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

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

Report of a Pest Risk Analysis for *Polygraphus proximus*

This summary presents the main features of a pest risk analysis which has been conducted on the pest, according to EPPO Decision support scheme for quarantine pests (PM 5/3(5)). The full PRA record is also available (see references).

Pests: ***Polygraphus proximus***
PRA area: EPPO region
Assessors: Expert Working group for PRA for ***Polygraphus proximus***
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EPPO Secretariat
Ms Fabienne Grousset – Consultant for EPPO who has prepared the draft PRA.
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Date: 2012-12-03/06. Core members (Salla HANNUNEN, Pietr KAPITOLA, Corinne LE FAY-SOULOY, Françoise PETTER, Arild SLETTEN, Nursen USTUN, Dirk Jan VAN DER GAAG), as well as the EPPO Panel on Quarantine Pests for Forestry reviewed the draft PRA between May and July 2013.
The risk management part was reviewed by the Panel on Phytosanitary Measures on 2013-10-31 and 2014-03-06.

STAGE 1: INITIATION

Reason for doing PRA: *Polygraphus proximus* is a bark beetle (Coleoptera: Scolytidae) of firs and other conifers. In recent years, it has spread within Russia from its original distribution in the Far-East[1] to several other regions (Siberia, Moscow province), and was also found (one record) in Leningrad province. *P. proximus* is reported to occur in Russia, Japan, the Korean Peninsula and North-East China. While it is mostly a secondary pest in its area of origin, and causing mortality mostly when trees are weakened, it has proved to be more aggressive in new locations, especially in Siberia. Its hosts at origin are endemic Far-East species of *Abies* and other conifers; at its new locations, it attacked new species, in particular *Abies sibirica*. In 2012, the Panel on Phytosanitary Measures decided that an EPPO PRA should be prepared.

[1] The Russian Far East is the extreme east parts of Russia, between river Lena and the Pacific Ocean.

Taxonomic position of pest: Insecta: Coleoptera: Scolytidae
Genus: *Polygraphus*
Species: *proximus* Blandford, 1894

STAGE 2: PEST RISK ASSESSMENT

PROBABILITY OF INTRODUCTION

Entry

Geographical distribution:
(see PRA record for references)

EPPO region: Russia: Far East (native), Siberia (introduced), Central Russia (introduced). Not considered established in Northwest Russia (Leningrad region)
Asia (native): China (North-East: Heilonjiang; Jilin), Japan (Hokkaido, Honshu, Kyushu, Shikoku), Korea Republic, Korea Democratic Peoples' Republic, Russia (Far East)

Major host plants or habitats:
(see PRA record for references)

The hosts of *Polygraphus proximus* belongs to the conifers: the main hosts seem to be *Abies* species, but it may also attack several *Pinus*, *Picea*, *Larix* and *Tsuga* species. Its host range in Asia differs from that in places where it was introduced (Siberia and European Russia).

Hosts species in the area of origin include:
- *Abies* spp.*: Abies nephrolepis* (East Siberian fir), *A. holophylla* (Manchurian fir), *A. sachalinensis* (Sakhalin fir), but also *A. mayriana (= A. sachalinensis* var. *mayriana*), *A. mariesii* (Maries fir), *A. firma* (Japanese fir), *A. homolepis* (Nikko fir), *A. veitchii* (Veitch fir)
- *Pinus* spp.: *Pinus koraiensis* (Korean pine), *Pinus densiflora* (Japanese red pine).
- *Larix* spp.: *Larix gmelinii* (=*L. dahurica*) (Dahurian larch) and *L. sibirica* (Siberian larch).
- *Tsuga* spp. (hemlock)
- *Picea* spp.*: P. abies* (Norway spruce), *Picea glehnii* (Sakhalin spruce), *Picea jezoensis* (=*P. ajanensis*) (Yeddo spruce).

Hosts species in the European part of Russia and in Siberia include: *Abies sibirica* and *A. balsamea, Picea abies.*

Which pathway(s) is the pest likely to be introduced on:

- **Wood of *Abies, Pinus, Picea, Larix, Tsuga* from where *P. proximus* occurs**

Wood may carry all stages of the pest. Eggs, larvae, pupae and adults may be present in and under the bark, and pupae (superficially) in the sapwood. In Russia, the pest has been detected in traded wood (internal movement) by the Russian NPPO and wood is the main pathway suspected for the movement of the pest from the Far-East to European Russia and to Siberia with raw logs being transported by train

- **Particle wood and waste wood of conifers from where *P. proximus* occurs**

This pathway includes wood chips of conifers. All stages of *P. proximus* can occur in wood chips, especially if bark is present. It is considered that *P. proximus* could survive even in the smallest wood chips. The chipping process releases volatiles that may attract the adult beetle.

