Department for Environment Food & Rural Affairs

Rapid Pest Risk Analysis (PRA) for:

Oligonychus perditus

31st January 2015

Stage 1: Initiation

1. What is the name of the pest?

Oligonychus perditus Pritchard & Baker,1955. Acari: Family Tetranychidae
Synonym: *Oligonychus chamaecyparisae* Ma & Yuan (1976).

2. What initiated this rapid PRA?

Oligonychus perditus is regulated by the EU to prevent its entry on *Juniperus* L. Following its addition to the Risk Register a PRA was requested for this pest to assess the risk of entry on other pathways and to determine whether these regulations may need extending to take into account its full host range.

3. What is the PRA area?

The PRA area is the United Kingdom of Great Britain and Northern Ireland.

Stage 2: Risk Assessment

4. What is the pest's status in the EC Plant Health Directive (Council Directive 2000/29/EC[1]) and in the lists of EPPO[2]?

Oligonychus perditus is listed in Annex II/AI of EC Plant Health Directive as a harmful organism that is banned from entry to, or spread within, the EU on plants of the genus *Juniperus* L., other than fruit and seeds, originating in non-European countries. It is listed by EPPO as an A1 quarantine pest.
Additionally, the host plants *Juniperus* L. and *Chamaecyparis* Spach originating from non-European countries are also banned from entry to the EU under Annex III of the EC Plant Health Directive. There are however, derogations for naturally or artificially dwarfed plants of *Chamaecyparis* and *Juniperus* originating from Japan (Commission Decision 2010/645/EU of October 26th) and the Republic of Korea (Commission Decision 2010/646/EU of October 26th). Both derogations stipulate that imports of *Juniperus* should only take place between January and March each year. Naturally or artificially dwarfed plants originating in non-European countries are also regulated and heavily inspected under Annex IVAI of the EC Plant Health Directive.

5. What is the pest's current geographical distribution?

The distribution in Table 1 is taken from Migeon, A & Dorkeld, F (2006 – 2013) Spider Mites Web (http://www1.montpellier.inra.fr/CBGP/spmweb/) and EPPO PQR (2014). It is also known to have been intercepted in the Netherlands and USA. In 1994, it was reported that a small population of *O. perditus* survived eight winters on a solitary imported plant in an educational garden in the Netherlands (CABI CPC, 2014). The species was described on intercepted *Juniperus* material in the USA by Pritchard & Baker (1955) (EPPO, 1997). It has never established outside of its original distribution in eastern Asia.

Table 1 : Distribution of *Oligonychus perditus*

North America:	-
Central America:	-

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0029:20100113:EN:PDF

[2] https://www.eppo.int/QUARANTINE/quarantine.htm

South America:	-
Europe:	-
Africa:	-
Asia:	China (*Anhui, Gansu, Guangdong, Hong Kong, Jiangsu, Jiangxi, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan*); Japan (*Hokkaido, Honshu*); Republic of Korea; Taiwan
Oceania:	-

6. Is the pest established or transient, or suspected to be established/transient in the UK/PRA Area?

The pest is absent from the UK and there are no recorded interceptions.

7. What are the pest's natural and experimental host plants; of these, which are of economic and/or environmental importance in the UK/PRA area?

The following hosts are taken from EPPO PQR (2014), CABI CPC (2014) and Spider Mites Web (Migeon & Dorkeld, 2013):

Cupressaceae: *Chamaecyparis funebris*; *Chamaecyparis obtusa*; *Chamaecyparis pisifera*; *Chamaecyparis* sp. *Cryptomeria japonica*; *Cupressus funebris*; *Fokienia hodginsii*; *Juniperus chinensis*; *Juniperus communis*; *Juniperus formosana*; *Juniperus x media; Juniperus rigida*; *Juniperus sabina*; *Juniperus* spp.; *Juniperus virginiana*; *Platycladus orientalis*.

Rosaceae: *Prunus salicina*.

Taxaceae: *Taxus cuspidata*.

Theaceae: *Camellia sinensis*.

Ma & Yuan (1976) (studying the mite under the synonym *Oligonychus chamaecyparisae*) also recorded the host *Biota orientalis*. This is considered a synonym of *Platycladus orientalis* (www.theplantlist.org, data supplied 2012).

Chamaecyparis pisifera, *Juniperus chinensis*, *Platycladus orientalis* are listed by EPPO PQR (2014) as major hosts. Of these only *Juniperus chinensis* is regulated for *O. perditus*, but *Chamaecyparis pisifera* is also regulated under Annex III.

The majority of hosts are coniferous, with the exception of *Prunus salicina* and *Camellia sinensis*. However, these are listed by CABI CPC (2014) as host plants in the context of

habitat/association, and are not known to be attacked by the pest and therefore not considered to be true hosts.

The Netherlands carried out a glasshouse experiment in which the mite was successfully reared on *J. communis*, *J. x media*, *J. sabina*, *J. virginiana* and *Platycladus orientalis* (EPPO, 1997). Rearing failed on *Chamaecyparis lawsoniana*, *Ilex crenata*, *Picea abies, Picea mugo*, *Rhododendron catawbiense*, *Taxus baccata* and *Vaccinium vitis-idaea*.

Of the known hosts *J. communis* is of particular importance to the UK as it is one of Britain's three native conifer species and a priority species in the UK Biodiversity Action Plan (JNCC, 2014). The UK natural distribution of cypress (*Chamaecyparis* and *Cupressus*) is more restricted (BSBI maps, 2014), but cypress are popular hardy ornamental garden and landscape species, as is *Platycladus orientalis*.

8. What pathways provide opportunities for the pest to enter and transfer to a suitable host and what is the likelihood of entering the UK/PRA area?

Pathway 1: Plants for planting

The movement of *O. perditus* in trade goes back to the 1950's, with the first known interceptions in the USA at Seattle, Washington in 1950, and again at San Francisco, California in 1951. On all these occasions adult mites were detected on *Juniperus* planting material arriving from Japan, but the species was not formally described until 1955 (Pritchard & Baker, 1955). The listing by the EU followed the finding of heavily damaged ornamental bonsai *Juniperus* in the Netherlands (CABI CPC, 2014; Vierbergen, 1989).

Since 1996 there have been 8 interceptions of *O. perditus* reported on Europhyt (Accessed Nov 2014), ranging from 1999 to 2007 (data extracted November 2014), one in Germany on *Juniperus* sp. and the remainder in the Netherlands on *J. chinensis* and, in one case, *J. rigida*. All interceptions were on bonsai from Japan. Earlier records also exist of interceptions by the Netherlands in 1992 and Germany from 1991 and 1992, again on *J. chinensis* (Plant Protection Service of the Netherlands, 1992; Der Bundesminister für Ernahrung, Landwirtschaft und Forsten, 1992). It is not known how much of this planting material is entering the EU.

Oligonychus perditus is listed as an II/AI harmful organism in the EC Plant Health Directive, being banned on plants of *Juniperus* L., other than fruit and seeds, originating in non-European countries. Additionally, *Juniperus* L. and *Chamaecyparis* Spach plants from non-European countries are also banned from entry to the EU under Annex III of the EC Plant Health Directive. Thus the risk of *O. perditus* entering the EU on *Juniperus* and *Chamaecyparis* is reduced. However, derogations are in place for naturally or artificially dwarfed plants of these genera originating from the Republic of Korea and Japan (see section 4), but these come with restrictions relating to the time of year of import for *Juniperus* and there is further regulation and inspection under Annex IV/AI of the EC Plant Health Directive. The numbers of interceptions reported have not been high, but the 8 interceptions from Japan since 1996 do demonstrate that bonsai imports remain a potential pathway. None of the other potential hosts, including *Platycladus orientalis* (which is recorded as a major host) are listed. Many of the unregulated conifers are

popular hardy ornamentals, although there are no data on the numbers grown in the UK compared to those imported.

In terms of detection, *O. perditus* can only be positively identified by the morphological examination of slide mounted specimens of both sexes in conjunction with published keys and descriptions as there are more than 200 known species in the genus *Oligonychus* Berlese, 1886. Of these at least three species, namely *O. coffeae* (Neiter), *O. punicae* (Hirst) and *O. mangiferus* Rahman & Sapra, share the same host and geographical range as *O. perditus* (Spider Mites Web (Migeon & Dorkeld, 2013)). In addition, the native *O. unuguis* occurs on a wide range of coniferous hosts in UK. In life *O. perditus* resembles many other species of spider mites with adults being no more than 0.45 mm in body length; pale greenish yellow. As such they are highly cryptic and difficult to detect when present at low levels. Plants with a low level spider mite infestation can be asymptomatic, whereas more heavily infested plants can exhibit a range of symptoms including foliar discolouration, browning and distorted growth.

Overall there is good evidence that this species does move on plants for planting, despite *Juniperus* spp. and *Chamaecyparis* spp. being regulated and there being no data on the movement on other hosts. It should also be noted that mites can be inadvertently transported on non-host plants, and are highly cryptic and difficult to detect at low levels. This pathway is rated moderately likely, with medium confidence.

Plants for planting	Very unlikely	☐	Unlikely	☐	Moderately likely	☑	Likely	☐	Very likely ☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐			

Pathway 2: Cut flowers or branches

Cut flowers and branches of host species are a possible pathway, and were identified as such by EPPO (EPPO PQR, 2014). Annex III of the EC Plant Health Directive covers plant products as well as plants, and as such prohibits the import of *Juniperus* and *Chamaecyparis* branches from non-European countries. Additionally, there are no known instances of interceptions on such material and no data on how frequently such material may be imported into the UK. Given that damage causes discoloration, which may be detected as the material is handled, the low chance of transfer to native hosts of concern, and the regulation of known major hosts this pathway is rated as unlikely, with high confidence.

Cut flower or branches	Very unlikely	☐	Unlikely	☑	Moderately likely	☐	Likely	☐	Very likely ☐
Confidence	High Confidence	☑	Medium Confidence	☐	Low Confidence	☐			

9. How likely is the pest to establish outdoors or under protection in the UK/PRA area?

The distribution of *O. perditus* in China and Japan (up to Hokkaido in the north), suggests it can survive a wide range of temperatures, including cold winters. Xu *et al*. (2002) found that the development of *O. perditus* took 29.4 days at 17ºC and 7.8 days at 35ºC. Based on this they reported that 11 generations may occur in areas of Shandong province, China.

In the Netherlands a small population of *O. perditus* survived eight winters on a solitary imported plant in an educational garden (CABI CPC, 2014), which suggests that survival in the UK would be possible. However, no other infestations of the mite were found in the garden. It was confirmed that the mites overwinter as eggs (Vierbergen, 1989).

Based on the evidence available, a rating of likely, with medium confidence is given for the UK, with southern areas and urban heat islands being at highest risk.

None of the records of interceptions state whether the affected plants were under protection. However, the Dutch carried out a glasshouse experiment in which the mite was successfully reared on *J. communis*, *J. x media*, *J. sabina*, *J. virginiana* and *Platycladus orientalis* (EPPO, 1997). If the hosts are present under protection, and bonsai may well be, then there appears to be no reason why the pest could not survive. Very likely, high confidence.

Outdoors	Very unlikely	☐	Unlikely	☐	Moderately likely	☐	Likely	☑	Very likely ☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐			
Under Protection	Very unlikely	☐	Unlikely	☐	Moderately likely	☐	Likely	☐	Very likely ☑
Confidence	High Confidence	☑	Medium Confidence	☐	Low Confidence	☐			

10. If the pest needs a vector, is it present in the UK/PRA area?

The organism is free living and does not require a vector.

11. How quickly could the pest spread in the UK/PRA area?

Locally, spider mites are able to move readily between plants. Long range natural spread is dependent on the wind or carriage with animals, such as birds and insects. Potentially spider mites may be able to disperse widely on air currents. However, when a population of *O. perditus* was found to have survived for eight years in the Netherlands, the mites had remained on the plant on which they were imported and no other infestations were found

in the surrounding area, although it is not known if other hosts were present (CABI CPC, 2014).

Spread with trade is likely to be more rapid, carried on planting material.

Natural Spread	Very slowly	☐	Slowly	☐	Moderate pace	☑	Quickly	☐	Very quickly	☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐				

With trade	Very slowly	☐	Slowly	☐	Moderate pace	☐	Quickly	☑	Very quickly	☐
Confidence	High Confidence	☑	Medium Confidence	☐	Low Confidence	☐				

12. What is the pest's economic, environmental and social impact within its existing distribution?

Heavily infested plants can exhibit symptoms including browning and distorted growth.

Damage to *J. chinensis* has been reported in Japan, but with no indication as to the severity (EPPO, 1997). Hong (1996) reported *O. perditus* as being one of the species causing severe damage to ornamental plants in the Jiangxi Province of China.

Severe damage was reported in the Netherlands on intercepted *Juniperus* material (Vierbergen, 1989) and, following this, glasshouse experiments were conducted. From these it was reported that *J. virginiana* and *Platycladus orientalis* were very sensitive to *O. perditus*, although there are no details as to exactly what this means (EPPO, 1997). There is no data available regarding the level of impact the mites had on the one finding in the Netherlands in an educational garden, but the fact that it was infested for 8 years suggests this is how long it took for the mites and damage to be noticed.

Impacts	Very small	☐	Small	☐	Medium	☑	Large	☐	Very large	☐
Confidence	High Confidence	☐	Medium Confidence	☐	Low Confidence	☑				

13. What is the pest's potential to cause economic, environmental and social impacts in the UK/PRA area?

The number of hosts of *O. perditus* under glass is likely to be small due to their hardy nature, although there may be some valuable bonsai plants under protection. Most host species will be grown locally in nurseries or gardens. In either case there is the potential for the pest to be noticed and controlled or eradicated. The occurrence for 8 years on one

tree in an educational garden in the Netherlands does suggest that the mite is unlikely to spread quickly, although it does also suggest that low levels of infestation may not be spotted quickly. Of most concern would be the planting of infected *Juniperus* spp. in the wild, but the only junipers coming in from areas where the mite is present are bonsai under derogation.

The UK already has a similar species, *O. ununguis*. The host range of this includes that of *O. perditus*, but is much wider (Spider Mites Web (Migeon & Dorkeld, 2013)). The Wales and Ireland Forestry led project IMPACT (http://impactproject.eu/insectsdb.php), listed *O. ununguis* as causing severe damage to trees under glass. Damage also occurs on outdoor trees, with, for those applications where reasons were given, this species being targeted by 40% of Acaricides applied to Christmas trees. (Garthwaite *et al*., 2009). However, these reports do seem to suggest that damage is either localised or can be managed.

Based on current evidence economic, environmental and social impacts would be small, with medium confidence. This is based on the presence of a similar mite already and growers already potentially using controls against this mite, but taking into account the potentially high value of some of the imported bonsai and wild junipers.

Economic Impacts	Very small	☐	Small	☑	Medium	☐	Large	☐	Very large	☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐				
Environ - mental Impacts	Very small	☐	Small	☑	Medium	☐	Large	☐	Very large	☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐				
Social Impacts	Very small	☐	Small	☑	Medium	☐	Large	☐	Very large	☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐				

14. What is the pest's potential as a vector of plant pathogens?

Oligonychus perditus is not known to be a vector of plant pathogens.

15. What is the area endangered by the pest?

Southern England and urban heat islands are the geographic areas most endangered by the pest. Based on the current regulations the industry most at risk is the hardy ornamental trade. However, given that reported interceptions are all on *Juniperus* sp. bonsai there is also risk to protected cultivation. Risk to native junipers can also not be discounted if imported juniper species were to be planted in the wider environment.

Stage 3: Pest Risk Management

16. What are the risk management options for the UK/PRA area?

(Consider exclusion, eradication, containment, and non-statutory controls; under protection and/or outdoors).

