Department for Environment Food & Rural Affairs

Rapid Pest Risk Analysis (PRA) for:

Monochamus guttulatus

September 2019

(Minor update February 2021 to take account of changed legislation)

Summary and conclusions of the rapid PRA

During the creation of DEFRA's ash pest list in response to ash dieback, *Monochamus guttulatus* was identified as a potential pest of ash that could cause damage within the UK. Given the very high degree of uncertainty surrounding the pest, a risk register entry and subsequent PRA was requested.

This rapid PRA shows:

Monochamus guttulatus is a beetle pest of a wide range of broadleaved hosts in the Russian Far East, northern China and Korea. The pest causes no significant economic impact in its current distribution. The available information about the pest is very limited with very high degrees of uncertainty surrounding every aspect of this PRA.

Risk of entry

Entry through plants for planting, squared and non-squared wood and wood chips have all been assessed as unlikely or moderately likely. There is a moderate volume of trade for wood and wood products from the pest's current distribution, but phytosanitary requirements on them are likely to reduce the risk of entry. Significant uncertainties around

elements of this pest's life cycle limit how conclusive this assessment can be. There is no evidence this pest has ever moved in trade.

Risk of establishment

This pest has been rated as likely to be able to establish in the UK, with high uncertainty. Summer temperatures in the UK are similar to the pests current distribution but with significantly warmer winters. The lack of detailed distribution data, thermal requirements and basic elements of the pest's biology limit the analysis that can be done for this pest's establishment.

Economic, environmental and social impact

No evidence of significant economic, environmental or social impacts have been found for this pest in its current distribution. The possibility of the pest causing more damage in the UK due to higher winter temperatures or the absence of natural predation are discussed. Without more information impacts have been assessed as very small, with low confidence.

Endangered area

Several broadleaved tree species in the UK could be considered at risk of this pest, as well as potential damage to the timber industry. There is too much uncertainty surrounding this pest to provide an accurate assessment of what is at risk however, with key uncertainties including not knowing if it can even damage healthy living hosts.

Risk management options

Current phytosanitary requirements on plants for planting and wood imports are not likely to provide comprehensive prevention of this pest's entry. If established, eradication from the wider environment would be difficult, but may be aided by the slow rate of natural spread expected for this pest.

Key uncertainties and topics that would benefit from further investigation

All elements of this risk assessment are subject to a high degree of uncertainty owing to the general lack of information about this pest. Detailed data on current distribution, lifecycle information and climatic requirements would increase the reliability of this assessment significantly. Should any further information be found for this pest, or if it is observed to have caused any significant damage in its current distribution, it is recommended this PRA is reviewed.

Images of the pest

Adult *Monochamus guttulatus* (dorsal view). The length is approximately 12 mm. *Image courtesy Udo Schmidt, 2017, https://www.flickr.com/photos/coleoptera-us/36232792500*

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.

A more detailed PRA is unlikely to resolve any of the issues identified in this Rapid PRA. The difficulty with a risk assessment of this pest stems from the lack of available information. Should any new information arise it would be necessary to review this rapid PRA.

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

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

Because of the lack of detailed information about this pest's potential impact and the high possibility of establishment should it arrive, statutory action is considered appropriate. We do not have enough information surrounding this pest to determine the risk it poses, but it is a quarantine pest in the plant health legislation under the listing "*Monochamus* spp.". Given the possibility of this pest causing more damage in the UK than its native range, continued exclusion is a sensible approach in the absence of certainties over its potential impact.

Yes Statutory action	✓	No Statutory action	

Stage 1: Initiation

1. What is the name of the pest?

This pest is *Monochamus guttulatus*, a beetle in the family Cerambycidae. No common names have been identified for it. Species in the family in general may be called longhorn or longicorn beetles.

2. What initiated this rapid PRA?

During the creation of DEFRA's ash pest list in response to ash dieback, *Monochamus guttulatus* was identified as a potential pest of ash that could cause damage within the UK. The pest was added to the UK Plant Health Risk Register, but information was limited, and a PRA was requested to better resolve the high degree of uncertainty surrounding the pest.

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 plant health legislation, and in the lists of EPPO[1]?

The relevant legislation for Great Britain is The Plant Health (Phytosanitary Conditions) (Amendment) (EU Exit) Regulations 2020[2]), where all species of *Monochamus* are quarantine pests. In Northern Ireland, EU legislation 2019/2072[3] continues to apply, and this listing is for non-European *Monochamus* spp., which includes *M. guttulatus*. However, the associated measures in the associated annexes on special requirements only apply to coniferous trees and wood.

Monochamus guttulatus is not included in any of EPPO's lists.

[1] https://www.eppo.int/ACTIVITIES/quarantine_activities (accessed 1 August 2018)
[2] https://www.legislation.gov.uk/uksi/2020/1527/contents/made
[3] http://data.europa.eu/eli/reg_impl/2019/2072/oj

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

Within Russia the beetle is common in the far eastern region around the Primorsky territory (Cherepanov, 1990). We do not know the full extent of its distribution in China, but it is found in the north east in the Heiongjang, Henan, Jilin and Liaoning provinces (Pu, 1980). It is found across North and South Korea (Cherepanov, 1990).

Table 1: Distribution of *Monochamus guttulatus*	
North America:	Not present.
Central America:	Not present.
South America:	Not present.
Europe:	Not present.
Africa:	Not present.
Asia:	China (limited distribution) (Cherepanov, 1990); North Korea (Cherepanov, 1990); Russia (limited distribution) (Kuprin & Yi, 2019); South Korea (Insectapro, 2019).
Oceania:	Not present.

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

There are no records or *Monochamus guttulatus* in the UK and no recorded interceptions in the UK. There are also no interceptions recorded on Europhyt from EU member states.

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?

Monochamus guttulatus is associated with many broadleaved trees found within eastern Russia, China and the Korean peninsula. It is difficult to produce a specific host list for this pest given its polyphagous nature and lack of literature about it.

Cherepanov (1990) identified the beetle in a survey of Cerambycidae in Russian forests. *Monochamus guttulatus* was found on a range of species in varying numbers, including oak, Manchu stripe maple, European bird cherry, Manchurian walnut, hornbeam, hazelnut, alder, elm, willow, plum and birch. Some of this host list also appears in Lep (1996) in a key to Russian Coleoptera, which also lists cedar as a potential host, but this is based solely on a loose translation of Russian. Pu (1980) has a single reference to *M. guttulatus* in China, on willow. Cedar, elm and ash are all uncertain hosts, listed as being common in forests that *M. guttulatus* has been found in but we do not have specific information confirming they are hosts (Kuprin & Yi, 2019). During the creation of the *Fraxinus* pest list we also received advice from a researcher in Russia that this pest has been found on ash (Andrey Selikhovkin, pers. comm., citing Izhevskiy *et al.* (2005))..

Because of the polyphagous nature of this pest and the lack of any detailed host information we do not have a good idea of what hosts are at risk in the UK. There is no information surrounding host preference and the feeding habits of this pest. This host list is not definitive, but the wide array of families it feeds on suggests the actual range of hosts might be much larger than is presented here.

Based on the hosts recorded in Cherepanov (1990) many of these genera are of significant economic importance to the UK. *Alnus, Betula, Prunus, Quercus, Salix* and *Ulmus* are amongst the most common UK broadleaved trees and of very high economic, environmental and social value to the UK.

Table 2: Hosts of *Monochamus guttulatus*

Family	Species	Common name	Reference
Betulaceae	*Alnus*	Alder	Cherepanov, 1990
Betulaceae	*Betula*	Birch	Cherepanov, 1990
Betulaceae	*Carpinus*	Hornbeam	Cherepanov, 1990
Betulaceae	*Corylus*	Hazelnut	Cherepanov, 1990
Fagaceae	*Quercus*	Oak	Cherepanov, 1990
Juglandaceae	*Juglans mandshurica*	Manchurian walnut	Cherepanov, 1990
Oleaceae	*Fraxinus mandshurica*	Manchurian ash	Izhevskiy *et al.*, 2005
Rosaceae	*Prunus*	Plum	Cherepanov, 1990
Rosaceae	*Prunus padus*	Bird cherry	Cherepanov, 1990

Table 2: Hosts of *Monochamus guttulatus*			
Family	**Species**	**Common name**	**Reference**
Sapindaceae	*Acer tegmentosum*	Manchu stripe maple	Cherepanov, 1990
Salicaceae	*Salix*	Willow	Cherepanov, 1990
Ulmaceae	*Ulmus*	Elm	Cherepanov, 1990

8. Summary of pest biology and/or lifecycle

Most information used for this summary is based on old taxonomic descriptions of the pest, with very little literature available. Eggs of *Monochamus guttulatus* are laid within 2-3 mm cavities chewed into the bark of the host tree, with one egg per cavity and emergence occurring within two to three weeks (Cherepanov, 1990). Cherepanov (1990) suggests the beetle prefers shoots between 2 and 8 cm in diameter, but it is not clear if this is adult feeding damage or for identifying new sites for creating larval galleries. Young larvae live in or under the bark and produce longitudinal sinuous galleries filled with fibrous frass. Later instar larvae bore 5 cm or more into the wood and pupate within the gallery. Within Russia, pupae are found between May and July, and develop within three weeks. Under laboratory conditions, at 21.2°C an adult beetle emerged on April 12th from a pupa formed on March 24th (Cherepanov, 1990).

Monochamus guttulatus remains in immature stages in a larval or pupal form for 2 years, only developing into an adult after two over-winterings (Cherepanov, 1990). Adult beetles nibble a round flight opening and emerge from the wood between June and July, and are flying between July and the end of August. Adults feed on the bark of trees, and appear to be polyphagous across a range of broadleaved species (Cherepanov, 1990).

Cherepanov (1990) states that *M. guttulatus* is found in dying trees. It is not clear if this pest would be a primary pest of healthy trees or if it predominantly feeds and reproduces on dead or very heavily stressed hosts. *Monochamus* species typically colonise dead or dying trees, and have very little direct impact on living trees outside of any vectored species they may carry (Bragard *et al.*, 2018).

9. 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?

Producing an accurate estimation of the risk of different pathways is very difficult without a comprehensive picture of this beetle's lifecycle, distribution or of the hosts it is associated with.

There is no evidence to suggest this pest has ever spread via trade, with a tight local distribution centred on the Russian Far-East, parts of northern China and the Korean peninsula (Cherepanov, 1990).

Plants for planting

It remains unclear if *Monochamus guttulatus* associates with living hosts. If it does so, hosts could be imported with eggs in cavities, larvae under the bark or later instar larvae and pupae within galleries in the wood. Larval and pupal stages would be difficult to detect during an inspection. Adult beetles could be associated with the bark, if they feed on living hosts (Cherepanov, 1990). It is not clear if *M. guttulatus* feeds on young saplings at an age most are likely to be imported.

There are significant restrictions on the import of several known hosts from the regions this pest is present. There is a prohibition, until such time as a risk assessment has been conducted, on specified genera of plants for planting (excluding seeds, *in vitro* material or artificially dwarfed plants) from outside the EU and Switzerland. This temporary prohibition applies to all but one of known hosts of *M. guttulatus*. i.e. *Acer, Alnus, Betula, Corylus, Fraxinus, Juglans, Prunus, Quercus, Salix* and *Ulmus* are included, leaving only *Carpinus* which is permitted. Even if *M. guttulatus* is associated with additional hosts, it is possible that the new hosts may also be in the list of temporary prohibitions. Even if some imports were to be permitted in future following risk assessments, other requirements continue to apply:

- All deciduous trees for planting must be grown in a nursery subject to routine inspection and subjected to appropriate treatments and to be dormant and free from leaves.
- *Prunus* plants for planting are prohibited from any third country outside of the Euro-Mediterranean area, which does not include any region in Russia this pest is known to be found.
- *Juglans ailantifolia, J. mandshurica* and *Ulmus davidiana* from Korea, Russia and China must also be accompanied by an official statement that they are free of *Agrilus planipennis*.
- *Quercus,* can be imported if dormant and free from leaves. Measures which require hosts to be dormant and free from leaves are unlikely to restrict the movement of this pest.

Specific data on the volume of trade for the host list from these regions was not possible to acquire, but trade in live plants for planting of these species is likely quite low and most known hosts are currently prohibited (other than artificially dwarfed plants, i.e. bonsai). As we do not have a complete host list, do not have a definite association of this pest with healthy living plants and the pest is highly polyphagous, any assessment of plants for planting as a viable pathway is difficult to make with. Due to the low level of trade in plants for planting, and the lack of definitive evidence this pest has ever moved in trade, this pathway has been rated as unlikely. Due to the current prohibitions on many deciduous woody genera including all but one of the known hosts, this judgement is made with high confidence. but if trade were to resume from countries in the range of *M. guttulatus* following the appropriate risk assessments, the likelihood and confidence ratings would require revision.

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

Bark, Non-squared wood and Woodchip

This pest is likely to be associated with bark, non-squared wood and potentially woodchip. Adult *M. guttulatus* feed on the bark of trees, young larvae live under the bark, and later instars of larvae bore up to 5cm into the wood (Cherepanov, 1990). The most likely route of entry of this pest will be the import of larval forms embedded within wood, a lifecycle stage they will persist in for up to two years (Cherepanov, 1990).

It is unclear if the specific requirements for the import of non-squared wood from China, Russia and South Korea (Forestry Commission, 2018) are likely to prevent the entry of this pest. Sawn wood of the two relevant species of *Juglans* must originate in areas free from *Agrilus plannipennis* or has undergone irradiation. *Prunus* imports must have originated in an area free from *Saperda candida* (of which there is no apparent overlap with the distribution of *M. guttulatus*) or have undergone heat treatment to 56°C. *Alnus, Betula, Salix* and *Ulmus* sawn wood from these regions must have originated in area free from *Anoplophora glabripennis* or have undergone heat treatment.

From the host list of *Monochamus guttulatus*, only cedar is coniferous, and this should be regarded as a highly uncertain host. Coniferous woodchip from China and South Korea must have undergone heat treatment to 56°C for at least 30 minutes. From Russia, the woodchip must be associated with an official statement that the wood originates from an area known to be free from *Monochamus* species. Non-coniferous woodchip from *Juglans* and *Ulmus* must originate in area free from *Agrilus plannipennis*.

There is a moderate volume of trade in non-squared wood and woodchip from China and Russia. From Eurostat statistics for 2014-2018, 609,200kg total fuel wood (CC 44011100),

2,646,900kg sawn *Quercus* (CC 44079115) and 897,00kg of various deciduous species (CC 44079927) were imported. This is an average of 633,160kg per year of sawn wood. The total for all woodchip was 242,600kg, of which only 115,00kg was specified to be non-coniferous (CC 44012100, & 44012200). This is likely to be under representative of the total level of imports due to difficulties in identifying a specific commodity code, and much of the woodchip being a mix of deciduous and coniferous species. It is important to note this refers to all imports from across China and Russia, not just from regions in which this pest is found (which is subject to a high degree of uncertainty). The data also does not account for trade that first moves via another European country into the UK. The full list of commodity codes used in this PRA can be found in Annex 1.

Because of the likely under reported volume of trade in this pathway, the possibility that measures to treat the wood are not guaranteed to remove the pest in all instances or are being applied evenly across wood producers, the likelihood score for bark, non-squared wood and woodchip has been set at moderately likely. We have low confidence in this, owing to difficulties with both the available information on the pest's biology and difficulty in accurately recording all trade.

Bark, Non-squared wood and Woodchip	Very unlikely	☐	Unlikely	☐	Moderately likely	☑	Likely	☐	Very likely ☐
Confidence	High Confidence	☐	Medium Confidence	☐	Low Confidence	☑			

Squared wood, WPM, Wood products

Later instars of *Monochamus guttulatus* are known to bore up to 5cm into the wood (Cherepanov, 1990). Squaring is unlikely to remove them, but is likely to be effective in preventing the introduction of the youngest larvae and adult beetles. It is unclear if adults feed exclusively on the bark or if they could be found in association with squared wood. The volume of trade is less than non-squared wood, but still accounts for at least 8,882,600kg between 2014 and 2018 (CC 44079990).

Wood packaging material is most likely a viable route of entry for this pest. Eggs and larvae could be associated with WPM. It's not clear how extensively woodland in this pest's native range is used for the production of WPM, but a substantial trade in WPM occurs from China. Using multiple different commodity codes for WPM from China Eurostat, approximately over 500,000kg of WPM imported annually. Although subject to phytosanitary requirements under ISPM 15, these standards are not necessarily being applied thoroughly, and a number of intercepted pests are still found on WPM.

There is also the risk that imported furniture, and other wooden products, are exported carrying *M. guttulatus.* Specific trade in wooden furniture has not been found for this pest, but likely contribute to the already large volume of trade in wood and wood products. Because of the moderate to high volume of trade, likelihood of entry on squared wood has been rated as moderately likely, with low confidence.

Squared wood, WPM	Very unlikely	☐	Unlikely	☐	Moderately likely	☑	Likely	☐	Very likely ☐
Confidence	High Confidence	☐	Medium Confidence	☐	Low Confidence	☑			

Natural Spread

Specific data on the rate of spread of this pest is not available, but its current distribution suggests natural spread to the UK is extremely unlikely. The pest has never been found in continental Europe. This pathway has been rated as very unlikely with medium confidence.

Natural Spread	Very unlikely	☑	Unlikely	☐	Moderately likely	☐	Likely	☐	Very likely ☐
Confidence	High Confidence	☐	Medium Confidence	☑	Low Confidence	☐			

Hitchhiking (including passenger baggage)

The ability of *M. guttulatus* to survive away from a host is unknown. Movement in passenger baggage, and in association with wood or wood products being carried by passengers, remains a possibility. It has been rated as unlikely with low confidence.

Hitchhiking	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?

Monochamus guttulatus is a free living organism and does not need a vector.

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

We do not have detailed thermal requirements for this pest and an uncertain distribution makes predicting climatic suitability very difficult. Climate in Primorsky province Russia, and much of the Chinese distribution of this beetle (Heiongjang, Jilin, and Liaoning provinces) is within the DFC (subarctic and boreal) and DFB (hemiboreal) Köppen-Geiger climate zone classifications (Kottek *et al.*, 2006). These areas have similar summer temperatures to much of the UK, but significantly colder winters. Some areas in South Korea and the Heinan province in China are significantly warmer than other parts of the pest's distribution, and are found in the BSK (semi-arid steppe) and DFA (hot summer continental) climates. Without detailed distribution data it is very difficult to determine what climatic conditions this pest is currently found in.

The weatherspark database (WeatherSpark, 2019) was used to compare the climate between two UK cities, London and Aviemore in the Scottish Highlands, two extremes of UK weather, and Vladivostok in the middle of the pest's known distribution. Annual high and low temperatures between April and October are very similar between the cities (Appendix 2, A). Adults only fly between July and August in Russia, and most feeding occurs at this time. In the winter Vladivostok is significantly colder (Appendix 2, A). There is also higher precipitation and humidity in Vladivostock in the summer compared to both regions in the UK (Appendix 2, B). The average degree days above 10°C in Vladivostock falls somewhere between London, and Aviemore (Appendix 2, C).

While adults are active in the summer, climatic similarity between the UK and the pest's current distribution is very high. It is possible that the milder winters seen in the UK are actually of benefit to this pest, though without knowing whether this beetle has low temperature requirements for a period of diapause or not, this is not certain. Overwintering within the wood provides some degree of protection in the colder winters of the current distribution, but it might be this pest could emerge earlier and persist for longer in the UK's warmer climate should it establish here.

Outdoor establishment in the UK for *Monochamus guttulatus* has been rated as likely. Similar summer temperatures to the current distribution, and less harsh overwintering conditions mean establishment could be quite likely. This is subject to very high uncertainty however, owing to limited information about the life cycle, the distribution and thermal requirements of the pest.

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

We do not have any reports of damage to trees in protected cultivation. Several of the hosts of this pest however can be grown under protection, at least for part of their

development, including *Prunus* species. If introduced it is not likely that protected cultivation will offer any greater chance for establishment than growth outdoors, and so this has been rated likely, with low confidence.

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

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

We do not have specific information about the potential rate of spread of *Monochamus guttulatus*. Adult beetles are in flight between July and August (Cherepanov, 1990), but their behaviour and capacity for long distance dispersal is unclear.

Most other species of *Monochamus* are weak fliers, spreading between 1 and 4 km across their entire adult lives (Kwon *et al.*, 1999; Akbulut & Linit, 1999). The flight of *Monochamus guttulatus* is likely to be similar to these, and is as such rated as slowly with low confidence.

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

With trade, and the internal movement of plants for planting and wood within the UK the beetle could spread more quickly. Spread with trade has been marked as quickly with low confidence. We do not have enough basic information about this pest's lifecycle to accurately determine its ability to spread with trade, and we have no examples of it having moved in trade previously.

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

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

There are no reports of significant impact caused by *Monochamus guttulatus* in its existing distribution. The pest appears to be of no significant economic concern.

The extent of the damage this species can cause to a single host is unclear. In the worst case example observed by Cherepanov (1990), a 37 cm shoot of Manchu stripe walnut had seven larvae within it. There is no indication this pest can cause host mortality. We have no information about this pest's ability to damage timber post-harvest.

Impacts have been set at very small, but with low confidence, owing to the lack of information available about this pest.

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

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

It is unclear if *M. guttulatus* could cause any significant damage in the UK. There is a very high degree of uncertainty here. We do not know if UK hosts would be any more susceptible to the beetle, if the UK climate would enable higher population levels than seen in its current distribution, or if any natural predators or parasites would be present in the UK that could limit population build up.

Monochamus guttulatus is described as preferring dying trees (Cherepanov, 1990), but it is not clear if timber industries are actually at risk. There is no evidence of impact on timber production in its current distribution. Similarly, we do not have confirmation that this pest can damage healthy living hosts. It might be that only already severely stressed trees are at risk and if this is the case it's unclear *if M. guttulatus* actually presents any further risk to UK hosts that are already dying.

Economic impacts have been assessed as very small with low confidence. We do not know enough about the basic biology and impact of this pest to come to an accurate determination of its damage.

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

Many of the hosts listed for *M. guttulatus* are very common and important genera in the UK environment. We do not have a clear picture of the possible impacts of this pest however and there are no reported environmental impacts from its current distribution. Environmental impacts have been set at very small with low confidence due to the absence of information about this pest.

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

There are no indications this pest can cause significant social impact. Damage to the timber industry might result in some disruption at the local level, but without conclusive evidence timber is actually at risk this is highly uncertain. Social impacts have been set at very small with low confidence.

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

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

There is no information on whether *Monochamus guttulatus* can vector other pests.

Other species of *Monchamus* are known to vector pests. *Monochamus alternatus, M. carolinensis* and *M. galloprovincialis,* for example are vectors for the pinewood nematode *Bursaphelenchus xylophilus* (Akbulut & Linit, 1999; Akbulut & Stamps, 2012). *Pinus* species have not been reported as a host of *M. guttulatus*.

Beside any specific vectored pest, it is likely that feeding from the pest increases the likelihood of opportunistic pathogens establishing in a host.

16. What is the area endangered by the pest?

A wide array of broadleaved tree species should be considered at risk of this pest, as well as the possibility of damage to timber post-harvest.

Stage 3: Pest Risk Management

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

Exclusion

Although specific data on volume of trade in plants for planting has not been found, it is expected to be fairly low. Current requirements for most of the hosts to be dormant and without leaves are unlikely to be effective in preventing the entry of a pest that bores up to 5 cm into the wood, though the temporary prohibitions on plants for planting of many of the recorded host genera will reduce the risk of entry while such measures are in place. High phytosanitary requirements involving thermal treatments in the production of wood and woodchip, provided they are being followed, may be an effective method of excluding this pest on some pathways. Larval and pupal stages of the pest would be difficult to detect at the border on plants for planting and in wood, woodchip and WPM.

Eradication or containment

As this pest would most likely to be found in the wider environment on a very large list of hosts, eradication or containment could be difficult. Populations of *M. guttulatus* in its current distribution are not building up to economically damaging levels and if the same low population levels were found in the UK it's not clear that this pest would even be noticed or identified in the field for a long time. The very slow rate of natural spread that is anticipated for this pest might help eradication.

Non-statutory controls

We have no data about the effectiveness of available insecticides against this species, or of any possible biological controls.

18. References

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Name of Pest Risk Analysts(s)

Dr Simon Lloyd

Appendix 1

Commodity codes used in determining volume of trade of squared wood, non-squared wood and bark.

Commodity Code	Description
4401 11 00	Coniferous fuel wood in the form of logs, billets, twigs, faggots or forms (including isolated bark).
4401 12 00	Fuel wood in the form of logs, billets, twigs, faggots or similar forms (including isolated bark), of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak/tanoak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus); serviceberry, grape pear, juneberry, shadblow and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); cherry, plum, apricot, almond and peach (Prunus); firethorn and pyracantha (Pyracantha); pear (Pyrus), rowan/mountain ash (Sorbus)
4401 40 90	Wood waste and scrap, not agglomerated in logs, briquettes, pellets or similar forms, of coniferous wood and wood of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia) and elm (Ulmus).
4403 11 00	Coniferous wood in the rough which has been treated with paint, stains, creosote or other preservatives, and which has not been stripped of bark or sapwood, or roughly squared
4403 12 00	Wood in the rough which has been treated with paint, stains, creosote or other preservatives, and which has not been stripped of bark or sapwood, or roughly squared, of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus); serviceberry, grape pear, juneberry, shadblow and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); cherry, plum, apricot, almond and peach (Prunus); firethorn and pyracantha (Pyracantha); pear (Pyrus), rowan/ mountain ash (Sorbus).
4403 21 10 90	Other coniferous sawlogs
4403 91 00 00	Oak wood (Quercus) in the rough, other than oak wood which has been treated with paint, stains, creosote or other preservatives, whether or not stripped of bark or sapwood or roughly squared.
4403 95 10 00	Birch (Betula) sawlogs of which any cross-sectional dimension is 15 cm or more
4403 99 00	Non-coniferous wood (other than tropical woods specified in sub-heading note 1 to Chapter 44 of the Tariff Code or other tropical wood), in the rough, whether or not stripped of bark or sapwood, or roughly squared, and which has not been treated with paint, stains, creosote or other preservatives, of birch (Betula), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak/tanoak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus); serviceberry, grape pear, juneberry, shadblow, and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); cherry, plum, apricot, almond and peach (Prunus); firethorn and pyracantha (Pyracantha); pear (Pyrus), rowan/mountain ash (Sorbus).
4404 20 00	Split poles, and piles, pickets and stakes of wood which have been pointed but not sawn lengthwise, of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus); serviceberry, grape pear, juneberry, shadblow, and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); cherry, plum, apricot, almond and peach (Prunus); firethorn and pyracantha (Pyracantha); pear (Pyrus), rowan/mountain ash (Sorbus).

4407 91 15 00	Sanded or end-jointed oak wood (Quercus), whether or not it has been planed or sanded.
4407 91 31 00	Planed oak (Quercus) wood in the form of blocks, strips and friezes for parquet or wood-block flooring, which has not been assembled.
4407 91 39 00	Planed oak (Quercus) wood other than blocks, strips and friezes for parquet or wood-block flooring, which has not been assembled.
4407 91 90 00	Unplaned oak (Quercus) wood
4407 94 10 00	Planed cherry (Prunus) wood; and end-jointed cherry wood, whether or not it has been planed or sanded.
4407 94 91 00	Sanded cherry (Prunus) wood
4407 94 99 00	Other cherry (Prunus) wood
4407 99 27 00	Planed non-coniferous wood, and end-jointed non-coniferous wood, whether or not planed or sanded, of plane (Platanus), sweet chestnut (Castanea), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak/tanoak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus), serviceberry, grape pear, juneberry, shadblow and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); firethorn and pyracantha (Pyracantha); pear (Pyrus); rowan/ mountain ash (Sorbus).
4407 99 40 00	Sawn and sanded non-coniferous wood
4407 99 90	Other non-coniferous sawn wood
4401 21 00	Coniferous wood in chips or particles
4401 22 00	Non-coniferous wood in chips or particles, of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak/tanoak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia), elm (Ulmus), serviceberry, grape pear, juneberry, shadblow, and shadbush (Amelanchier); chokeberry (Aronia), cotoneaster (Cotoneaster), hawthorn (Crataegus), common quince (Cydonia), apple (Malus); cherry, plum, apricot, almond and peach (Prunus); firethorn and pyracantha (Pyracantha); pear (Pyrus), rowan/mountain ash (Sorbus).
4415 00 00	Wooden packing cases, boxes, crates, drums and similar packings; cable drums; pallets, box pallets and other load boards; and pallet collars of coniferous wood and wood of birch (Betula), oak (Quercus), maple (Acer), plane (Platanus), poplar/aspen (Populus), sweet chestnut (Castanea), ash (Fraxinus), Japanese walnut (Juglans ailantifolia), Manchurian walnut (Juglans mandshurica), Japanese wing nut (Ptercarya rhoifolia), tanbark oak/tanoak (Lithocarpus densiflorus), horse chestnut or buckeye (Aesculus), alder (Alnus), hornbeam (Carpinus), Katsura tree (Cercidiphyllum), hazel (Corylus), beech (Fagus), golden rain tree (Koelreuteria), willow (Salix), lime (Tilia) and elm (Ulmus).
2514 00 00	Slate, whether or not roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape
2515	Marble, travertine, ecaussine and calcareous monumental or building stone of an apparent specific gravity of 2,5 or more, and alabaster, whether or not roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape
2516	Granite, porphyry, basalt, sandstone and other monumental or building stone, whether or not roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape
6801 00 00	Setts, curbstones and flagstones, of natural stone (except slate)
6802	Worked monumental or building stone (except slate) and articles thereof, other than goods of heading 6801; mosaic cubes and the like, of natural stone (including whether or not on a backing; artificially coloured granules, chippings and powder, of natural stone (including slate)

Appendix 2

Climatic comparison of Vladivostock within the distribution of this pest and London and Aviemore.

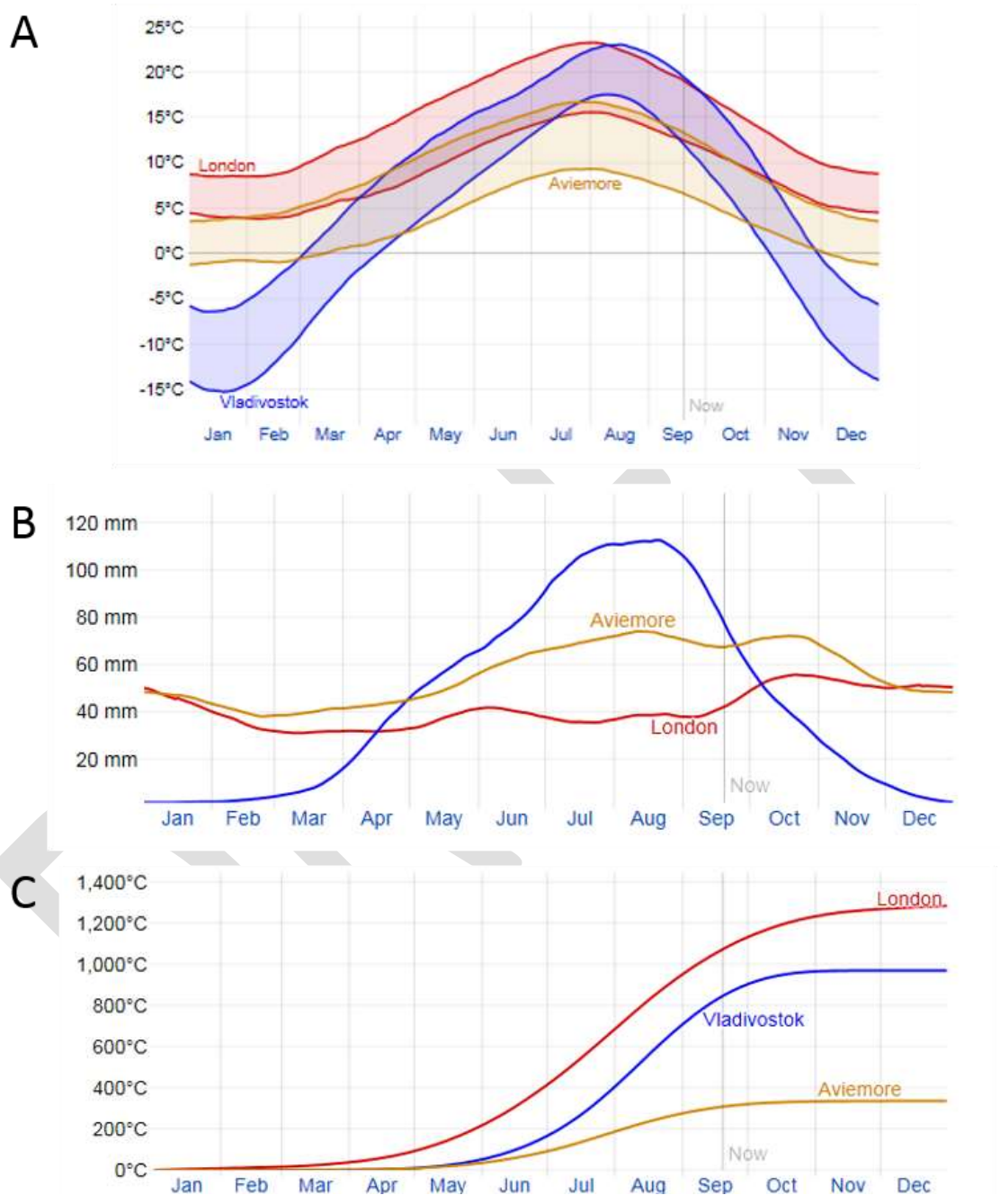

Figure 1 Climatic comparison of Vladivostock, London and Aviemore. A) Average daily high and low temperatures, B) average rainfall, C) Degree days (base 10℃).

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