- **Bark of host species from where *P. proximus* occurs**

All life stages may be associated with bark.

- **Natural spread from where *P. proximus* occurs**

The distance of flight of adults is not known. There are currently no management options applied in Russia that would prevent or slow down

natural spread.

- **Wood packaging material**

As eggs, larvae and adults occur in or under the bark, and pupae in sapwood, they can be present in wood packaging material, especially if it still has some bark attached. The pest was also found on car poles (with bark) of railway wagons (which are dunnage). It is considered that a correct implementation of ISPM 15 should address the risk.

- **Plants for planting of *Abies, Pinus, Picea, Larix* and *Tsuga* from where *P. proximus* occurs**

All life stages of the pest may be associated with rooted plant for planting of a certain size.

- **Plant parts (cut branches/foliage, including cut Christmas trees) of *Abies, Pinus, Picea, Larix* and *Tsuga*, from where *P. proximus* occurs.**

All life stages of the pest may be associated with stem of a certain size.

Pathways considered very unlikely

- **Other articles of wood (e.g. objects made of wood, including those still carrying bark, crates).** All life stages may be present on objects made of wood (e.g. wood handicrafts), especially if bark is still present. However, wood will usually be dried before being used for such objects. The later development stages will have emerged and the earlier stages are not likely to survive.

- **Hitch-hiking.** There is no indication that this might be a relevant pathway for the movement of the pest.

- **Movement of individuals, shipping of live beetles, e.g. traded by collectors.** *P. proximus* may circulate between hobbyist entomologists, but are most likely to be sent dead.

- **Soil.** There is no data on whether adults of *P. proximus* overwinter in the soil.

Establishment

Plants at risk in the PRA area:

Based on information from outbreaks in Siberia and European Russia, it seems that *P. proximus* may be able to attack other conifer species, at least in the host genera *Abies*, *Larix*, *Picea*, *Pinus* and *Tsuga*. Hosts of *P. proximus* are present throughout the PRA area. *Abies* seems to be considered as preferred hosts.

Climatic similarity of present distribution with PRA area (or parts thereof):

P. proximus occurs in a very wide range of climatic conditions at origin and in outbreak areas. The climatic conditions will affect the natural distribution of the host, but not directly the limit the distribution of the pest due to its hidden life stages. It is expected that the pest will be able to survive where ever its host plants grow.

Characteristics (other than climatic) of the PRA area that would favour establishment:

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Which part of the PRA area is the area of potential establishment:

All parts of the PRA area where host plants grow.

POTENTIAL ECONOMIC CONSEQUENCES

How much economic impact does the pest have in its present distribution:

The pest does not seem to cause much damage in its native areas (Far-East Russia, Japan, China, Korea) as it mostly attack weakened trees.

In Siberia, *P. proximus* is acting as a primary pest, and in particular has caused extensive damage on *Abies sibirica*, with damage comparable to those by *Monochamus urussovi*. The pest has caused tree mortality. In the Moscow region, trees died within 1-2 years of infestation. In severe outbreaks in Siberia, healthy trees are reported to die within 1-4 years after the first attack. In Siberia, the average percentage of fir trees killed in outbreaks was 7-14% of all fir trees in the stands per year.

P. proximus bores galleries under the bark. Massive attacks lead to discontinuation of the sap supply, and progressive die-back of the canopy. The pest is also found associated with fungi (*Ophiostoma* spp. and *Leptographium sibirica)*. However the role of the fungi associated with *P. proximus* in the damage observed is not fully understood.

Describe damage to potential hosts in PRA area:

P. proximus could cause damage to conifer plantations and forests, and this damage would be increased in the presence of weakened trees or recently felled trees and timber. The pest has attacked *Abies sibirica* in Siberia and *Picea abies* in the region of Moscow, which are not present in its area of origin. It is believed that it could attack new coniferous hosts in the genera *Abies*, *Pinus*, *Larix*, *Picea* and *Tsuga* if introduced in other parts of the PRA area. Limited management measures are available.

P. proximus can both introduce new fungi in the PRA area (such as *O. aoshimae)*, and act as a vector of fungi already present in the PRA area (such as *L. sibirica*).