Exclusion of the pest is possible through further regulation of the host plants. *Juniperus* spp. and *Chamaecyparis* spp. are regulated, but there are derogations (see section 8) and other hosts are not regulated. One difficulty is that while heavily infested plants show browning and distorted growth, magnification is required to see feeding scars on part or the whole surface of scale leaves, suggesting low level infestation may be undetected. Also microscopic preparation is required to distinguish this from other conifer feeding species. There have been a number of interceptions on *Juniperus* bonsai over the years, but none on other planting material. A requirement for post entry quarantine and monitoring for example for 6 months would provide an opportunity for PHSI to verify that the plants are free of this mite.

Eradication of the pest could be achieved through destruction of the plant material or the use of approved acaricides, such as abamectin. However, during hibernation (in the egg stage) eradication may be difficult. It may also be difficult to eradicate if the affected hosts are large and foliage is dense.

17. Summary and conclusions of the rapid PRA

Provide an overall summary and conclusions and then short text on each section:

This rapid PRA shows: *O. perditus* is a mite pest of conifers. It is regulated on *Juniperus* spp. and both *Juniperus* and *Chamaecyparis*, another major host, are banned from entry to the EU from non-European countries, with the exception of derogations from Japan and the Republic of Korea. Other hosts are not specifically regulated. Since regulation interceptions in the EU have only been made on *Juniperus* bonsai entering under derogation from Japan. The mites are highly cryptic, and plants with a low level spider mite infestation can be asymptomatic, whereas more heavily infested plants can exhibit a range of symptoms including foliar discolouration, browning and distorted growth.

Risk of entry:

Moderately likely on plants for planting, with **medium confidence**. There are a range of regulations which are currently in place, both against the pest and some of its major hosts, but not all hosts. There have been interceptions in the EU on bonsai from Japan. **Unlikely** on cutflowers or branches – with **high confidence**.

Risk of establishment:

Based on the evidence available a rating of **likely**, with **medium confidence** is given for the UK, with southern areas and urban heat islands probably being more at risk of populations building up.
If the hosts are present under protection, then there appears to be no reason why the pest could not survive: **very likely**, **high confidence**.

Economic, environmental and social impact

Based on current evidence economic, environmental and social impacts would be **small**, with **medium confidence**. This is based on the presence of a similar mite already and growers already potentially using controls against this mite, but taking into account the potentially high value of some of the imported bonsai.

Endangered area

Southern England and urban heat islands are the geographic areas most endangered by the pest. Based on the current regulations the industry most at risk is the hardy ornamental trade. However, given that reported interceptions are all on *Juniperus* sp. bonsai there is also risk to protected cultivation. Risk to native Junipers can also not be discounted if imported Juniper species were to be planted in the wider environment.

Risk management options

Possibility of further regulation of host plants. However, the mite is cryptic and even on heavily regulated host pathways there have been interceptions. A requirement for post entry quarantine and monitoring for example for 6 months would provide an opportunity for PHSI to verify that the plants are free of this mite. Eradication of the pest could be achieved through destruction of the plant material or the use of approved acaricides.

Key uncertainties and topics that would benefit from further investigation

There are uncertainties regarding this pests' ability to establish outdoors across the UK. Warmer areas are considered at greatest risk, but how far its range could extend is unclear. Also unclear is the actual level of impact this mite can have. Information from the literature mentions severe impacts, but apart from the condition of imported and intercepted host species there is very little data.

18. Is there a need for a detailed PRA or for a more detailed analysis of particular sections of the PRA? If yes, select the PRA area (UK or EU) and the PRA scheme (UK or EPPO) to be used.

No	✓				
Yes		PRA area: UK or EU		PRA scheme: UK or EPPO	

19. Images of the pest

O. perditus: eggs and feeding damage to *Juniperus chinensis.*

Copyright: Plant Protection Service, Wageningen. Source: CABI CPC.

20. Given the information assembled within the time scale required, is statutory action considered appropriate / justified?

Yes Statutory action	✓	No Statutory action	

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