	69000	70000	75000	77000
Bulgaria	15051	16264	16400	17000	17672
Croatia	26000	32000	24300	19000	25000
Cyprus	411	479	335	505	437
Czech Republic	1818	940	1094	1500	1421
Denmark	58	60	56	51	50
Estonia	623	569	538	540	449
France	18880	18827	18704	18679	18782
Germany	4590	4533	4539	4534	4549
Greece	1405	1574	1500	1547	1400
Hungary	6042	6667	6643	6399	7245
Israel	3000	3100	2450	2500	1675
Italy	13048	12639	13081	14064	14219
Jordan	650	555	555	555	555
Kazakhstan	700	700	600	900	1000
Kyrgyzstan	1500	1800	2100	1800	1800
Latvia	728	356	179	124	60
Lithuania	1928	1347	1042	1075	1025
Luxembourg	795	795	795	795	600
Morocco	8000	8183	8132	8608	11334
Netherlands	226	300	300	300	300
Norway	352	361	407	417	416
Poland	21120	22187	21129	21044	21678
Portugal	1969	1964	1965	1965	1600
Republic of Moldova	20038	19564	19357	18738	18283
Romania	78940	76225	75292	74688	69288
Russian Federation	58400	57600	35400	35600	35200
Serbia	164000	200000	198855	201230	130000
Slovakia	2800	2900	2900	2800	1900
Slovenia	2500	2600	2000	2000	3000
Spain	20520	19791	18695	19500	16700
Sweden	130	120	128	132	120
Switzerland	327	332	331	341	342
Tunisia	4140	3200	3000	3400	4300
Turkey	18930	19340	19400	19400	16624
Ukraine	21100	20500	20200	19900	19600
United Kingdom	1000	888	880	864	870
Uzbekistan	8557	8900	8200	10000	11000
Total	**618181**	**665060**	**630421**	**637058**	**567732**

Table 10. Apricot (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	380	400	700	719	700
Algeria	27362	31085	32849	34119	36100
Austria	472	503	492	511	600
Azerbaijan	2004	2109	2269	2396	2484
Bosnia and Herzegovina	300	315	314	500	500
Bulgaria	6857	7092	7000	7200	7178
Croatia	500	600	630	653	500
Cyprus	331	317	222	309	259
Czech Republic	1606	1407	1331	1400	1305
France	14021	14176	14049	14017	13440
Germany	53	55	54	53	50
Greece	5715	5732	5300	4500	7500
Hungary	5081	5295	4888	4840	4285
Israel	1600	1500	1100	770	772
Italy	17708	16308	17370	18033	19543
Jordan	775	898	898	898	898
Kazakhstan	1700	2000	2300	2300	2500
Kyrgyzstan	7300	7500	8500	8000	8000
Malta	4	2	4	3	4
Morocco	11750	11341	11187	11196	12643
Poland	1501	1638	1670	1821	1758
Portugal	600	600	568	568	400
Republic of Moldova	1947	2088	2013	2031	2001
Romania	2900	3314	2931	2578	2618
Russian Federation	19000	18000	11000	11000	11000
Serbia	3500	3338	3500	4500	3500
Slovakia	1180	1190	1220	1210	1100
Slovenia	31	28	28	32	34
Spain	18150	18338	18834	18000	17600
Switzerland	625	646	660	669	689
Tunisia	8900	8000	8200	7900	10000
Turkey	53400	55200	58000	59000	59801
Ukraine	9600	9500	9400	9200	9200
Uzbekistan	34573	36000	38848	42000	45000
Total	**261426**	**266515**	**268329**	**272926**	**283962**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 11. Pears (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	450	488	550	700	690
Algeria	20102	22128	22718	23417	24700
Austria	414	414	398	398	400
Azerbaijan	4004	4075	4198	4231	4345
Belarus	5203	5363	5359	5467	5798
Belgium	7063	7336	7594	7944	8000
Bosnia and Herzegovina	7400	6500	6472	6800	6500
Bulgaria	327	569	600	300	501
Croatia	1400	1396	1484	2134	1900
Cyprus	139	166	126	115	92
Czech Republic	333	408	464	600	526
Denmark	440	400	323	296	340
France	8542	8118	7288	7121	6977
Germany	2226	2097	2090	2093	2088
Greece	4350	4377	4000	4500	5200
Hungary	2162	2394	2577	2644	2734
Israel	1800	1900	1750	1700	1499
Italy	38512	37945	40700	40190	40233
Jordan	268	329	329	334	334
Kazakhstan	2700	1700	1700	1800	2000
Kyrgyzstan	1700	1800	1800	1800	1800
Latvia	737	606	304	226	181
Lithuania	946	1233	926	890	999
Luxembourg	128	128	124	124	65
Malta	4	8	7	2	6
Morocco	3660	3883	3633	3556	4026
Netherlands	6914	7300	7500	7800	8000
Norway	129	127	122	124	90
Poland	12503	13036	13028	13152	13188
Portugal	12871	12827	12800	12820	11000
Republic of Moldova	1205	1247	1248	1140	1147
Romania	4421	4619	4590	4538	5096
Russian Federation	15400	14600	8000	8000	8000
Serbia	13000	13500	14000	14167	10000
Slovakia	1760	1700	1700	1700	1300
Slovenia	284	221	221	214	209
Spain	33630	31891	29216	24000	26900
Sweden	200	168	179	184	200
Switzerland	898	870	845	838	831
Tunisia	12700	11000	15000	12000	13500
Turkey	33200	33400	32920	33060	20252
Ukraine	14400	14100	13700	13600	13600
United Kingdom	1600	1536	1472	1507	1680
Uzbekistan	10000	10500	9500	12000	12500
Total	**290125**	**288403**	**283555**	**280226**	**269427**

Table 12. Avocado (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Bosnia and Herzegovina	297	303	305	336	330
Cyprus	99	106	80	88	79
France	11	4	4	4	4
Greece	308	334	400	440	400
Israel	4970	5100	6270	6480	6565
Morocco	1660	1920	1972	2038	2000
Portugal	11000	11500	11600	11602	11000
Spain	9801	9980	10023	10500	10400
Tunisia	25	23	24	25	30
Turkey	100	120	120	146	146
Total	**28271**	**29390**	**30798**	**31659**	**30954**

Table 13. Blueberries (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Germany	1410	1406	1406	1426	1429
Italy	200	199	202	205	200
Latvia	306	229	164	138	110
Lithuania	5320	4966	5200	968	1000
Morocco	10	10	9	9	10
Netherlands	935	953	962	967	960
Norway	25	22	26	28	23
Poland	1440	1954	2256	2366	2521
Romania	300	285	291	285	280
Russian Federation	600	600	500	500	500
Sweden	3960	4500	4781	4922	4800
Ukraine	500	600	600	200	190
Uzbekistan	100	105	100	120	130
Total	**15106**	**15829**	**16497**	**12134**	**12153**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 14. Chestnut (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	2000	2000	2000	2000	2300
Azerbaijan	201	405	406	472	492
Bulgaria	19	21	24	25	20
France	6967	6965	7003	7151	7200
Greece	9026	8921	10600	10618	7400
Hungary	457	684	777	801	462
Italy	24032	24224	25000	24972	24500
Portugal	30265	30300	30398	30456	34600
Romania	3	2	2	3	2
Slovenia	11	5	5	6	5
Spain	6134	9523	9800	8000	8400
Turkey	37260	38960	38980	39040	38400
Ukraine	67	92	93	80	80
Total	**116442**	**122102**	**125088**	**123624**	**123861**

Table 15. Hazelnut (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Azerbaijan	17379	19994	21577	22193	22691
Belarus	1171	1616	1634	1562	1600
Bulgaria	376	702	700	601	171
Croatia	900	1246	1877	2000	4000
Cyprus	92	85	80	31	19
Denmark	6	6	6	6	6
France	2953	2916	3351	3572	3834
Greece	717	652	800	600	400
Hungary	90	88	103	99	161
Italy	69685	72314	71050	70100	70500
Kyrgyzstan	3200	4500	4856	4995	5000
Poland	2241	3100	3131	2663	3500
Portugal	527	500	527	527	400
Republic of Moldova	889	967	1012	400	400
Romania	10	1	5	11	15
Russian Federation	619	854	864	826	800
Slovenia	32	43	43	52	57
Spain	19937	16802	15411	13500	13800
Tunisia	52	48	49	50	40
Turkey	392860	433920	412468	421108	432439
Ukraine	30	30	30	40	20
Uzbekistan	1042	1206	1288	1326	1300
Total	**514808**	**561590**	**540862**	**546262**	**561153**

Table 16. Walnuts (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Austria	6600	6700	6500	6709	2200
Azerbaijan	2053	2584	2629	2675	2725
Belarus	5500	5100	5145	5125	5100
Belgium	229	230	233	240	240
Bosnia and Herzegovina	4000	4252	4568	4652	4000
Bulgaria	8353	8935	8900	7600	7217
Croatia	6500	6327	6945	7100	7000
Cyprus	307	333	280	242	196
Czech Republic	1400	1409	1400	1395	1400
France	16631	16928	17126	17679	17541
Germany	5110	5201	5262	5431	5400
Greece	9195	9232	13700	10500	10500
Hungary	2679	2837	3303	3531	4182
Italy	4005	4500	4450	4445	4400
Kazakhstan	466	403	382	300	300
Kyrgyzstan	758	1200	1210	1231	1200
Luxembourg	76	76	76	76	75
Morocco	5470	4975	4999	5007	5128
Poland	6345	19488	19583	20106	20900
Portugal	3200	3200	3158	3159	2800
Republic of Moldova	3145	3421	3581	3867	4088
Romania	1678	2119	1726	1523	1490
Russian Federation	7344	7500	7566	7536	7500
Serbia	14000	15000	16115	16410	13000
Slovakia	2000	2780	2804	2793	2800
Slovenia	61	92	92	105	115
Spain	6500	7147	7418	4000	7800
Switzerland	1000	1500	1517	1566	1600
Turkey	76583	82117	84917	86533	90683
Ukraine	14000	14060	14100	13400	14060
Uzbekistan	3499	3100	3125	3180	3200
Total	**218687**	**242746**	**252810**	**248116**	**248840**

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 17. Figs (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Albania	9500	9600	11000	12000	9900
Algeria	49180	48790	47273	46935	49600
Azerbaijan	1479	1720	1535	1519	1539
Bosnia and Herzegovina	160	250	280	285	300
Croatia	700	1000	1100	1000	900
Cyprus	383	365	255	117	97
France	460	460	441	423	446
Greece	6452	6319	4800	4500	3700
Israel	217	300	360	730	740
Italy	3848	3863	2700	2539	2553
Jordan	542	195	195	195	200
Malta	130	70	69	70	50
Morocco	44000	44441	42381	42000	45200
Portugal	86500	86382	86600	86614	87000
Slovenia	7	3	3	4	5
Spain	12332	12344	12509	11500	9900
Tunisia	18380	15000	15000	17690	17600
Turkey	62240	61594	57944	58356	47857
Uzbekistan	100	114	100	150	150
Total	**296610**	**292810**	**284545**	**286627**	**277737**

Table 18. Gooseberry (area harvested in ha. FAO Stat - http://faostat.fao.org, January 2012)

Countries	2006	2007	2008	2009	2010
Austria	350	360	355	360	350
Czech Republic	650	640	650	678	620
Denmark	17	20	19	17	20
Estonia	264	230	231	231	183
Finland	33	34	33	32	31
Germany	8570	8442	8600	9000	9000
Hungary	363	408	420	435	282
Kyrgyzstan	20	20	20	20	20
Latvia	69	38	18	9	8
Lithuania	189	189	139	146	150
Poland	2980	3122	2902	2824	2796
Republic of Moldova	10	14	13	20	11
Russian Federation	16000	16000	12400	12300	12300
Slovakia	27	20	20	150	70
Switzerland	7	6	6	6	4
Ukraine	1000	1000	1000	1000	1000
United Kingdom	295	268	265	290	277
Total	**30844**	**30811**	**27091**	**27518**	**27122**

Table 19. Pomegranate (not covered in FAOStat, data extracted from various publications. No very recent data)

Azerbaijan	ca. 10.000 ha of plantations / 34.000 t (Babayev, 2009).
Cyprus	75 ha / 450 t in 1994 (Gregoriou, 1995)
Greece	25.000 trees in orchards on about 100 ha, but ca. 265.000 trees in total, most mixed in orchard of other species (Lionakis, 1995)
Italy	200 t (scattered trees, few plantations, mostly Sardegna and Sicily) (Monastra et al., 1995)
Morocco	monoculture or associated with grapevine and olive (no details) (Walali Loudyi, 1995)
Portugal	few orchards and mostly dispersed trees, with an estimated total of 400 ha (De Sousa et al., 1995)
Spain	2.800 ha / ca. 25.000 t in 1996 (mostly in the Alicante region) (Panos Callado, 2000).
Tunisia	14.500 ha / 4.4 million plants (Mars, 1995)
Turkey	2.6 million trees / 56.000 t (Aksoy, 1995; Ozguven & Yilmaz, 2000).

Table 20. Loquat (not covered in FAOStat, data extracted from various publications. No very recent data)

Cyprus	50 ha in 1994 (Gregoriou, 1995)
Greece	300 ha in Caballero & Fernandez (2002); 75 ha, 15.000 trees in 1992 in regular orchards, but 150.000 trees in total (Lionakis, 1995)
Israel	330 ha (Caballero & Fernandez, 2002); 300 ha (Blumenfeld, 1995)
Italy	663 ha (Caballero & Fernandez, 2002); 6-7000 t mainly in Sicily (Monastra et al., 1995)
Morocco	385 ha (Caballero & Fernandez, 2002); ca. 30 ha of orchards, but mostly garden trees (Walali Loudyi, 1995)
Portugal	243 ha (Caballero & Fernandez, 2002); 443 ha (De Sousa et al., 1995)
Spain	2914 ha / 41.487 t (Caballero & Fernandez, 2002); 3700 ha / 35.000 t (Llacer et al., 1995)
Turkey	1470 ha / 13.500 t (Caballero & Fernandez, 2002); 288.000 trees / 12.000 t. (Karadenis, 2003); 261.000 trees / 9.000 tonnes, with an increasing production at the time (Aksoy, 1995)

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 21. Poplar (area in 1000 ha – for those countries reporting under the International Poplar Commission; FAO, 2008)

Country	Category	2004				2007			
		Area	Productive	Protective	Other	Area	Productive	Protective	Other
Belgium	Planted	35,0	33,3	1,8	0,0	32,5	30,9	1,6	0,0
Belgium	Indigenous	2,5	0,0	0,0	2,5	2,5	0,0	0,0	2,5
Bulgaria	Planted	18,6	13,1	5,5	0,1	18,9	13,1	5,6	0,2
Bulgaria	Indigenous	1,3	0,3	1,0	0,0	1,0	0,3	0,7	0,0
Bulgaria	Agroforestry and trees outside forests	0,3	0,2	0,2	0,0	0,2	0,2	0,0	0,0
Croatia	Planted	13,0	12,1	0,9	0,0	12,0	11,2	0,8	0,0
Croatia	Indigenous	7,0	6,7	0,4	0,0	9,0	8,6	0,5	0,0
France	Planted	236,0	236,0	0,0	0,0	236,0	236,0	0,0	0,0
France	Indigenous	39,8	12,0	27,9	0,0	39,8	12,0	27,9	0,0
Germany	Planted	10,0	10,0	0,0	0,0	100,0	100,0	0,0	0,0
Germany	Indigenous	1,0	0,0	1,0	0,0	1,0	0,0	1,0	0,0
Germany	Agroforestry and trees outside forests	0,5	0,3	0,3	0,0	0,5	0,3	0,3	0,0
Italy	Planted	118,7	95,0	23,7	0,0	118,5	94,8	23,7	0,0
Morocco	Planted	4,2	3,6	0,4	0,2	4,3	3,8	0,3	0,2
Morocco	Indigenous	2,5	0,5	2,0	0,0	2,5	0,5	2,0	0,0
Morocco	Agroforestry and trees outside forests	0,7	0,1	0,6	0,0	0,7	0,1	0,6	0,0
Romania	Planted	59,7	15,3	44,3	0,1	55,3	14,1	41,1	0,1
Romania	Indigenous	27,4	9,7	17,6	0,1	24,3	8,1	16,1	0,0
Romania	Agroforestry and trees outside forests	0,8	0,2	0,3	0,3	0,7	0,1	0,3	0,3
Russian Federation	Planted	26,0	25,0	1,0	0,0	26,0	25,0	1,0	0,0
Russian Federation	Indigenous	21900	15330	6570	0,0	21536,1	15075,3	6460,8	0,0
Russian Federation	Agroforestry and trees outside forests	5,0	0,0	5,0	0,0	5,0	0,0	5,0	0,0
Serbia	Planted	33,1	31,5	1,7	0,0	33,1	31,5	1,7	0,0
Serbia	Indigenous	1,2	0,0	1,2	0,0	1,2	0,0	1,2	0,0
Serbia	Agroforestry and trees outside forests	3,2		3,2		3,2	0,0	3,2	0,0
Spain	Planted	94,0	84,6	4,7	4,7	98,5	88,7	4,9	4,9
Spain	Indigenous	22,0	3,3	17,6	1,1	25,0	3,8	20,0	1,3
Spain	Agroforestry and trees outside forests	6,0	0,9	4,8	0,3	6,5	1,0	5,2	0,3
Sweden	Planted	0,2	0,2	0,0	0,0	0,3	0,2	0,0	0,0
Turkey	Planted	125,0	125,0	0,0	0,0	125,0	125,0	0,0	0,0
UK	Planted	1,3	1,3	0,0	0,0	1,3	1,3	0,0	0,0

Annex 7. - Areas (ha) grown in some countries of the PRA area for some host plants

Table 22. *Salix* (area in 1000 ha – for those countries reporting under the International Poplar Commission; FAO, 2008)

		2004				2007			
Country	**Category**	**Area**	**Productive**	**Protective**	**Other**	**Area**	**Productive**	**Protective**	**Other**
Bulgaria	Planted	0,1	0,0	0,0	0,0	0,1	0,1	0,0	0,0
Bulgaria	Indigenous	1,5	0,1	1,4	0,0	2,6	0,1	2,5	0,0
Bulgaria	Agroforestry & trees outside forests	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Croatia	Planted	4,0	3,6	0,4	0,0	3,0	2,7	0,3	0,0
Croatia	Indigenous	7,0	5,0	2,0	0,0	10,0	7,1	2,9	0,0
France	Indigenous	66,6	20,0	46,6	0	66,6	20,0	46,6	0,0
Germany	Agroforestry & trees outside forests	0,5	0,3	0,3	0,0	0,5	0,3	0,3	0,0
Germany	Planted	1,0	1,0	0,0	0,0	1,0	1,0	0,0	0,0
Germany	Indigenous	1,0	0,0	1,0	0,0	1,0	0,0	1,0	0,0
Romania	Planted	21,1	4,5	16,6	0,0	20,4	4,4	16,0	0,0
Romania	Indigenous	16,8	1,9	14,9	0,0	15,2	1,4	13,8	0,0
Romania	Agroforestry & trees outside forests	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Russian Federation	Indigenous	285,0	199,5	85,5	0,0	242,1	169,5	72,6	0,0
Serbia	Planted	6,9	5,3	1,7	0,0	6,9	5,3	1,7	0,0
Serbia	Indigenous	7,5	0,0	7,5	0,0	7,5	0,0	7,5	0,0
Serbia	Agroforestry & trees outside forests	0,7	0,0	0,7	0,0	0,7	0,0	0,7	0,0
Spain	Planted	2,0	0,4	1,6	0,0	2,5	0,5	2,0	0,0
Spain	Indigenous	6,0	0,1	5,7	0,2	25,0	3,8	20,0	1,3
Sweden	Planted	15,0	14,9	0,0	0,2	15,0	14,9	0,0	0,2
UK	Planted	2,0	2,0	0,0	0,0	2,0	2,0	0,0	0,0

Table 23. Mixed *Populus* and *Salix* (area in 1000 ha – for those countries reporting under the International Poplar Commission; FAO, 2008)

		2004				2007			
Country	**Category**	**Area**	**Productive**	**Protective**	**Other**	**Area**	**Productive**	**Protective**	**Other**
Bulgaria	Planted	0,5	0,4	0,0	0,0	0,4	0,3	0,0	0,0
Bulgaria	Indigenous	1,6	0,7	0,9	0,0	1,8	0,7	1,2	0,0
Bulgaria	Agroforestry & trees outside forests	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Croatia	Planted	2,0	1,7	0,3	0,0	2,0	1,7	0,3	0,0
Croatia	Indigenous	0,0	0,0	0,0	0,0	14,0	9,8	4,2	0,0
Germany	Indigenous	0,5	0,0	0,5	0,0	0,5	0,0	0,5	0,0
Romania	Planted	2,4	1,5	0,9	0,0	1,8	0,4	1,4	0,0
Romania	Indigenous	9,1	2,1	7,0	0,0	8,1	1,6	6,5	0,0
Romania	Agroforestry & trees outside forests	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Spain	Indigenous	10,0	0,5	9,0	0,5	12,0	0,6	10,8	0,6
Spain	Agroforestry & trees outside forests	2,0	0,1	1,8	0,1	2,0	0,1	1,8	0,1

Annex 8. Phytosanitary import requirements of EPPO countries in relation to the various pathways

Sources:
- EU Directives
- EPPO collection of summaries of phytosanitary regulations, for non-EU countries, 1999 to 2003 depending on countries.
- expert updates given for Turkey in relation to the draft EPPO PRA on *Apriona* spp.
- update for Russia (Ministry of Agriculture of the Russian Federationorder No. 456 dd. December 29, 2010).

* indicate pests that occur in New Zealand according to PQR (EPPO, 2012), i.e. if there are requirements from where the pest occurs, they will apply to New Zealand.
✓ indicates when the requirement would imply a measure for the commodity from New Zealand.
× indicates when the requirement would not specifically apply to that commodity from New Zealand (i.e. would not have any effect).
? indicates an uncertainty (whether the pest occurs in New Zealand, or whether the requirements would apply to the commodity from New Zealand).

Warning: the tables below for non-EU countries were developed based on EPPO summaries of phytosanitary regulations (prepared between 1999 and 2003). Regulations of some countries might have changed in the meantime, but it still gives some indication of the measures in place. In the case of Turkey, part of the information was corrected by a Turkish expert in the framework of the EPPO PRA on *Apriona* spp. and the Regulation on Agricultural Quarantine (2007-01-23) was also consulted.

Table 1. Plants for planting of host species

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
Albania		✓ All plants: import permit (IP), PC
Algeria	✓ ***Chaenomeles***, ***Crataegus***: prohibited ✓ ***Citrus***: prohibited ✓ Some cultivars of ***Malus domestica*** prohibited ✓ Some cultivars of ***Pyrus communis*** prohibited	✓ All plants: PC ✓ Fruit or ornamental plants of species not indigenous or cultivated in Algeria: IP ✓ ***Pinus***: free from some specified pests (incl. *Mycosphaerella pini**) ✓ ***Phoenix***: import permit; prohibited from countries where *Fusarium oxysporum* f. sp. *albedinis* occurs; otherwise free from it and practically free from other pests. × **Conifers**: free from *Ips* spp.? ✓ ***Castanea**, **Eriobotrya**, **Juglans**, **Punica***, **Ribes**: IP ✓ ***Ficus***: IP, practically free from pests; ✓ ***Malus***: IP, specific requirements for various pests (incl. *Q. perniciosus**, Anarsia lineatella, Grapholita molesta*, apple proliferation phytoplasma, tomato ringspot nepovirus*,. amylovora*; ; Treatment against *Q. perniciosus* (if from infested country) ✓ ***Persea*** Free from *Phytophthora cinnamomi**, Radopholus citrophilus and Radopholus similis ✓ ***Prunus***: IP; free from *Agrobacterium tumefaciens**, *Anarsia lineatella*, cherry little cherry disease*, cherry necrotic rusty mottle disease*, Grapholita molesta* and Xanthomonas arboricola pv. pruni*, symptoms of viruses and virus-like organisms*; place of production freedom for some pests. apricot chlorotic leafroll phytoplasma, cherry necrotic rusty mottle disease*, plum pox potyvirus and tomato ringspot nepovirus*, *Q. perniciosus** (or treatment) × ***Prunus dulcis***: free from *Ascochyta chlorospora* ✓ ***Pyrus***: IP; free from some specified pests (*Agrobacterium tumefaciens**, *Anarsia lineatella* and *Grapholita molesta**); ✓ ***Rubus***: import permit × **Solanaceae**. Free from potato stolbur phytoplasma ✓ ***Vitis***: IP; Free from *Agrobacterium vitis*, *Guignardia baccae* and *Viteus vitifoliae**. Requirements for grapevine flavescence dorée

Annex 8. Phytosanitary import requirements of EPPO countries

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
		phytoplasma, for viruses and virus-like organisms* Accompanying growing medium free from *Xiphinema americanum* and other nematodes that can be vectors of viruses*[?]
Belarus	✓ Plants from countries where *Bemisia tabaci** occurs: prohibited	✓ All plants: import permit, PC ✓ Plants with roots: free from soil ✓ Plants with roots originating in countries where *Popillia japonica* occurs: prohibited × Plants originating in countries where *Spodoptera littoralis* or *Spodoptera litura* occur: prohibited × Plants originating in countries where *Phymatotrichopsis omnivora* occurs: Prohibited × Deciduous woody plants originating in countries where Ceroplastes japonicus or Ceroplastes rusci occurs: prohibited ✓ Deciduous woody plants originating in countries where Dialeurodes citri, Icerya purchasi*, Lopholeucaspis japonica, Pantomorus godmani[?] or Pseudococcus calceolariae[?] occur: prohibited × ***Acer*** from countries where Hyphantria cunea occurs: prohibited ✓ ***Chaenomeles***, ***Crataegus***, ***Sorbus*** from countries where Erwinia amylovora* or Quadraspidiotus perniciosus* occur: prohibited × ***Citrus*** from countries where Dialeurodes citri, Phyllocnistis citrella, Unaspis citri, Unaspis yanonensis or Xanthomonas axonopodis pv. citri occur: prohibited ✓ ***Malus*** from countries where Erwinia amylovora*, Quadraspidiotus perniciosus*, Hyphantria cunea, Grapholita molesta*, Carposina niponensis Rhagoletis pomonella or Agrilus mali occur: prohibited ✓ ***Prunus*** *from countries where* Quadraspidiotus perniciosus*, Hyphantria cunea, Grapholita molesta*, or Carposina niponensis occur: prohibited ✓ ***Pyrus*** *from countries where* Erwinia amylovora* Quadraspidiotus perniciosus* Hyphantria cunea Grapholita molesta* Carposina niponensis Numonia pyrivorella ✓ ***Ribes***, ***Rosa***, ***Salix*** *from countries where* Quadraspidiotus perniciosus* Prohibited ✓ ***Vitis*** *from countries where* Viteus vitifoliae* occurs: prohibited
Croatia	✓ ***Pinus*** originating in Belgium, France, Spain or non-European countries: prohibited ✓ ***Populus*** in Belgium, France, Spain or non-European countries Prohibited	✓ All plants: PC; growing season inspection for quarantine pests ✓ Fruit trees 'Origin from certification scheme' for virus and virus-like organisms (AD) ✓ Plants with soil: Soil free from Synchytrium endobioticum and nematode quarantine pests (AD) ✓ Perennial plants: import permit ✓ ***Abies*** Plants originating in Belgium, France, Spain or non-European countries: Prohibited × ***Castanea*** from USA Prohibited ✓ ***Chaenomeles***, ***Crataegus***, ***Eriobotrya***, ***Malus***, ***Pyrus***, ***Sorbus*** 'Place of production freedom' (last 2 seasons) for Erwinia amylovora (AD) 'Radius freedom' (no outbreak within 10 km of place of production) for Erwinia amylovora (AD) ✓ ***Chaenomeles***, ***Crataegus***, ***Eriobotrya***, ***Malus***, ***Pyrus***, ***Sorbus*** from New Zealand: prohibited (16 Oct. -30 April) or area freedom for Erwinia amylovora (1 May-15 Oct) × ***Photinia***, ***Prunus***, ***Rosa*** from Asia or North America: during the growing season: prohibited. Outside the growing season: Free from leaves and fruits × ***Platanus*** from France, Italy, Switzerland or USA: prohibited × ***Ulmus*** from Canada or USA: prohibited × ***Solanum*** (except tissue culture) from North America except Canada and USA, Central America or South America: prohibited ✓ ***Vitis***: certification scheme for virus and virus-like organisms
EU, Norway, Switzerland, Montenegro	✓ ***Abies, Chamaecyparis, Pinus*** from non-European countries: prohibited ✓ ***Chaenomeles, Crateagus***, ***Malus***, ***Prunus***, ***Pyrus***, ***Rosa*** (other than dormant plants free from leaves, flowers and fruit), from non-European countries: prohibited (III.A.9) ✓ ***Quercus***, ***Crataegus*** from non-European countries: prohibited with leaves/non dormant. ✓ Plants of **Solanaceae** from third countries other than European and Mediterranean: prohibited ✓ ***Vitis*** from third countries (other than Switzerland):	General requirements: ✓ Plants for planting from third countries: must be subject to a plant health inspection in the country of origin (Annex V.B.I.1) ✓ Plants from third countries (IV.A.I.36.1): grown in nurseries and requirements for Thrips palmi (PFA, PFPP, treatment). ✓ Trees and from third countries other than European and Mediterranean countries (Annex IV.A.I.39): clean and free from flowers and fruits, grown in nurseries, inspected and found free from symptoms of pests or treated. ✓ Deciduous trees and shrubs from third countries other than European and Mediterranean (Annex IV.A.I.40): dormant and free from leaves. ✓ Plants with roots, planted or intended for planting, grown in the open air (IV.A.I.33) place of production free from *Clavibacter michiganensis* ssp. *sepedonicus**, *Globodera pallida**, *Globodera rostochiensis**, *Synchytrium endobioticum**. ✓ Soil and growing medium, attached to or associated with plants ((IV.A.I.34) orgiinating in a number of countries (incl. NZ): specific requirements regarding the growing medium.

Annex 8. Phytosanitary import requirements of EPPO countries

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
	prohibited ✓ ***Citrus***: prohibited	✓ Naturally or artificially dwarfed plants from non-European countries: detailed requirements, including grown in nurseries, found free, inspections, requirements regarding growing medium (IV.A.I.43). ✓? Plants from countries where some pests are known to occur (Bean golden mosaic virus, Cowpea mild mottle virus, Lettuce infectious yellow virus, Pepper mild tigré virus, Squash leaf curl virus, other viruses transmitted by *Bemisia tabaci*[*?], and where *Bemisia tabaci** (non-European populations) or other vectors[?] of the pests are known to occur: no symptoms of the viruses and requirements for *Bemisia tabaci* (PFA, or PFPP, or eradicated on the plants) <u>Rosaceae and Ribes</u> ✓ ***Chaenomeles, Crataegus, Eriobotrya, Malus, Pyrus, Sorbus*** from third countries other than Switzerland, and other than those recognised as being free from *Erwinia amylovora* or in which PFA have been established in relation to *Erwinia amylovora* (could include NZ): prohibited to certain protected zones (Annex III.B.1) ✓ ***Chaenomeles, Crataegus***, *Cydonia*, ***Eriobotrya, Malus, Prunus, Pyrus*** from non-European countries: country freedom or PFA (+extra requirements) for *Monilinia fructicola** ✓ *Amelanchier*, ***Chaenomeles,*** *Cotoneaster*, ***Crataegus,*** *Cydonia*, ***Eriobotrya, Malus,*** *Mespilus*, ***Photinia davidiana***, *Pyracantha*, ***Pyrus, Sorbus***: requirements for *Erwinia amylovora** (Country freedom or area freedom, or removal of plants) × ***Crataegus*** from countries where *Phyllosticta solitaria* is known to occur: requirements for *Phyllosticta solitaria* × ***Photinia*** (other than dormant, free from leaves, flowers and fruit) from USA, China, Japan, the Republic of Korea and Democratic People's Republic of Korea: prohibited × ***Malus, Prunus, Pyrus*** (dormant plants, free from leaves, flowers and fruits): prohibited from non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA. i.e. not prohibited from New Zealand. ✓ **Herbaceous perennial plants of the families … Rosaceae**, from third countries, other than European and Mediterranean countries: specific requirements incl. grown in nurseries, free from plant debris, flowers and fruits, inspected, or treatment ***Malus, Prunus, Pyrus, Ribes, Rubus*** from countries where some pests are known to occur: requirements for symptoms in place of production: × ***Malus***: *Phyllosticta solitaria* ✓ ***Prunus***: Apricot chlorotic leafroll mycoplasma, *Xanthomonas campestris* pv. *pruni** ✓ ***Prunus persica***: *Pseudomonas syringae* pv. *persicae** × ***Pyrus***: *Phyllosticta solitaria* ✓ ***Rubus***: Arabis mosaic nepovirus*, Raspberry ringspot nepovirus, Strawberry latent ringspot nepovirus*, Tomato black ring nepovirus ✓ **On all species**: non-European viruses and virus- like organisms. × ***Pyrus*** from countries where Pear decline mycoplasm is known to occur: requirements for this pest ✓ ***Malus*** from countries where some pests are known to occur on *Malus:* Cherry rasp leaf virus (American), Tomato ringspot virus*: specific requirements (certification scheme or requirements for derived from, and no symptoms) × ***Malus*** from countries where apple proliferation mycoplasm is known to occur: specific requirements × ***Prunus*** (many species, incl. *P. amygdalus, P. armeniaca*, P. domestica,, persica, salicina, other species of *Prunus* susceptible to plum pox virus) from countries where Plum pox virus is known to occur: specific requirements for plum pox virus ✓? ***Prunus*** from countries where Tomato ringspot virus* occurs on Prunus[?], or the from countries where Cherry rasp leaf virus (American), Peach mosaic virus (American), Peach phony rickettsia, Peach rosette mycoplasm, Peach yellows mycoplasm, Plum line pattern virus (American), Peach X-disease mycoplasm are known to occur, or in non-European countries where Little cherry pathogen*[?] is known to occur: certification scheme or derived under certain conditions, and no symptoms. ✓ ***Rubus*** from countries where tomato ringspot virus*, Black raspberry latent virus, Cherry leafroll virus*, Prunus necrotic ringspot virus*, Raspberry leaf curl virus (American), Cherry rasp leaf virus (American) occur: requirements for these pests ✓ ***Rubus***: specific requirements for Arabis mosaic virus*, Raspberry ringspot virus, Strawberry latent ringspot virus*, Tomato black ring virus. <u>Conifers</u> ✓ **Conifers** from non-European countries: nursery and PFPP free from *Pissodes* spp. ✓ **Conifers** over 3 m in height from non-European countries: produced in nurseries and place of production free from *Scolytidae* spp. (Non-

Annex 8. Phytosanitary import requirements of EPPO countries

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
		European) Quercus ✓ Castanea, **Quercus**: requirements for *Cryphonectria parasitica* (area freedom or no symptoms); from non-European countries, for *Cronartium* spp. (non-European) (official statement of no symptoms) × ***Quercus*** from the USA: area freedom for *Ceratocystis fagacearum* Populus ✓ ***Populus*** from third countries: requirements for *Melampsora medusae** (official statement on symptoms) × ***Populus*** with leaves from North America: prohibited × ***Populus*** from the American continent: requirements for *Mycosphaerella populorum* Other fruit species ✓ ***Castanea***, *Quercus:* requirements for *Cryphonectria parasitica* (area freedom or no symptoms); from non-European countries, for *Cronartium* spp. (non-European) (official statement of no symptoms) ✓ ***Persea*** spp., rooted or with growing medium attached or associated: requirements for *Radopholus citrophilus* and *R. similis* (country freedom, or negative tests). ✓ Herbaceous species and plants of ***Ficus*** and *Hibiscus* from non-European countries: requirements for Bemisia tabaci* (PFA, or PFPP, or treatment) × ***Corylus*** from Canada and the USA: requirements in relation to *Anisogramma anomala* (PFA or PFPP) Other non-fruit species × ***Fraxinus, Juglans mandshurica, Ulmus davidiana, Ulmus parvifolia,*** *Pterocarya rhoifolia* from CA, CN, JP, Mongolia, Rep. of Korea, Russia, Taiwan and US: requirements for *Agrilus planipennis* (PFA or PFPP) × ***Ulmus*** from North America: requirements for Elm phloem necrosis mycoplasm ✓ ***Camellia*** from non-European countries: specific requirements for *Ciborinia camelliae* (area freedom or no symptoms) × **Plants of herbaceous species** from countries where *Liriomyza sativae* and *Amauromyza maculosa* are known to occur: requirements fo these pests (PFA, PFPP, treatment) ✓ **Plants of herbaceous species** from third countries: requirements for Liriomyza huidobrensis and L. trifolii (area freedom or no signs) ✓ **Herbaceous perennial plants of the families …Leguminosae**, from third countries, other than European and Mediterranean countries: specific requirements incl. grown in nurseries, free from plant debris, flowers and fruits, inspected, or treatment ✓ **Herbaceous species** and plants of ***Ficus*** and ***Hibiscus*** from non-European countries: requirements for *Bemisia tabaci** (PFA, or PFPP, or treatment) ✓ Some requirements regarding protected zones (e.g. for ***Eucalyptus*** / Azores) × ***Fuchsia*** from USA and Brazil: requirements for *Aculops fuchsiae* × ***Phoenix*** requirements for *Paysandisia archon*; Phoenix from Algeria, Morocco: prohibited
Israel	✓ Plants originating in tropical or subtropical countries: prohibited ✓ **Rosaceae**: prohibited	✓All plants: IP, PC, free from soil, sand, organic manure or compost (except peat)
Jordan		✓All plants: IP, PC; free from soil. ✓ ***Prunus domestica, P. persica***: free from virus and virus-like diseases*?.
Khirghistan		✓ All plants: IP, PC, free from soil, PFA for quarantine pests, place of production and buffer zone inspected during the last growing season and found free from quarantine pests); ✓ Plants with growing medium: growing medium free from *Globodera pallida**, *Globodera rostochiensis** and *Meloidogyne chitwoodi*. ✓ **Solanaceae**: specific requirements for *Globodera pallida*, Globodera rostochiensis**, Synchytrium endobioticum*, *Ralstonia solanacearum*, Phthorimaea operculella** and *Leptinotarsa decemlineata*
Morocco	✓ ***Chaenomeles, Crataegus, Eucalyptus, Sorbus***: prohibited ✓ ***Citrus, Eriobotrya***: prohibited; ✓ ***Malus domestica***: prohibition of some cultivars *Pyrus communis*: prohibition of some cultivars.	✓ All plants: PC; ✓ Plants with soil: pest free ✓ **Fruit trees**: free from Ag*robacterium tumefaciens** ✓ ***Malus, Pyrus***: IP, specific requirements (e.g. *Erwinia amylovora**, *Monilinia fructicola**, viruses and virus-like organisms*), dormant and not more than one year after grafting, declaration of date of grafting, prohibition of import between certain dates; *Malus domestica*: specific

Annex 8. Phytosanitary import requirements of EPPO countries

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
		requirements in relation to apple proliferation phytoplasma. ✓ ***Prunus***: import permit, requirements in relation to certain pests (e.g. peach rosette phytoplasma, *X. arboricola* pv. *pruni**, *M. fructicola**, *Xylella fastidiosa*); *P. armeniaca*, *P. domestica*, *P. dulcis*, *P. salicina* (in relation to plum pox virus and virus and virus-like diseases*), *P. avium* (in relation to cherry necrotic rusty mottle disease*); *P. persica* (plum pox potyvirus, *Pseudomonas syringae* pv. *persicae**, virus and virus-like diseases*). Specific requirements for many other *Prunus* spp. ✓ ***Rubus***: sprecific requirements in relation to some viruses (incl. tomato ringspot nepovirus*, arabis mosaic nepovirus*, strawberry latent ringspot nepovirus*, cherry leaf roll nepovirus in Rubus[?], apple mosaic ilarvirus in Rubus[?])
Moldova		✓ All plants: PC, IP, disinfection; Plants with roots: free from soil.
Russia		✓ All plants: import permit, PC, ✓ Plants with roots: substrate free from quarantine pests ✓ Plants from areas where *Q. perniciosus* *or *Pseudaulacaspis pentagona* occur: disinfection prior to import ✓ Planting material of fruits, berries, ornamental plants and vines (except strawberries): dormant and free from leaves, flowers and fruits. ✓ Seedlings, rootstocks, cuttings and pome fruits, stone fruit and nut crops. free of pests, pathogens of fungal, bacterial, viral and nematode diseases, and produced in the areas, places and / or sites free from the abovementioned diseases. × Seedlings and cuttings of apple rootstocks, cherries: from areas, locations and production sites free of Cherry rasp leaf nepovirus.
Tunisia	✓ Forest trees: prohibited; ✓ ***Chaenomeles*, *Crateagus***: prohibited from countries where *E. amylovora** occurs (+requirements for *E. amylovora**, viruses & *Q. perniciosus**) ✓ ***Sorbus***. prohibited from countries where *E. amylovora** occurs (other requirements for E. amylovora andQ. *perniciosus** from other origins) ✓ ***Phoenix dactylifera***: prohibited ✓ Arecaceae (ornamental): prohibited ✓ **Rutaceae**: prohibited ✓ ***Malus, Pyrus****:* prohibited from countries where *E. amylovora** occurs	✓ All plants: PC, free from *F. occidentalis** × Plants from countries where *F. oxysporum* f.sp. *albedinis* occurs: prohibited; ✓ ***Acacia*, *Acer*, *Euonymus*, *Fagus*, *Ligustrum*, *Populus*, *Salix*, *Syringa*, *Tilia*,** *Ulmus*: from countries where *Q. perniciosus** occurs: free from or fumigation; × ***Quercus***: originating in Romania or CIS: PFA for *Ophiostoma piceae* and *C. parasitica* ✓ ***Rosa****:* from countries where *Q. perniciosus** occurs: free from or fumigation; from countries where arabis mosaic nepovirus*, or strawberry latent ringspot nepovirus*, or tomato black ring nepovirus occur: field freedom; countries where raspberry ringspot nepovirus occurs: place of production freedom ✓ ***Castanea***: requirements for *Ceratocystis parasitica*, *Ceratocystis fagacearum* and *Ophiostoma piceae**; ✓ ***Juglans***: from countries where *Q. perniciosus** occurs: free from or fumigation; ✓ ***Prunus***: Derived from material free (by testing) from relevant quarantine pests, specific requirements for plants originating from countries where *X. arboricola* pv. *pruni**, *M. fructicola**, *Q. perniciosus** occur. ✓ ***Ribes*** from countries where *Q. perniciosus** occurs: free from or fumigation × ***Solanum*** from Asia, Australia or America except Canada: prohibited ✓ ***Vitis***: specific requirements for virus and phytoplasma diseases*; from where *Q. perniciosus** occurs: free from or fumigation
Turkey		✓ All plants: requirements regarding growing medium, import permit, PC, free from soil or free from pests and treated; ✓ Plants with roots gown in the open air: PFA for Clavibacter michiganensis subsp. sepedonicus, Globodera pallida*, G. rostochiensis* and Synchytrium endobioticum*; ✓ Woody plants: free from plant debris, flowers and fruit; various other requirements ✓ Herbaceous perennial plants of several families (incl. Leguminosae, Rosaceae): plants grown in nurseries; free from plant debris, flowers and fruits; inspected prior to export and found free from signs or symptoms of pests, or treatment; specific requirements for *Liriomyza brassicae, L. bryoniae, L. huidobrensis L. sativae, L. trifolii* and *Amauromyza maculosa*. ✓ ***Camellia***: requirements for *Ciborinia camelliae* × ***Castanea****:* requirements for *Cryphonectria parasitica* ✓ ***Chaenomeles:*** requirements for *Q. perniciosus**, *E. amylovora** × ***Citrus, Persea***: specific requirements for *Radopholus citrophilus*, *R. similis* × **Conifers**: free from some specified pests (none recorded in NZ) ✓ ***Cornus*, *Euonymus*, *Fagus*, *Ligustrum Lonicera*,, *Populus*,*Salix*, *Syringa*, *Tilia***: specific requirements for *Q. perniciosus** ✓ ***Crataegus***: requirements for *Q. perniciosus**, *E. amylovora**, *Monilinia fructicola** , *Phyllosticta solitaria* ✓ ***Eriobotrya***: specific requirements for *M. fructicola** ✓ ***Juglans***: place of production freedom for *Q. perniciosus**

Annex 8. Phytosanitary import requirements of EPPO countries

Country	Prohibitions or requirements implying prohibition from NZ	Other general and specific requirements
		✓ ***Malus, Pyrus***: specific requirements (e.g. *Q. perniciosus**, non-European viruses and virus-like organisms?, *M. fructicola**, *E. amylovora**, *Phyllosticta solitaria*); ***Malus***: specific requirements for countries where apple proliferation phytoplasma, Cherry rasp leaf nepovirus, Tomato ringspot nepovirus* occur; ***Pyrus***: from countries where pear decline phytoplasma occurs ✓ **Palmae** from non-European countries: requirements for Palm lethal yellowing phytoplasma and Coconut cadang cadang cocadviroid ✓ ***Pinus***: specific requirements for some pests (incl. *Mycosphaerella pini**) × ***Platanus***: specific requirements for *Ceratocystis fimbriata* f.sp. *platani* ✓ **Poaceae** (some subfamilies and genera). grown in nurseries; free from plant debris, flowers and fruits; inspected prior to export and found free from pests or treatment ✓ ***Prunus***: specific requirements for some pests (e.g. *Q. perniciosus**, *M. fructicola**, many viruses and phytoplasmas*?); requirements for *P. persica* (*Pseudomonas syringae pv. persicae**) × ***Quercus***: requirements for *Cryphonectria parasitica Ceratocystis fagacearum* ✓ ***Ribes***: specific requirements for non-European viruses and virus-like organisms*? ✓ ***Rosa***: requirements for *Q. perniciosus** and several other pests ✓ ***Rubus***: specific requirements for Arabis mosaic nepovirus*, Raspberry ringspot nepovirus, Strawberry latent ringspot nepovirus*, Tomato black ring nepovirus, non-European viruses and virus-like organisms? × **Solanaceae**: requirements for potato stolbur phytoplasma ✓ ***Sorbus***: requirements for *Q. perniciosus**, *E. amylovora** ✓ ***Ulmus,Zelkova***: requirements for elm phloem necrosis phytoplasma, *Ophiostoma ulmi**, *Q. perniciosus**. × **Vitis**: requirements for Grapevine Flavescence dorée phytoplasma and *Xylophilus ampelinus*
Ukraine		✓ All plants: import permit, PC; free from quarantine pests or disinfested at the points of entry.

Table 2. Wood of host species
Note: None of the phytosanitary import requirements for wood imply a prohibition from New Zealand.

Country	General and specific requirements
Albania	✓ All non-squared or squared wood: import permit, PC
Algeria	✓ All non-squared or squared wood: PC × ***Castanea*** (squared or not) from countries where *Cryphonectria parasitica* occurs: treatment × **Conifers** (squared or not): free from *Bursaphelenchus xylophilus*; Non-squared with bark: Free from *Dendroctonus* spp. and *Ips* spp. ✓ ***Pinus*** (squared or not): free from *Mycosphaerella dearnessii*, *Mycosphaerella gibsonii* and *Mycosphaerella pini**
Belarus	✓ All squared wood: PC ✓ All non-squared wood: import permit, PC
Croatia	✓ All non-squared or squared wood (except sawn wood): PC ✓ **Conifers** (non-squared): debarking or kiln-drying × ***Castanea*** (non-squared) from USA: debarking or kiln-drying × ***Platanus*** (non-squared) from France, Italy, Switzerland or USA: prohibited × ***Populus*** (non-squared) from North America, Central America or South: debarking or kiln-drying × ***Quercus*** (non-squared) from Romania, USA or CIS countries: debarking or kiln-drying
EU countries, Norway, Switzerland	✓ **Conifers** (IV.A.I.1.6) from origins other than Russia, Kazakhstan and Turkey, European countries, Canada, China, Japan, the Republic of Korea, Mexico, Taiwan and the USA (where *Bursaphelenchus xylophilus* is known to occur): bark-free and free from grub holes, caused by the genus *Monochamus* spp., or kiln-drying, orfumigation, or chemical pressure impregnation or heat treatment (requirements for wood of conifer from the individual countries listed above are not listed here) ✓ **Conifers** and ***Castanea*** is also subject to some requirements for protected zones (IV.B.1 to 6) Requirements for inspection (V.B.I.6) (for some custom codes only, listed in the same article):

Annex 8. Phytosanitary import requirements of EPPO countries

Country	General and specific requirements
	✓ **Conifers** (Coniferales), from non-European countries, Kazakhstan, Russia and Turkey × ***Quercus*** from the USA, *Platanus* from the USA and Armenia, *Populus* from the American continent, *Acer saccharum* from USA and Canada; *Fraxinus*, *Juglans mandshurica*, *Ulmus davidiana*, *Ulmus parvifolia* and *Pterocarya rhoifolia* from Canada, China, Japan, Mongolia, Rep. of Korea, Russia, Taiwan and USA Inspection for certain protected zones (for some customs codes): ✓ **Conifers** (Coniferales), excluding wood which is bark-free originating in European third countries, and *Castanea* Mill., excluding wood which is bark-free Other requirements do not apply to New Zealand: × ***Acer saccharum*** from USA and Canada: specific requirements × ***Fraxinus, Juglans mandshurica, Ulmus davidiana, Ulmus parvifolia*** and *Pterocarya rhoifolia* from Canada, China, Japan, Mongolia, Rep. of Korea, Russia, Taiwan & USA: PFA for *Agrilus planipennis* or squared. × ***Quercus*** from the USA: squared or bark free or sawn and kiln-dried × ***Platanus*** from the USA or Armenia: kiln-drying × ***Populus*** from the American continent.: bark free or kiln-drying
Israel	✓ All squared or non-squared wood: IP, PC.
Jordan	✓ All squared or non-squared wood: IP.
Khirghistan	✓ All squared or non-squared wood: IP, PC, place of production and buffer zone inspected during the last growing season and found free from quarantine pests, fumigation before dispatch.
Moldova	✓ All squared or non-squared wood: PC, IP, disinfection
Morocco	✓ All non-squared wood with bark: PC
Russia	× Non-squared *Pinus (*prohibited from countries where *Bursaphelenchus xylophilus* occurs)
Tunisia	✓ All squared or non-squared wood: PC. × ***Castanea*** squared and non-squared wood: area freedom for *Cryphonectria parasitica;* non-squared: debarking × **Conifers** non-squared from countries outside Europe and Mediterranean area: debarking × ***Quercus***: non squared from Romania or CIS: PFA *C. parasitica* and *Ophiostoma picea**, or debarking and squaring, or debarking and drying
Turkey	✓ All squared or non-squared wood: PC; ✓ Sawn wood (squared or not): kiln drying; ✓ Squared wood: free from pests ✓ Sawn non-squared wood (except Coniferae): debarking and free from pests; ✓ Non-squared wood (except Coniferae) (free from pests and debarking or fumigation); ✓ Firewood (except coniferae: free from pests and fumigation if foliage) × **Conifers** squared: free from *Bursaphelenchus xylophilus* and *Pissodes* spp; Conifers non-squared: debarking and specific requirements for several pests (incl. none recorded in NZ), firewood prohibited × ***Abies*** (squared and non-squared): free from *Orthotomicus erosus* ✓ ***Pinus*** (squared or not): free from several pests (incl. *Mycosphaerella pini**) × ***Platanus*** (squared or not): free form *Ceratocystis fimbriata* f.sp. *platani* × ***Castanea***, ***Quercus*** (squared or not): free from *Cryphonectria parasitica.*