How much economic impact would the pest have in the PRA area:

The potential economic impact is assessed to be major with a medium uncertainty. This uncertainty is linked to the new host species which may be attacked while invading new areas and the role of pathogenic fungi.

Potential environmental impact is assessed to be massive with low uncertainty. Host plants are key forest trees and their destruction will affect the environment in the PRA area.

Limited management measures are available and would be costly to implement.

CONCLUSIONS OF PEST RISK ASSESSMENT

Summarize the major factors that influence the acceptability of the risk from this pest:

P. proximus is a pest of important conifer forest trees in the PRA area. It may attack healthy trees and cause mortality. Host plants are widely present in the PRA area. If introduced, the probability of establishment is high, and the probability of eradication or containment would be very unlikely due to the hidden life stages of the pest and the fact that it might not be detected before it has already established and caused damage. It is also very likely that the pest would spread both naturally and by human-assistance through the movement of infested material.

Estimate the probability of entry:

Entry of a number of commodities (e.g. wood, particle wood) is already regulated in the EU and countries following similar regulations (although it may exist some ambiguities whether Russia is a "non-European countries" and *P. proximus* a "non-European Scolytidae").

For other countries, the probability of entry is considered **likely with wood with bark and plants for planting**, and **moderately likely for**

	particle wood, waste wood and bark. Entry should not occur with wood packaging material when ISPM 15 is applied. Entry in the near future (e.g. next 5 years) to other countries of the PRA area with natural spread is considered unlikely, except for neighbouring countries close to infested areas in Russia such as Kazakhstan and Belarus.
Estimate the probability of establishment:	The probability of establishment is **high (with a low uncertainty)** in the entire PRA area where host plants are grown.
Estimate the probability of spread:	The rate of spread of the pest is likely to be **high (with a low uncertainty)** as it can move with wood (including firewood), bark, untreated wood packaging, and plants for planting. Beetles can also fly several km or be transported by wind.
Estimate the potential economic impact:	The potential economic impact in the area of potential establishment is considered as **major with medium uncertainty**. This uncertainty is linked to the new host species which may be attacked while invading new areas and the role of pathogenic fungi
Degree of uncertainty	The main uncertainties are : - current and potential host range (which species may be attacked in the genera *Abies, Pinus, Picea, Larix* and *Tsuga),* - Impact of the pest on other hosts than *Abies* - Impact and influence of the pathogenic fungi associated with *P. proximus*
OVERALL CONCLUSIONS	The probability of introduction of the pest in the PRA area is rated as high. Early detection of an outbreak is unlikely and eradication or containment of this pest would therefore be difficult The PRA area is at risk of important economic impact in case of introduction of this pest.

STAGE 3: PEST RISK MANAGEMENT

IDENTIFICATION OF THE PATHWAYS

Pathways studied in the pest risk management

- Wood of *Abies, Pinus, Picea, Larix* and *Tsuga*
- Particle wood and waste wood of conifers
- Bark of conifers
- Rooted plants for planting of *Abies, Pinus, Picea, Larix* and *Tsuga*

Based on measures recommended for plants for planting, measures are also recommended for

- Plant parts (including cut Christmas trees) of *Abies, Pinus, Picea, Larix* and *Tsuga*

Wood packaging material is not considered in detail in this stage as pest risk management in international trade is already in place with ISPM 15

IDENTIFICATION OF POSSIBLE MEASURES

Possible measures for pathways

- Wood of *Abies, Pinus, Picea, Larix* and *Tsuga*

Measures related to the crop or to places of production:

- Inspections at the place of production may not detect low infestations.
- No treatments may be able to eliminate the pest completely in forests.
- No resistant cultivars exist.
- Pest-free area: the Panel on Quarantine Pests for Forestry will develop specific guidance to establish a PFA for *P. proximus*

Measures related to consignments:
- Inspection of the consignment is not sufficient as a standalone measure.
- Heat treatment (until the core temperature reaches at least 56 °C for at least 30 min) or irradiation (1kG) will kill the pest. Reducing humidity by kiln-drying is not considered sufficient as a phytosanitary treatment if the temperature does not reach at least 56°C for 30 min. Handling and packing methods need to be used in combination with treatment to avoid infestation during transport. This may be achieved by transporting the wood outside of the flight period of *P. proximus*, or through PFA areas, or packed in a way preventing infestation.
- Removal of the bark will remove most individuals and reduce the risk to an acceptable level.
- The wood could be accepted for immediate processing, during period when adults are not likely to fly, with appropriate measures relating to disposal of bark and waste. However, this option is not recommended because the risk attached to the disposal of bark and waste, which can be heavily infested, is too high, and it is difficult to control that the wood will be processed immediately

- Particle wood and waste wood of conifers, Bark of conifers

The same measures are recommended as for wood, except for irradiation. Fermentation of wood chips is not considered effective to kill the pest.
If particle wood or waste wood are stored in the exporting country for a sufficient period, individuals would not survive desiccation or would be unable to complete their development over time as wood chips dry out. This would have the same effect as requiring a treatment. However this option is not recommended as it is difficult to implement and check in practice.

- Plants for planting of *Abies, Pinus, Picea, Larix* and *Tsuga* except seed and cutting

Measures related to the crop or to places of production:
- Pest-free area: the Panel on Quarantine Pests for Forestry will develop specific guidance to establish a PFA for *P. proximus*
- Inspection may detect signs of the pest but will not detect early infestations as most of the life stages are hidden within the plant (e.g. when only entry holes are present).
- Insecticide treatments will not guarantee pest freedom.
- Plants for planting can be grown under complete physical protection throughout their life with sufficient measures to exclude the pest. This is not common practice for nurseries of forest trees and this will not be practical for large plants, but it may be relevant for bonsais. Plants will then need to be transported in conditions preventing infestation during transport.

Measures related to consignments:
- *P. proximus* does not attack very young trees because the bark is not thick enough. Trees with a maximum diameter smaller than 4 cm have not been observed to harbour the pest. This measure cannot be applied to bonsais because the bark of bonsais may be thick enough to allow pest development.
- Import of the consignment under special licence/permit and post-entry quarantine: This would require keeping the plants in post-entry quarantine for a sufficient time to detect the symptoms of larval activity or emergence of beetles. When the plants are in active growth, a period of 2 months will be sufficient but during winter time when the plant contain overwintering stages, plants will need to be maintained in Post-entry quarantine for a longer period.

EVALUATION OF THE MEASURES IDENTIFIED IN RELATION TO THE RISKS PRESENTED BY THE PATHWAYS

Degree of uncertainty The main uncertainties in the management part are:

- Feasibility of a PFA in countries where the pest occurs ***(to be considered further by the Panel on Panel on Quarantine Pests for Forestry in 2015)***
- Minimum size of the plants that are not attacked by the pest

IDENTIFICATION OF POSSIBLE MEASURES

PC= Phytosanitary certificate

Pathway	**Estimated probability of entry** (from countries where the pest occurs)	**Existing regulation**	**Measures**
Wood packaging material (including dunnage)	Very likely	Yes (ISPM 15)	Treated according to ISPM 15
Wood of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*	Likely (low uncertainty)	Yes in the EU (non-European Scolytidae)	PC and - PFA* (including handling and packing methods preventing infestation after leaving the PFA) officially recognized by the importing country or -Complete removal of bark or - Treatment (heat treatment or irradiation) + handling/packing methods to prevent infestation of the consignment after treatment.
Particle wood and waste wood of conifers	Moderately likely (low uncertainty)	Yes in the EU for wood chips (non-European Scolytidae)	PC and - PFA* (including handling and packing methods preventing infestation after leaving the PFA) officially recognized by the importing country or - Heat treatment + handling and packing methods preventing infestation after treatment or - Produced from bark-free wood
Bark of host species	Moderately likely (medium uncertainty)	Yes in the EU (conifer bark from non-European countries)	PC and - PFA* officially recognized by the importing country or - Heat treatment
Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* except seed and cutting	Likely (medium uncertainty)	Yes in the EU (hosts from non-European countries)	PC and - PFA* (including handling and packing methods preventing infestation after leaving the PFA) officially recognized by the importing country or - Post-entry quarantine or - Plants less than 4 cm stem diameter (except bonsais) or - plants grown under complete physical protection with handling and packing methods preventing infestation after leaving the protected conditions.
Natural spread	Unlikely, except for Kazakhstan and Belarus	-	No measure proposed, but if control measures are applied, this could slow down natural spread
Plant parts (including Cut Christmas trees) of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*	Unlikely	Yes in the EU (hosts from non-European countries)	PC and - PFA* (including handling and packing methods preventing infestation after leaving the PFA) officially recognized by the importing country or - plants of a specific size (less than 4 cm diameter)

* Guidance to establish a PFA for *P. proximus* is being drafted by the Panel on Panel on Quarantine Pests for Forestry.

References

See PRA Record (doc 15-21047). EPPO (2014) Pest risk analysis for *Polygraphus proximus.* EPPO, Paris. Available at http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm