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

15-21045

Pest Risk Analysis for

Polygraphus proximus

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) *Pest risk analysis for Polygraphus proximus*. EPPO, Paris.
Available at http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm

Photo: Adult of Polygraphus proximus, Krasnoyarsk region (RU). Courtesy: Evgeni Akulov (RU).

15-21047 (14-19313, 13-19062)

Pest Risk Analysis for *Polygraphus proximus*

This PRA follows EPPO Standard PM 5/3 (5) *EPPO Decision-support scheme for quarantine pests*.

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 2012-12-03/06.
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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.

Because of new findings on pathogens associated with P. proximus, the EPPO Panel on Quarantine Pests for Forestry suggested in 2015 that the PRA should be revised to include more information on this aspect. This will be done in 2015-2016.

Content

Introduction

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 (Chilahsaeva, 2008; Mandelshtam & Popovichev, 2000; Baranchikov *et al.*, 2010 & 2011b, Gninenko *et al.*, 2010 & 2010a). *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.

Elements on the biology of *P. proximus*

Life cycle

P. proximus is a bivoltine species (two swarming periods) (Kurentsov, 1941; Akulov *et al.*, 2011). In the Far East, emergence and flight of the first generation of adults occurs in May-July, and adults of the next generation may emerge in August-September. Because of the very long flight period, generations can overlap. Sisterbroods exist and females may lay eggs on several trees in the flight period. If conditions are not favourable to emergence of the second generation, the insect may overwinter as adult (see below) (Akulov *et al.*, 2011). Where ecoclimatic conditions are not favourable for having two generations (more northern areas and mountains), the adults may fly at the end of June and *P. proximus* has only one generation per year (Kurentsov, 1941). There are no data on temperatures for development, nor on temperature limits.

The different stages of the *P. proximus* are located as follows:
- eggs in the phloem
- larvae under the bark or in the bark
- pupae very superficially in the sapwood or in the bark (see details below).
- adults, when in the tree, are in the bark or under the bark.

Adult bark beetles leave the trees for a short period of dispersal to colonize new trees or fallen logs, and pioneer individuals release aggregation pheromones that attract others and trigger mass attacks (Sauvard, 2004; Dajoz, 2007). For Polygraphini (such as *P. proximus*), pioneer individuals are the males. At emergence, males fly to other trees, and then bore entry holes and tunnels into the bark. In the Moscow region, Chilahsaeva (2008) found an average of 4 gallery systems per 10 dm^2. Krivetz *et al.* (2011) report an average of 3.1-4 systems/dm^2 in Tomsk region. Females are possibly attracted by pheromones emitted by the male enter the tunnels. Each system of tunnels corresponding to a "family" consists of a nuptial chamber where mating occurs, from which are created maternal galleries (see *Adults* below), from which are created larval galleries (see *Larvae* below). Pupae develop closer to the surface of the tree, in the sapwood (Chilahsaeva, 2008) or in the bark.

During the summer, all life stages are present at the same time in or under the bark (egg, larvae, pupae, adults) or in the sapwood (pupae) (Chilahsaeva, 2008; VNIILM, 2010). The insect may overwinter as larvae, pupae or adults. The ratio of overwintering varies depending on local conditions, but the species overwinters mostly as adults; in some cases, larvae are not found (Baranchikov, pers. comm.). There is an uncertainty on whether adults overwinter under the bark or elsewhere. Several authors mention that they overwinter under the bark; for example, Baranchikov & Krivetz (2010) found different age larvae, pupae and overwintering adults (78%) under the bark of the trees. Chilahsaeva (2010a) also found live overwintering adults under the bark.

Adults

Adults measure 2.5-3.5 mm and have a very broad body. Beetles are reported to differ from some other *Polygraphus* spp. in Moscow region and in Siberia by having 6 antenomers in antennal funicule (instead of 5) (Chilahsaeva, 2008; VNIILM, 2010; Baranchikov *et al.*, 2011; Akulov *et al.*, 2011; Izhevskiy *et al.*, 2005; Stark, 1952, Pfeffer, 1995). However, this trait seems to be distinctive only for the population in the Moscow area and in Siberia: few other *Polygraphus* spp., *P. jezoensis* for example, have 6 antenomers in antennal funicule (Izhevskiy *et al.*, 2005). Therefore this feature is not sufficient for confirming identification.

There is no comprehensive protocol to distinguish *P. proximus* from all other *Polygraphus* spp. Chilahsaeva (2010) provides an identification key of *P. proximus* with the other three *Polygraphus* spp. that occurred in the Moscow area prior to the introduction of *P. proximus* (*P. punctifrons*, *P. poligraphus*, *P. subopacus*). Blandford (1894) and Kurentsov (1941) provide a general description of *P. proximus* adults.

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

Each gallery system consists of 2-3 maternal (egg) galleries of 3-7 cm, which are generally oriented horizontally (but the direction may be different on trees felled by the wind; Chilahsaeva, 2008). On average, the density of maternal galleries is 9.1-15 per dm^2 (Krivets, 2012). At emergence, each adult makes an exit hole in the bark. The density of emerging beetles can reach up to 90 specimens per dm^2 (Krivets, 2012). For information on overwintering of adults, see under life cycle above.

Eggs/larvae/pupae

Limited data were found on egg, larval and pupal stages. Eggs are laid separately in the maternal galleries, and each larva bores its own larval gallery. Krivetz *et al.* (2011) report a mean number of egg chambers per 1 cm tunnel between 9.5 and 12.97 in Tomskaya oblast and a sex ratio of 1.94 to 2.7 females/male. Larval galleries are oriented along the stem and measure up to 7 cm; they are located in the inner bark, sometimes touching the sapwood and are filled with frass (Chilahsaeva, 2008). The length of larval galleries found by Krivetz *et al.* (2011) in the Tomsk region is between 1.6 and 3.3 cm.

Pupal chambers are located partly in the sapwood (often at least 1/3 of the body in the bark) or completely in the bark. If they are completely in the sapwood, they are covered with frass and dust (Chilahsaeva, 2008).

Attack and damage (see all details and references under 6.01)

At origin, *P. proximus* generally attacks trees that are weakened by biotic or abiotic factors, or recently fallen trees or timber. *P. proximus* generally seems to have a preference for attacking fallen trees or logs (Baranchikov, 2012, pers. comm.). In new areas of outbreak, especially in Siberia, the pest has also been shown to attack apparently healthy trees. It may then cause tree mortality. The pest can be associated with wood-inhabiting fungi, but the role of these fungi in the process of tree killing is not yet known.

Baranchikov & Krivetz (2010) and Gninenko *et al.* (2012) detail the cycle of infestation of the pest. At new outbreaks (especially in Siberia), *P. proximus* may also attack healthy trees but in the first year they exsudate resin which kills the pest. In the second year, those weakened trees may be attacked again, and consequently die. Gninenko *et al.* (2012) also note that the pest may infect the trees with fungi in the first attacks, which would contribute to weakening the trees. In severe outbreaks in Siberia, healthy trees are reported to die within 1-4 years after the first attack (see details in 6.01).

Locations of the attacks

Sauvard (2004) mentions that some bark beetle species have a preference for certain parts of the tree, and that when several species colonize the same tree, they usually attack at different heights on the trunk and in branches. From the literature available for recent outbreaks (Chilahsaeva, 2008 and Baranchikov *et al.*, 2011) there is no preference of trees of a certain diameter or height. Baranchikov (2012, pers. comm.) observed infestations on trees in a wide range of stem diameter and heights, and on mature trees as well as on trees with stems of 4 cm diameter. Young trees measuring less than 1 m in height are generally not attacked by *P. proximus* (Baranchikov, 2012, pers. comm.). The place of attack depends on the thickness of the bark.

Several articles refer to the size of trees and locations of attacks. Kono & Tamanuki (1938) mention that *P. proximus* is mostly found on medium sized to large trees. Chilahsaeva (2008) found that it first attacked trees of a diameter of 24-26 cm, and then trees of 30-32 cm. Krivetz *et al.* (2011) indicate attacks on trees measuring 16-28 cm in diameter and 18-23 m in height, of different ages. Ohtaka *et al.* (2002a) did not find a difference in densities of egg galleries depending on the height of the trees, except for the uppermost part of the tree with thin bark which is rarely attacked. In a survey on seasonal occurrence of the beetles, Tokuda *et al.* (2008) surveyed holes at 0-2 m. Chilahsaeva (2008) mentions that galleries were located at a height of 0.5-2.5 m. Kurentsov (1950; cited in Chilahsaeva, 2008) reports that *P. proximus* is occasionally found on large branches. Baranchikov et al (2011b) note that it was found on the whole trunk (density 60-70 numbers/dm^2). Krivetz *et al.* (2011) report attacks at 0 m height, but also beginning at 0.25 and 0.5 m. They note that *P. proximus* rarely attacks the uppermost parts of the trunk. For example a 16.3 m tree was attacked up to 14.25 m height.

Detection and identification of *P. proximus*

Detection of all life stages is difficult because the pest is small and all life stages are hidden, except adults during flight. The pest might be present in an area for several years before damage is observed and the pest is detected (Gninenko *et al.*, 2010). Adults may be observed during the flight period, when large numbers may be in flight at the same time to colonize other trees (Chilahsaeva, 2008). They may also be trapped, but no species-specific pheromone has been identified for *P. proximus. P. proximus* has been captured in traps for other species (e.g. those for *Ips sexdentatus*, Baranchikov *et al.*, 2010). However, use of trapping does not guarantee detection. For details on trapping, see 6.04.

Identification relies on thorough morphological examination, and misidentification may occur: there are many scolytids infesting conifers, including several other *Polygraphus* spp. In Russia, it is also thought that *P. proximus* may have initially been misidentified (as other Polygraphus species or *Xylechinus pilosus*) both in the Moscow area and in Siberia (Chilahsaeva, 2008; Gninenko *et al.*, 2010a; Baranchikov & Krivetz, 2010, Gninenko & Klyukin, 2011).

Signs indicating the presence of the pest in the trees are not specific to *P. proximus* and may have other causes (e.g. infestation by other insects):

- Location of the pupal chambers (partly in the sapwood): in Siberia on fir, this is characteristic of *P. proximus.* However, in the rest of the PRA area other pests may have similar chambers (e.g. *P. poligraphus*)
- Entry and exit holes. These are not distinguishable based on their diameter (Tokuda *et al.*, 2008).
- Resin flowing from the entry holes, in the form of drops or sometimes of a flow down the trunk (Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010).
- Dust/frass around entrance holes and at the base of the trunk, although this happens at late stages of infestation as it it generally a sign of successful colonisation by the insect (Baranchikov, pers. comm., 2012)
- Yellow/red-brown crowns, although this happens at late stages of infestation (Chilahsaeva, 2008; Baranchikov *et al.*, 2010).
- Bark falling from the trees exposing galleries (also at late stages of infestation) (Gninenko *et al.*, 2010; VNIILM, 2010).

Stage 1: Initiation

1.01 - Give the reason for performing the PRA

Identification of a single pest

Concerns were expressed about the recent spread of *P. proximus* within Russia and the possibility that it would reach other countries in the EPPO region. The Panel on Phytosanitary Measures decided in 2012 that a PRA should be performed for the whole of the EPPO region.

1.02a - Name of the pest

Polygraphus proximus

1.02b - Indicate the type of pest

Arthropod

1.02d - Indicate the taxonomic position

The taxonomic position is as follows:
Domain: Eukaryota
Kingdom: Metazoa
Phylum: Arthropoda
Class: Insecta
Family: Scolytidae [Curculionidae]
Subfamily: Hylesininae [Scolytinae]
Tribe: Polygraphini
Genus: *Polygraphus*
Species: *Polygraphus proximus* Blandford, 1894

1.03 - Clearly define the PRA area

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?

Yes

A PRA was prepared in Russia by the Federal Forestry Agency - Russian Research Institute for Silviculture and the mechanization of forestry (VNIILM, 2010).

1.05 - Is the earlier PRA still entirely valid or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest, for another area with similar conditions)?

Only partly valid

The Russian PRA ((VNIILM, 2010) applies only to the Russian Federation. Some information has been used in the present PRA. The quantitative ratings given were not used.
Elements from a Norwegian PRA for another bark beetle, *Ips amitinus*, have also been used (Økland & Skarpaas, 2008). Because of some similarities with some pathways and risk management measures, this PRA also uses information from the EPPO PRAs on *Agrilus anxius* and *Apriona* spp.

1.06 - Specify all host plant species (for pests directly affecting plants). Indicate the ones which are present in the PRA area.

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 at origin (e.g. Far-East Russia, Japan, China) differs from that in places where it was introduced (Siberia and European Russia). *P. proximus* has already successfully transferred to some species that are not native in its original range, such as *Abies balsamea*, *A. sibirica*, *Picea abies*, and it is considered likely that this could happen again if it is exposed to other species of *Abies*, *Larix*, *Picea*, *Pinus* and *Tsuga* that do not occur in its original range. It is supposed that *P. proximus* will behave similarly to the majority of *Polygraphus* spp., which attack closely related hosts (except *P. grandiclava* that has coniferous and broadleaved hosts, cherry and pine; Avtzis *et al.*, 2008). There are other examples of bark beetles that have attacked new hosts (see 6.02).
Therefore the EWG considered that in addition to the known host species, all species belonging to the genera *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* are potential host plants.

Hosts in the area of origin

The main hosts of *P. proximus* in its area of origin are Far-East species of fir, especially *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) and other *Abies* (Kôno & Tamanuki, 1939, citing previous publications; Kurentsov, 1941; Niijima, 1941; Bright & Skidmore, 1997; Wood, 1997; Bright & Skidmore, 2002; Ohtaka *et al.*, 2002a & b; Yamaoka *et al.*, 2004; Ohtaka *et al.*, 2006; Hara *et al.,* 2008; Tokuda *et al.*, 2008; Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010, Baranchikov & Krivetz, 2010).

P. proximus is reported to be polyphagous as other conifers have also been recorded as hosts at origin:
- *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 abies* (Norway spruce - not native in the Far East), *Picea glehnii* (Sakhalin spruce), *Picea jezoensis* (=*P. ajanensis*) (Yeddo spruce).

(Kôno & Tamanuki, 1939, citing previous publications; Niijima, 1941; Bright & Skidmore, 1997; Ohtaka *et al.*, 2006; Hara *et al.,* 2008; Tokuda *et al.*, 2008; Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010; Baranchikov & Krivetz, 2010).

No information was found in the literature on hosts in Korea, but it is assumed that they are similar to those in the Far East.

Hosts in the European part of Russia and in Siberia

The host plants found attacked varied depending on the place:
- *Picea abies* in the Leningrad region (Chilahsaeva, 2008 citing others).
- *Abies sibirica* and *A. balsamea*, but also *Picea abies* in the Moscow province (Chilahsaeva, 2008; Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010). Note: *A. balsamea* is a North American species.
- In Siberia, it has only been observed on *A. sibirica* (Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010; Baranchikov *et al.*, 2011b), even in forests including other conifer species (Baranchikov, pers comm). Until outbreaks in other parts of Russia, *A. sibirica* was not considered as a possible host, but *P. proximus* has become an aggressive pest of this species in Siberia (Baranchikov *et al.*, 2010).

In semi-experimental conditions in the laboratory using logs, the pest reproduced on all conifer species tested, in the following order of preference: *Abies sibirica*, *Larix sibirica*, *Picea obovata* and *Pinus sibirica* (Kerchev, 2012).

Most [known or expected] host trees in the genera *Abies*, *Larix*, *Picea*, *Pinus* and *Tsuga* also occur in other parts of the PRA area. *A. sibirica, Larix* spp., *Pinus* spp. and *Picea abies* in particular are widely distributed in natural environments and forests. Some Far-East species, even if not used as forest trees in other parts of the PRA area, are used as ornamental trees and could occur in parks, amenity areas and gardens. Details on the distribution of the hosts in the PRA area are given under 3.01.

Uncertainty on hosts

- Details are lacking of the importance of other conifers than fir as hosts in the Far-East.
- Some authors mention host genera and not species, such as *Abies* spp., *Pinus* spp., *Larix* spp., *Tsuga* spp.
    - Details are lacking on other host species at origin in these genera (if any), apart from *Picea abies, Abies sibirica, A. balsamea*. For example, there are other important forest trees of these genera in the Far-East, such as: *Abies semenovii*, *P. sylvestris*, *Larix amurensis*, *L. olgensis* and *L. maritima*.
    - The host status of the species that occur in other parts of the PRA area is unknown, for example the main *Abies* species in the Western part of the PRA area (*A. alba)*, the main *Pinus* spp. (e.g. *P. nigra*, *P. sylvestris, P. maritima,* etc.), the main *Larix* spp. (*Larix decidua*).
- Baranchikov *et al.* (2011b) mentions that *P. proximus* was trapped in a forest of *Pinus sibirica* ("кедр"). However, this related to capture in a trap, and not observation on the trees themselves, and some firs occurred in the locality were the beetles were trapped.
- An interception of *P. proximus* on *Cryptomeria* dunnage from Japan is reported from New Zealand (Brockerhof *et al.*, 2003). This genus is not mentioned as a host in the available literature and has not been considered as a host in the present PRA.

1.07 - Specify the pest distribution

EPPO region: Russia[2]

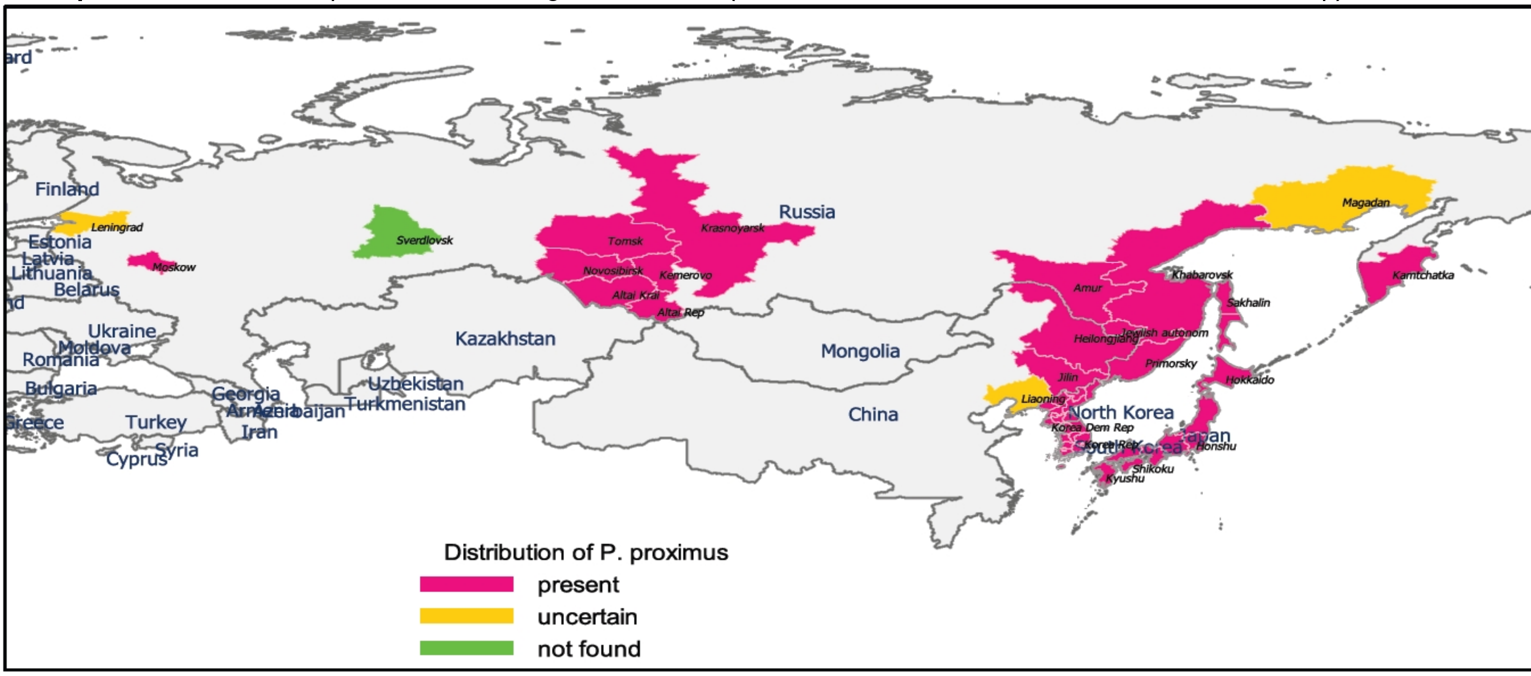
Far East	native	Khabarovsk Primorye Sakhalin including the Kuril islands (Iturup, Kunashir, Shikotan) Amur, Jewish Autonom	Niijima, 1941; Kurentsov, 1941 Pavlovskii & Shtakelberg, 1955
Siberia	introduced	Kemerovo: detected in 2005, possibly present since the mid-1990s Tomsk: detected in 2008 Krasnoyarsk: detected in 2009/2010 Altai Republic: detected 2011 Altai Kray: detected 2011-2012 Novosibirsk: detected in 2012	Baranchikov, 2010; Baranchikov & Krivetz, 2010; VNIILM 2010, 2011 & 2012; Baranchikov *et al.*, 2011b; Gninenko *et al.*, 2012; Baranchikov et al., 2012b
Central Russia	introduced	Moscow region: detected in 2006	Chilahsaeva, 2008
Northwest Russia		Leningrad region: detected in 1999 (incursion). It is not considered established (see uncertainty below)	Mandelshtam & Popovichev, 2000

More details on the presence of the pest in Russia are given under 1.12.

Asia (native): China (North-East: Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010; Heilonjiang: Wood & Bright, 1992; Bright & Skidmore, 2002 - Jilin (Knížek, 2011) see also uncertainty below), Japan (Hokkaido, Honshu, Kyushu, Shikoku - widespread Tokuda *et al.*, 2008), Korea Republic & Korea Democratic Peoples' Republic (Knížek, 2011), Russia (Far East) (Blandford, 1894; Kôno & Tamanuki, 1939; Gninenko *et al.*, 2010).

Asia (introduced): Siberia (Kemerovo, Tomsk, Krasnoyarsk, Altai Republic, Altai Kray, Novosibirsk) (Baranchikov, 2010; Baranchikov & Krivetz, 2010; VNIILM 2010, 2011 & 2012; Baranchikov *et al.*, 2011b; Baranchikov *et al.*, 2012b; Gninenko *et al.,* 2012)

Map 1. Distribution of *P. proximus*, including uncertainties (uncertainties are detailed in the text under the map)



<u>Uncertainties on the distribution</u>

- **Russia**. The bark beetle may be present in other areas as listed above. It may have not been detected or misidentified as happened in the Kemerovo region (Baranchikov & Krivetz, 2010).
    - **Native distribution: Magadan**. The pest occurs in Kamtchatka and Southern part of Khabarovsk Kray

[2] The 'Russian Federation' has been abbreviated to 'Russia' throughout the PRA.

(Krivolutskaya, 1973; Kurentsov, 1941; Baranchikov & Krivetz, 2010), but is not recorded in the neighbouring region of Magadan. This could also be explained by the fact that the northernmost limit of its distribution in Far East Russia is situated to the South of this region, but no detailed information was found about the distribution of the pest in Kamtchatka and in the middle and northern part of Khabarovsk Kray. It should also be noted that fir is not a common species in Magadan.

  - **Leningrad province**. Mandelshtam & Popovichev (2000) report the finding of one specimen on a *Picea abies* tree situated close to a railway track on the Baltic sea coast close to Sankt Petersburg. Baranchikov & Krivetz (2010) mention that it was found in the seaport territory. Mandelshtam (2011b) considers that it does not breed constantly in the region (the reference given is Mandelshtam & Popovichev, 2000). *P. proximus* is also not included in the list of bark beetles of the Leningrad region (Voolma *et al.*, 2004). Baranchikov *et al.* (2010) note that the finding in the Leningrad province was considered as a small incidental introduction, and was not repeated. Mandelshtam (pers. comm., 2013) reported that he has regularly monitored the *Abies sibirica* artificial stands in parks in around St. Petersburg and there were no damage by bark-beetles during the past ten years.
  - **Siberia**. Tokuda *et al.* (2008), in a distribution list based on Nobuchi (1966) and Koizumi (1994), refer to the pest being widespread in the "Siberian region". Wood (1992) also mentions its presence in Siberia although the references seem to relate to the Far-East. The pest had apparently not yet been detected in Siberia at that time, and it is therefore assumed that Siberia was used as a generic name covering the Far-East. Now *P. proximus* is widespread in Southern Siberia.
- **China**. The pest is recorded in Heilonjiang (Wood & Bright, 1992; Bright & Skidmore, 1997) and Jilin (Knížek, 2011). This is consistent with a continuous distribution from Primorsky region in the Russian Far-East. However, if the pest also occurs in the Korean peninsula, one could wonder about its presence in other provinces of China, in particular Liaoning, which borders the Korea Democratic Republic. In addition Yin & Huang (1996) may give more distribution detail but only the abstract was available.

Stage 2, 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

P. proximus is a single taxonomic entity (described in Blandford, 1894).

Common name: four-eyed fir bark beetle, Sakhalin-fir bark beetle (en), Sachalintannenborkenkäfer (de), polygraphe du sapin de Maries (fr), todomatu-kikuimusi (ja), уссурийскоий полиграф (ru), (EPPO, 2011), уссурийски корояд (bg), пихтовый полиграф (ru) (Mandelshtam, 2011a).

Synonyms:
- *Polygraphus magnus* Murayama, 1956 (Wood, 1992);
- *P. laticollis* Eggers (Wood & Bright, 1992),
- *P. miser* Blandford, 1894 (Knizek, 2011)
- *P. nigricans* Kurentsov, 1948 (Knizek, 2011)
- *P. oblongus* Blandford 1894 (Knizek, 2011).

P. abietis Kurentsov, 1941 and *P. horyurensis* Murayama, 1937 are mentioned by Mandelshtam as synonyms (2011a - Russian version only; the English version does not indicate P*. horyurensis* as a synonym), but this is published on the Internet and not in a scientific publication.

Chilahsaeva (2010) provides an identification key of *P. proximus* with the other three *Polygraphus* spp. that occurred in the Moscow area prior to the introduction of *P. proximus* (*P. punctifrons*, *P. poligraphus*, *P. subopacus*). Blandford (1894) and Kurentsov (1941) provide a general description of *P. proximus* adults. There is no comprehensive protocol to distinguish *P. proximus* from all other *Polygraphus* spp. However the EWG considered that there are no difficulties for a specialist to perform a correct identification of the insect.

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 Siberia, *P. proximus* has caused extensive damage on *Abies sibirica* since its introduction (Baranchikov *et al.*, 2010). In new areas of outbreaks, it causes death of healthy trees within a few years (Chilahsaeva, 2008; Baranchikov *et al.* 2010, 2011b & 2012; Gninenko, 2010; VNIILM, 2010; Akulov *et al.*, 2011) (see details in 6.01).

As many bark beetles, *P. proximus* is associated to wood-inhabiting fungi. Details and references on damage and on association with such fungi are given under 6.01.

1.12 - Does the pest occur in the PRA area?

yes

In the PRA area, the pest occurs only in part of Russia. It has not reached the limits of its possible distribution in Russia (based on the presence of host plants). It is native in Far-East Russia (as in other areas of the Far-East).

Details on outbreaks in other regions of Russia

The pest is thought to have spread by train on logs and most outbreaks were recorded along the transport routes (especially the Trans-Siberian railway) (Baranchikov *et al.*, 2011a &b).

Siberia

Baranchikov *et al.* (2011b) estimate that the pest is very widespread in Siberia. In Siberia, damage by *P. proximus* may have originally been attributed to *Monochamus urussovi* or *Xylechinus pilosus*, and further surveys are needed to determine the exact extent of outbreaks (Akulov *et al.*, 2011; Baranchikov & Krivetz, 2010; Baranchikov *et al.*, 2011). In the literature available for Siberia, the estimates of the size of the outbreaks varie. Baranchikov *et al.* (2012) give an estimate of overall 30000 ha in 19 administrative areas of 4 South-Siberian regions.

- Krasnoyarsk Kray. Gninenko *et al.* (2010) mention outbreaks of 43 and 23 ha respectively in 2004 and 2005. The pest was first "officially" recorded in 2009, on 2000 ha of fir (Baranchikov & Krivetz, 2010; Gninenko & Klyukin, 2011). Two outbreak areas of 3000 ha each were found in 2009 (on Siberian fir), with foci that were at least 3 years old with a lot of freshly infested fir trees at the periphery (Baranchikov *et al.*, 2010). *P. proximus* occurs in several areas of the Krasnoyarsk region. It has not been found North of Krasnoyarsk yet, but its spread is expected due to the presence of large areas subject to fire damage and damage by *Dendrolimus sibiricus* (i.e.

favourable to attacks) (Akulov *et al.*, 2011). In the literature available, the most recent estimates of the size of the infested area vary: a few local outbreaks (up to 3000 ha) (Baranchikov, 2011); 2000 ha (Akulov *et al.*, 2011); 1900 ha (Gninenko, 2010).

- Kemerovo. The pest was first detected in 2005, but was originally misidentified as *Xylechinus pilosus*. Outbreaks covered 5200 ha in 2005, showing that the pest was present much before its detection (Baranchikov & Krivetz, 2010; Gninenko *et al.*, 2010). It is presumed that it may have been introduced in the Kemerovo and Krasnoyarsk regions already in the mid-1990s (Akulov *et al.*, 2011). Baranchikov (2011) and Baranchikov et al (2011b) estimate the overall size of outbreaks to up to 30 000 ha. Akulov *et al.* (2011) estimates the size of outbreaks to 25 000 ha for Kemerovo and Tomsk regions together.
- Tomsk. The pest was detected in 2008 (Baranchikov & Krivetz, 2010) on fir. In 2009, it was also found in pheromone traps used to monitor *Ips sexdentatus* in an area with low density of fir (Baranchikov *et al.*, 2010). The pest was detected in several areas in 2011 (Baranchikov *et al,* 2011b). Demidko (2012), using cross-dating with tree rings, estimated the introduction of *P. proximus* in the South of Tomsk region to 2006 at the latest. It occurs in parks in the city of Tomsk (Mizeeva *et al.*, 2012). Baranchikov & Krivetz (2010) mention that outbreaks of xylophagous pests in Tomsk covered 28 000 ha, but were mostly due to *Xylechinus pilosus*, *Monochamus urussovi* and *Ips sexdentatus*, and *P. proximus* was rare.
- Altai Krai and Altai Republic. The pest was detected in 2011-2012 *(*Baranchikov *et al.*, *2011b,* VNIILM, 2011 & 2012; Gninenko et al., 2012). In the Altai Republic, it occurs in the North of the territory (Turochaksky district). In the Altai Krai, the outbreaks are situated in the Eastern part of the Krai (Salairskiy Kryazh) (Baranchikov, pers. comm., 2012). The estimated infested area in Altai Krai according to the Russian Forest Agency (see below) is the highest of all regions.
- Novosibirsk region. Outbreaks were registered in 2 south-eastern forest enterprises ('Lesnicheistvo') – the northern part of Salairskiy Kryaz (Baranchikov, 2012b; Baranchikov 2012a, Baranchikov, pers. comm.)

According to official information from the Russian Forest Agency, the outbreak areas of *Polygraphus proximus* in 2012-2013 in Russia are as follows (O. Kulinich, All-Russian Center of Plant Quarantine, RU, 11-2012 and 07-2103, pers. comm.):

	31.12.2011	1.10.2012	1.07.2013
Total	2671 hectares	19154 hectares	27763 hectares
Altai Krai	-	16359	21440
Krasnoyarsky region	2226	2028	4570
Kemerovskaya region	395	460	1425
Tomskaya region	50	307	348

The obvious discrepancy of data between the data available in the litterature and the official information (e.g. 28000ha in Tomsk according to Baranchikov & Krivetz (2010) and 50 ha in 2011 according to Kulinich, see above) can be explained by the fact that authors only report the data for the ongoing year – appearance of a new focus and still "alive" outbreaks. Dead forests are often excluded from the current year report.

Central Russia, Moscow. Adults were collected in July 2006 in the Moscow region (Khimki district) on *Abies sibirica* and *A. balsamea*. Other individuals, previously misidentified, were later identified as being *P. proximus* (Chilahsaeva, 2008). In 2006-2007, the pest had therefore been collected in different parts of the Moscow region, which are distant from each other (Khimki, Pushkino, Podolsk, Odintsovo, Bykovo). The pest was also found near Serpukhov (Baranchikov *et al.*, 2012; Gninenko *et al.*, 2012). The beetle was found exclusively on weakened trees, no outbreaks were detected (Baranchikov, pers. comm.).

North-West Russia, Leningrad area. (See 1.07). The pest is not considered present in this area in this PRA.

Other regions. The presence of the pest in fir forests was investigated in the Sverdlovsk region (along the Transsiberian railway - see map under 1.07) but the pest was not found (Baranchikov *et al.,* 2011b).

1.13 - Is the pest widely distributed in the PRA area?

not widely distributed

The pest has a limited distribution in the PRA area. As far as known, it is present in some regions in Russia (see details under 1.07 and 1.12). In the regions where it was recently established (i.e. Siberia, Moscow region - see 1.12), it infests a small part of the forest area where hosts occur.

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

yes

Most host plants of *P. proximus* occur in the PRA area. They may occur in the wild, in forests including plantations and as ornamental trees. Some of the Far-East conifer species would be present mostly as ornamentals. Details on the distribution of host plants in the PRA area are given in section 3.01.

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

no

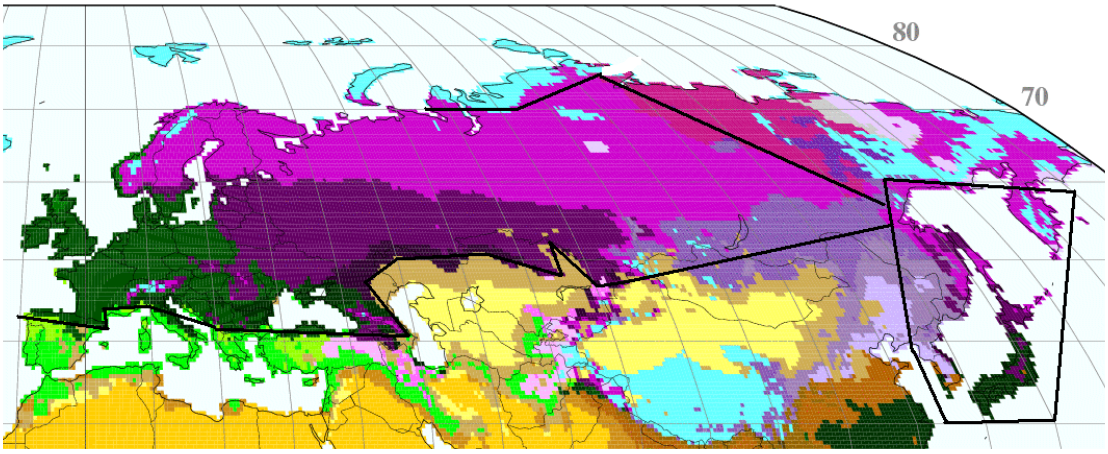
P. proximus is a free-living organism.

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?

yes

The climate classification of Köppen-Geiger (extract below, complete map in Annex 1) indicates climatic similarity between the current distribution of the pest in Russia and part of the PRA area, including most of the rest of Russia (except North and extreme North-East), Sweden, Norway, Finland, part of Central Europe, Caucasus and East of the Black Sea. In addition, *P. proximus* is present in all islands of Japan, some of which are under a climate similar to part of Western Europe, from Northern Spain, Ireland and Scotland in the West, through Northern Italy to Northern Turkey, and the Black Sea Basin in the East.

Map 2. Map of Köppen Geiger climate classification (extract)



1.17 - With specific reference to the plant(s) 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

P. proximus has caused damage both at origin (e.g. Tokuda *et al.*, 2008) and in Siberia (Baranchikov *et al.*, 2010). Damage could be increased when the pest is associated with pathogenic fungi (see 6.01). The impact could be economic (loss of trees and productivity of forests, loss of export markets), or environmental (damage to sensitive environments, loss of ecosystem functions linked to forests). Social damage may occur locally.

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

1.18 - Summarize the main elements leading to this conclusion.

- *P. proximus* is a known pest of several conifer species, including major tree genera in the PRA area for forestry. There are uncertainties on the host range (see 1.06), in particular which species of the susceptible genera are at risk, but *P. proximus* has already attacked species that are not native in its area of origin, such as *A. sibirica, A. balsamea, Picea abies,* and *Pinus sibirica*.
- Its known hosts are widespread in the PRA area, as forest trees and in wild habitats, but also in nurseries, plantations and as ornamentals, and it could also transfer to new hosts when spreading into the PRA area.
- There seem to be similar ecoclimatic conditions where the pest occurs and in part of the PRA area, which would be favourable to establishment.

Stage 2, 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.

Aspects of the life cycle relevant to the pathways (see details in *Introduction*): *P. proximus* is a bivoltine species. At emergence, males colonize new trees, bore an entry hole in the bark and create nuptial chambers under the bark. Each family includes several females. Females lay eggs and larvae complete their development in galleries situated in the inner layer of the bark or touching the sapwood (Chilahsaeva, 2008). Pupae develop in the sapwood or in the bark. In summer, all stages may occur in the trees. Larvae, pupae and adults may overwinter. Signs of presence of the pest are flying adults, entry (of the males colonizing new trees) and exit holes (of the emerging adults) on the bark; resin produced as drops or flow along the trunk; crowns turning yellow or red-brown; bark falling from the trees. It has been considered throughout the PRA that eggs, larvae, pupae and adults are present in or under the bark, and pupae (superficially) in the sapwood.

1. Possible pathways

Wood of *Abies*, *Pinus*, *Picea*, *Larix*, *Tsuga* from countries where *P. proximus* occurs. This pathway covers all types of wood (except wood packaging material and wood chips - see below), such as wood with or without bark, sawn or round, firewood. 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 (EPPO, 2011) and wood is the main pathway suspected for the movement of the pest from the Far-East to European Russia (Gninenko *et al.*, 2010) and to Siberia with raw logs being transported by train (Baranchikov *et al.*, 2011a & b). The pest was also found at timber loading/reloading stations (Akulov *et al.*, 2011). *P. proximus* has also been intercepted on wood from Siberia (USDA, 1991 - not necessarily intercepted by the USA, possibly by Japan). Note: the pathway for conifer wood from countries where *P. proximus* occurs is regulated in many EPPO countries against other pests, including some Scolytidae. <u>This pathway was considered in detail</u>. In this pathway, the answers often differentiate "wood without bark" (free from bark), and wood with bark (which also covers debarked wood, which may retain some bark).

Particle wood and waste wood of conifers from countries where *P. proximus* occurs. This pathway includes wood chips of conifers. Hosts of *P. proximus* may be used alone or in mixture with other species to produce particle wood and waste wood. Wood chips are used for fuel and energy production, pulp and paper industry, mulch and decoration in gardens, playground surfacing. Processing of wood into wood chips is a destructive process that should destroy some individuals but not all of them considering their small size. 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 beetle. Therefore wood chips could become infested after processing.
Association of the pest with waste wood is similar to association with wood or wood chips, depending on the size of wood pieces.
<u>This pathway was considered in detail.</u>

Bark of host species from countries where *P. proximus* occurs. Bark of conifers may be used (in the form of bark chips) as bulking agent, industrial composting, biodegradeable waste (biosolids), bark mulch, used in gardens for decoration, in growing media (potting soils or growing media for orchids), water conservation, erosion prevention; production of souvenirs and decorations. All life stages may be associated with bark. <u>There is little information on trade for this pathway but it was considered in detail.</u>

Natural spread. <u>This pathway was not considered in detail as most questions of the scheme are not relevant.</u>
This pathway includes natural spread from new areas of introduction to other EPPO countries: Moscow province towards the West; Siberia towards Kazakhstan. Adults fly and the pest is expected to spread naturally from areas where it occurs. However, natural spread is not considered possible from the Far-East (Japan, China, Korea, or Far-East Russia) to other countries of the PRA area due to the distance. In addition, no information was found on natural spread, in particular from Far-East Russia westwards, or within China, Korea(s) or Japan. Natural spread would however be possible if the pest establishes in other part of the PRA area, and this is covered in the "*Spread*" section (section 4).
The distance of flight of adults is not known. However, natural spread will be slower than spread with human assistance. There may be some events that will increase the rate of spread (e.g. transported by wind, swarming on sea). The natural spread will depend on many parameters, such as the presence of hosts (condition of the trees, density), the presence of fallen trees (preferred by the beetle) and logs with bark, climatic conditions, and prevailing winds. *P. proximus* is bivoltine, so two adult flights occur in the same year.
There are currently no management options applied in Russia that would prevent or slow down natural spread. There are currently no procedures allowing to detect the natural spread of *P. proximus.* There is no species-specific pheromone. *P. poligraphus* may be trapped in traps for monitoring other species, as it was the case in the Tomsk region in traps targeting *Ips sexdentatus* (Baranchikov *et al.*, 2010). However, detection of natural spread would

require specific trapping in Russia to monitor the progress of outbreaks towards the border, and in neighbouring countries to detect entry of the pest. There is currently no indication of natural spread from the Far-East towards other areas in Russia.
Currently, the closest presence to borders of other EPPO countries is either from Altai Krai to Kazakhstan – about 100 km, or from Moscow region to Belarus – over 400 km). It should also be noted that there is a continuum of conifers from Siberia to mountains of Kazakhstan, from Central Russia to Europe in the West. However, it is not known if the pest would spread in the absence of its preferred host *Abies*.
The probability of entry by natural spread was rated as unlikely. This probability would increase if new outbreaks appeared within Russia in areas that are closer to borders.

Natural spread is covered in the "*Spread*" section (section 4).

Wood packaging material (including dunnage). 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), see photo below (Akulov *et al.*, 2011).

Conifer poles used to transport wood in the Russian Federation (they are usually made from stems of conifer trees that are "not dry" and debarking is not necessary)

Dunnage has also been shown as a major source of introduction of Scolytinae worldwide (for example in New Zealand, 34.7 % of interceptions of Scolytinae are made on dunnage, 10.4 % on pallets; Brockerhoff *et al.*, 2003). Haack (2001) noted that *P. poligraphus* had been regularly intercepted on crating from Russia over the period 1985-2000. Wood packaging material is considered as a major pathway for the introduction of the pest in the PRA area. However the EWG did not continue the detailed assessment of this pathway in the entry section, though comments are made in the conclusions for entry. The EWG believed that treatments in ISPM 15 are effective to destroy *P. proximus*, if they are properly applied. ISPM 15 *Regulation of wood packaging material in international trade* (FAO, 2009) requires that 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 insects (including Scolytidae) and nematodes that are present in wood packaging material at the time of treatment (e.g. results of the PEKID project, 2009 for other bark beetles). In addition, no report of interception was found for this pest on wood packaging material apart from a doubtful interception in New Zealand, on *Cryptomeria* dunnage (see uncertainties on hosts in 1.06), according to the notifications of non-compliance published in the EPPO Reporting Service in 2000-2011. However, this pathway presents a major risk for the spread of the pest within Russia and within the Eurasian Economic Commission (Belarus, Kazakhstan, Russia) if treatments of the wood packaging material are not applied.

Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* from countries where *P. proximus* occurs. This pathway only includes rooted plants for planting. A draft EPPO data sheet for *P. proximus* (unpublished) mentions that the infestation in the Leningrad province was due to the movement of ornamental *Abies*, but the original source of this could not be retrieved. The EPPO Alert List (EPPO, 2011) also mentions plants for planting as a possible pathway, and states that adults could be hitch-hikers on various commodities. All life stages could be associated to plants for planting. There was little information on trade for this pathway but it was considered in detail.

Plant parts (cut branches/foliage, including cut Christmas trees) of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*, from countries where *P. proximus* occurs. Stems even of a small diameter may be infested by *P. proximus* (4 cm,

Baranchikov, 2012, pers. comm.) therefore cut Christmas trees may also be infested (potted Christmas trees are covered by the pathway “plants for planting”). It is believed that Christmas trees would mostly be imported and discarded in winter (i.e. out of the flying period, so that the pest will not spread even if the trees are stored outside before selling). If discarded trees are burnt or composted during winter, the pest will be killed before it could transfer to a suitable host. However there may be a risk of transfer and further establishment if infested Christmas trees are left in the open (e.g. a landfill) as several specimens may then emerge, find a suitable host and reproduce.
Nevertheless, according to Eurostat, the existing trade of Christmas trees (06049120) from countries where the pest occurs is very limited and originates only from China (see Table 1 in Annex 2), and there is no information on import into EPPO non-EU countries. If trade volumes increase in the future, the risk of entry will increase.
Regarding cut branches of conifers, it is unlikely that *P. proximus* is found associated with cut foliage and branches (intended for decoration, and of a small diameter). This pathway was not studied in details in the entry section because of the absence of existing trade, but possible measures for cut Christmas trees were identified together with those for plants for planting.

2. Pathways considered very unlikely, not considered further

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, although the possibility is mentioned in EPPO (2011). *P. proximus* does not seem to present features that would favour this possibility, unlike some insects that are known to be attracted to light on handling and loading sites. In theory, adults could become associated with other non-host commodities and material as they fly. However, they would need to feed during transport. There is no information available to study this pathway in detail, especially on whether the biology of the pest would allow adults to survive for long transport durations (e.g. survival of the adults without food, etc.).

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, although this is documented for *P. poligraphus* (Zahradník, 2004). There is also no data on movement of soil from the countries where the pest occurs.

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

Seeds, cones of host plants. No life stages of *P. proximus* are associated with seeds or cones of conifers.

2.01b - List the relevant pathways that will be considered for entry and/or management.

- Wood of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* from countries where the pest occurs
- Wood chips of conifers from countries where the pest occurs
- Bark of conifers from countries where the pest occurs
- Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* from countries where the pest occurs

Pathway 1: Wood of Abies, Pinus, Picea, Larix and Tsuga from countries where the pest occurs

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?

very likely for wood with bark
very unlikely for wood without bark (bark-free wood)

Level of uncertainty: **low for wood with bark**
medium for Wood without bark (bark-free wood)

Where the pest occurs, it is likely to be associated with trees in forests, especially of *Abies* spp. In the Far-East, it is considered as the most common phloeophagous species and in Siberia is has become widespread, at least in some areas (Kurentsov, 1941; Baranchikov & Krivetz, 2010). Eggs, larvae, pupae, and adults may be present in and under the bark, and pupae in the sapwood. Because galleries are at the interface with wood and bark, all stages are likely to be present on wood which has retained its bark. Only pupae and callow adults are likely to be associated with bark-free wood, but they will be exposed to dessication if they are not protected by frass.

USDA (1991) mentions that 95% of exploitable Russian fir forests occur in Siberia and the Far-East, and lists the following Far-East firs as being commercially important: *Abies sibirica**, *A. holophylla**, *A. gracilis*, *A. mayriana** (= *A. sacchalinensis* var. *mayriana)*, *A. semenovii*, *A. sacchalinensis*.* For Larch, 3 Far East species are noted as representing the most likely exports to the US markets; *Larix sibirica**, *L. gmelinii** and *L. amurensis.*
(* indicate species specifically identified as hosts of *P. proximus*).

Uncertainty for wood without bark: whether there is frass protecting the pupae in pupal chambers.

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?**

very likely for wood with bark
very unlikely (for wood without bark

Level of uncertainty: **low for wood with bark**
medium for wood without bark (amount of bark that may remain in practice)

There is little management in forests for the production of wood. Most trees are cut in winter. Cut trees may remain in the forest for some time. The pest may infest the trees prior to felling or recently fallen trees. Signs of activity may be observed prior to felling of the trees, especially resin drops or flow on the trunk and at entry/exit holes, but this would require identification of the insect, as other bark beetles may be responsible for similar damage. Detection may be more difficult at early stages of infestation (i.e. before the emergence of a generation), as entry holes may not be numerous and may not be visible, exit holes would not be present, and resin production may not be abundant. Several reports mention that, in the Moscow area, crowns were still green in spring, while trees had died in the autumn (Chilahsaeva, 2008). All stages are in or under the bark, and may not been seen if bark is present. Adults may also be trapped (see 6.04) but there are no specific lures/traps.

Some measures are in place in certain EPPO countries for conifer wood from countries where *P. proximus* occurs (see 2.09 and 7.10 for this pathway), such as in the EU. The wood should originate from a pest free area for *Monochamus* spp. (non-European), *Pissodes* spp. (non-European), non-European *Scolytidae* spp. (this includes *P. proximus*), or be bark free or subject to some measures (e.g. treatment). This would ensure the absence of *P. proximus*. For the countries that have such measures in place (see 2.09 and 7.10), it is therefore unlikely that the pest is associated with the pathway at origin.
It should be noted that in practice a certain quantity of bark may remain on trunks after debarking.

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?

likely

Level of uncertainty: **Medium** (Whether the host species are traded from areas where *P. proximus* occurs)
No specific data were found on the trade of wood for the species identified as hosts for *P. proximus*. EU trade statistics (Eurostat) for 2005-2011 indicate a trade of several categories of conifer wood, mostly from Russia but also from China and Japan (see Tables 1-15 in Annex 3 - there was no or very little trade from the Republic of Korea, and no trade from the Democratic Republic of Korea). The broad categories below were traded. There is no indication that these include specific hosts of *P. proximus* (apart from *P. abies*), but these hosts are prevalent at origin. Data for

Pinus sylvestris and *Abies alba* are also included below, due to the uncertainty on the host range of the pest. The largest imports are of wood of *Picea abies*, *A. alba* and *P. sylvestris;* imports of other conifers (i.e. which may include preferred hosts of *P. proximus*, such as Far-East fir species, *Abies sibirica* or *Pinus sibirica*) are much lower.

- **Firewood** (44011000). Mostly from Russia to Sweden, Finland and Denmark for a total of over 1.6 million tonnes in 2011 (this would cover many species that are not hosts, including deciduous species) (Table 1).
- **Rough wood of *Picea abies* or *Abies alba*** (sawlogs - 44032011; other - 44032019). Mostly from Russia to Finland, Germany and Sweden, for a total of over 5.2 million tonnes in 2011 (Tables 2 and 3)
- **Rough wood of *Pinus sylvestris*** (sawlogs - 44032031; other than sawlogs - 44032039), mostly from Russia to Finland for a total of over 4 millions tonnes in 2011 (Tables 4 and 5)
- **Rough wood of other conifers** (sawlogs - 44032091; other - 44032099), mostly from Russia to Germany and Denmark, for a approximately 53.000 tonnes in 2011 (Tables 6 and 7).
- **Hoop wood and the like (poles etc.)** (44041000). Minor import to several countries from Russia and China, for over 19.000 tonnes in 2011 (Table 8)
- **Sawn wood of *Picea abies* or *Abies alba*** (planed - 44071031; other 44071091) mostly from Russia to Finland for a total of about 110.000 tonnes in 2011 for planed wood and 7.5 million tonnes for other types (Table 9 and 10)
- **Sawn wood of *Pinus sylvestris*** (planed 44071033 - other than planed 44071093), mostly from Russia to many countries for over 50.000 tonnes in 2011 for planed wood, 2.4 millions tonnes for other types (Tables 11 and 12).
- **Sawn wood of conifers** (sanded - 44071015; planed - 44071038; other than planed). Mostly from Russia and China to many countries for a total of over 150.000 tonnes (sanded), 345.000 tonnes (planed) and 5.9 millions tonnes (other) in 2011 (Tables 13, 14 and 15).

No detailed data is available for import of host species of *P. proximus* into EPPO non-EU countries. However, export data of all coniferous roundwood and sawnwood was gathered from FAOStat (Tables 16 and 17) and showed that very small quantities are coming from China, Japan and Korea. Export of coniferous roundwood from Russia to non-EU countries is quite large although it has decreased from over 1.8 million m^3 in 2008 to less than 0.5 in 2010 [1 m^3 of fir or spruce wood is about 0.5 tonnes]. They are mainly to Uzbekistan, Turkey and Kazakhstan. Export of coniferous sawnwood from Russia is stable (between 3 and 2.5 million m^3 per year). It is mainly imported into Uzbekistan, Azerbaijan, and Kazakhstan.

Regarding wood imported into Europe and originating from Russia, the specific origin of this wood within Russia is also not known. Nevertheless, it is assumed that there is a substantial trade from areas where the pest occurs. USDA (1991) identifies Khabarovsk Kray, Amur and Yakutsk as the regions with the main reserves of trees in Russia. It seems that, for the last 20 years, there is no longer trade of wood from Far East to Europe, as it is not economically viable. Wood from Far East is exported to Japan and Chine for which transport is easier (Baranchikov, pers. comm. 2013).

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?

likely

Level of uncertainty: **low**

According to data regarding monthly imports in 2011 (see Table 18 in Annex 3 for firewood (44011000) and rough wood categories), the imports from Russia are spread over the year for a limited number of EPPO countries (e.g. Finland, Sweden, Germany). For most countries in the PRA area, imports are limited and may not occur every year. Imports from China are only once or twice a year into very few countries.

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

Likely for wood with bark
Unlikely for wood without bark

Level of uncertainty: **low for wood with bark,**
medium for wood without bark (whether there is frass protecting pupae in pupal chambers)

Wood is considered as the likely pathway for spread of the pest within Russia (Gninenko, 2010; Baranchikov *et al.*, 2011 a & b), and the pest has therefore survived the conditions and duration of storage and transport from the Far-East to Siberia and to the European part of Russia. Transport of wood between the Far East and Moscow takes usually more than 4 weeks (about 3 weeks between Siberia and Moscow). It occurs all year round, at temperatures between -35°C to +35°C. (Kulinich, pers. comm., 2013)
It is supposed that all stages will survive if bark is present even if data is lacking on possible survival of eggs or young larvae when exposed to dessication. As the pest is recorded to be able to attack recently felled trees and logs, it is

assumed that some life stages could survive for some time in logs. The presence of bark would also avoid dessication and favour survival.
If wood is free from bark, only pupae/callow adults may be associated (although they mostly would have been killed during the process of removing bark), but the remaining pupae/callow adults would be exposed to desiccation and adults will die because they could not perform maturation feeding.

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

Likely for wood with bark
Very unlikely for wood without bark

***Level of uncertainty:* low**

The pest may attack recently felled trees and logs. If adults emerge in transport and storage, they will be able to colonize new logs, and therefore reproduce. The pest preferably attacks logs rather than standing trees. Logs may also be infested during transport and in storage. This supposes that both males and females are present in a consignment, and that conditions are favourable. As the pest attacks trees massively in forests, it is likely that one lot would contain several individuals.
The pest cannot multiply on bark-free wood. Even if adults emerge, they would need bark for maturation feeding to reproduce.

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

Likely for wood with bark
Unlikely for Wood without bark

***Level of uncertainty:* low**

Where phytosanitary import requirements are in place, inspections would be carried out at origin and at destination. The presence of the pest can be easily overlooked or confused with other species. In addition, inspection of wood consignments is difficult and detection would depend on the intensity of inspection. If the log is infested after the tree is cut, there may be only entry holes, which are more difficult to detect. Therefore, inspection may not allow detecting the pest, even if phytosanitary import requirements target Scolytidae, and even less where more general or no phytosanitary import requirements are in place.

For wood without bark, the pupal chamber galleries and galleries would be easily visible. However, detection would depend on the level of infestation.

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

likely

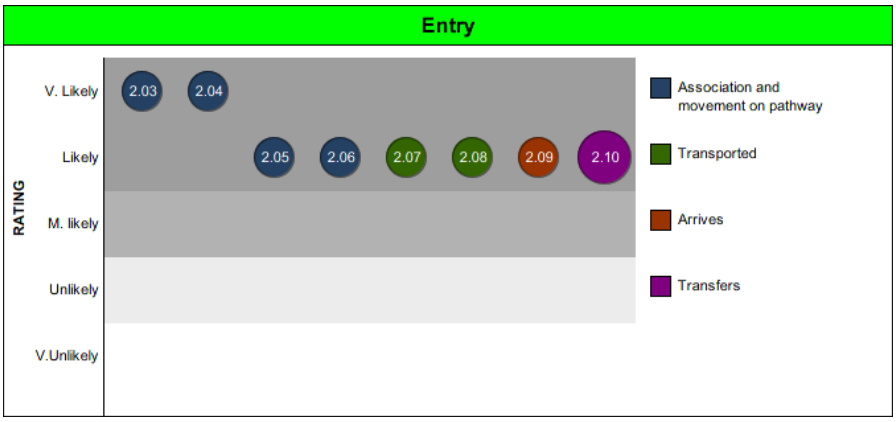
***Level of uncertainty:* medium** (whether the pest would find suitable hosts)
Wood is often stored in the vicinity of forests, and adults may fly to suitable hosts and establish colonies. There is an uncertainty on the species that would be suitable as hosts, i.e. on whether adults could transfer to new hosts (such as *Abies, Pinus* or *Larix* species that are not recorded as hosts), as it did for *A. sibirica, A. balsamea* and *Pinus sibirica* in new outbreak areas. In the Leningrad and Moscow regions, the pest was detected on *Picea abies*, which occurs widely in the PRA area. If the wood is imported and processed during the winter (i.e. when adults will not emerge), transfer will only be possible if wood and bark waste is not properly disposed of.
In Norway, imported round wood may be stored for several months before being processed and, in a PRA on *Ips amitinus*, it was considered likely that individuals would reach hosts under the current import practices (Økland & Skarpaas, 2008).

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

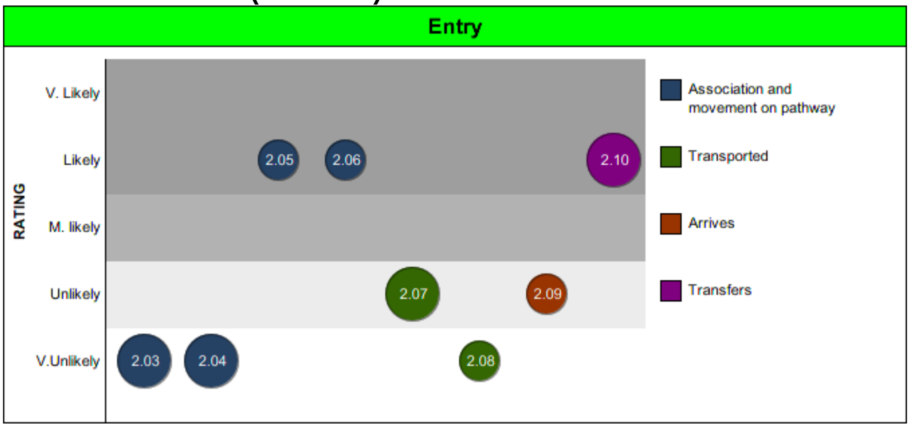
Likely for wood with bark / very unlikely for wood without bark

***Level of uncertainty:* low (medium for wood without bark)**
The probability of entry is considered as “likely” for wood with bark (with low uncertainty), but is “very unlikely” for wood without bark (bark-free) (with medium uncertainty). From the biological point of view, this pathway is very favourable for entry of the pest. However, there are uncertainties attached to the assessment. Although there is a large trade of conifer wood from countries where the pest occurs, especially Russia, it is unsure how preferred hosts and areas where the pest occurs are represented in this trade, for example Far-East species from Far-East Russia, *Abies sibirica* from Siberia. It is also not known whether the wood is exported with or without bark. Finally it is not known whether the pest could, once at destination, transfer to a species that is not specifically recorded as host; this is nevertheless likely as it happened with *Abies sibirica*, *A. balsamea*, *Picea abies, Pinus sibirica*.

Wood with bark:



Wood without bark (bark-free):



Pathway 2: Particle wood and waste wood of conifers from countries where the pest occurs

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:* medium** (whether conifer wood chips are made from species that are hosts. What constitutes "waste wood")

In areas where the pest occurs, it is likely to be associated with conifer trees in forests. The conifer species used to produce wood chips in countries where the pest occurs are not known, but it is supposed that they include some hosts of *P. proximus,* as these are prevalent where the pest occurs. Wood chips may consequently contain the pest, especially if bark is present. Some individuals would be killed during the process of wood chipping.

Waste wood may be produced as a result of sawing or squaring logs. Waste wood resulting from squaring will contain a large proportion of bark and is more lilkely to contain the pest.

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?**

likely for particle wood, waste wood not agglomerated and bark
Unlikely for waste wood agglomerated in logs or briquettes

***Level of uncertainty:* medium**

There is little management in forest, although signs of beetle attacks may be observed. Trees used to produce wood chips are more likely to have a high concentration of pest organisms, because wood chips are typically made of low quality wood. At processing, some galleries may be observed. Wood chips are processed through grinding or chipping, which may damage some individuals and expose others to dessication. The European Standard on solid fuel (CEN, 2011) identifies four classes of wood chips according to particle size (i.e. passing through round hole sieve of the specified size), with a fraction (3 to 6%) being allowed to be above the class size. Wood chips in the smallest class have a minimum size of 3.15 mm. In the largest class, 75% of wood chips should be comprised in the range 16-100 mm, and 6% can measure 200-350 mm. In the Netherlands, the common maximum size of wood chips (in any direction) is 200 mm (Alakangas, 2010). All life stages of *P. proximus* are small (<3.5 mm for adults) and remaining individuals would survive in wood chips of any size. A PRA conducted for another bark beetle, *Ips amitinus* in Norway (Økland & Skarpaas, 2008) noted that the pathway wood chips is only relevant when chips are made from wood with bark.

Waste wood may be agglomerated in logs, briquettes or similar form. Agglomeration may further damage the pest. For such commodities, probability of association is unlikely.

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?

likely

***Level of uncertainty:* medium** whether conifer wood chips are made from species that are hosts. What constitutes "waste wood")

EU trade statistics (Eurostat) for 2005-2011 indicate a trade of coniferous wood chips (44012100) from countries where the pest occurs, mostly Russia, for a total of over 12 millions tonnes in 2011 (see Table 1 in Annex 4). Finland imported most of the coniferous wood chips from Russia. This data mixes all coniferous wood, but this is likely to comprise some hosts of *P. proximus*, as these are prevalent species in forests in Russia. VKM 2013 noted that coniferous wood may contaminate consignements of deciduous wood chips originating in the USA because during large-scale logging operations by harvesters, it is not possible to ensure that trees of certain genera are avoided. This may also be the case for wood chips from other origins. VKM 2013 also stated that a rapid increase in import of wood chips is expected due to the targets of the EU energy policy towards 2020.

EU trade statistics (Eurostat) for 2007-2012 indicate a trade of waste wood from countries where the pest occurs, mostly Russia, for a total of over 0.2 million tonnes in 2012. Trade seems quite volatile as quantity varied between 0.17 and 0.39 between 2007 in the last 5 years. However, it is not known if this waste wood contains host species.

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?

likely

***Level of uncertainty:* low**

Imports from Russia are spread over 8 months in a year for Finland and Sweden, but are less frequent for a limited number of EPPO countries (e.g. Germany, the Netherlands), see Table 2 in Annex 4. For most countries in the PRA area, imports are limited and may not occur every year, see Table 1 in Annex 4. Imports from China, Korea or Japan are less frequent than once a year.

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

moderately likely

***Level of uncertainty:* low**

If stages are intact following processing, they will be subject to desiccation, which would lower the likelihood of survival (Økland & Skarpaas, 2008; Kopinga *et al.*, 2010), although desiccation would be slower in the bulk of the consignments. Chips are usually stored in big piles. The outer part of the pile may be too dry, and the temperature in the core of the bulk will be too high due to composting effect. VKM 2013 reports that experiments on survival of pest organisms during storage and ship transport of wood chips are scarce. Heat development is an occasional phenomenon which depends on moisture content, quality of the wood chips, external temperature and size of the pile. In some cases, considerable heat development can occur within the chip pile, or parts of the chip pile. Comparing to lethal temperatures described in ISPM 15, temperatures in chip piles may in some cases reach lethal levels for biological organisms in the wood chips (i.e. 56°C). During heat development, higher temperatures are usually associated with the core of the chip pile, while temperatures in the periphery of the pile are much lower and seldom lethal.

As a conclusion, part of the wood chips consignment/pile is likely to present the appropriate conditions of moisture and temperature for the survival and development of the pest. Young larvae may survive if the size of the wood chips is sufficient to accomplish the life cycle. Survival of later stage of larvae, pupae and adults does not depend on the size of wood chips.

Waste wood is likely to be of bigger size than wood chips and the pest will be less subjected to dessication than in wood chips.

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

unlikely

***Level of uncertainty:* low**

If late stages are present in the wood chips/wood waste and adults emerge, they could infest the wood chips/waste. During transport and storage in the open, adults may be attracted to the wood chips, but only the outside layer of the bulk may be infested, if it is not too dry. Adults will be less attracted to waste wood.

For bigger size wood chips and waste wood, the pest may complete its development, if the period of storage is long enough.

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

very likely

***Level of uncertainty:* low**

Where phytosanitary import requirements are in place, inspections would be carried out at origin and at destination. These would be more targeted if the requirements target Scolytidae (e.g. in the EU). Detection of the pest would be difficult for the same reasons as indicated for the wood pathway. In addition detection would be complicated by the fact that wood chips of non-host species may be mixed with those of host species. In addition, inspection of wood chips consignments is difficult and detection would depend on the intensity of inspection. Therefore, inspection is unlikely to detect the pest, even if phytosanitary import requirements target Scolytidae.

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

moderately likely

***Level of uncertainty:* medium** (whether the pest would find suitable hosts)

Transfer would require that the wood chips/waste are stored in the open in the proximity of forests (which seems to be commonly the case in the PRA area for large quantities of wood chips). Imports are made by countries where known hosts occur (e.g. *Picea abies* in Finland). The intended use of the wood chips would also influence transfer.

Transfer would be facilitated where wood chips are used outdoors, for example as mulch and decoration in gardens, playground surfacing. But in this type of use, the wood chips would probably be too dry to allow the pest development.

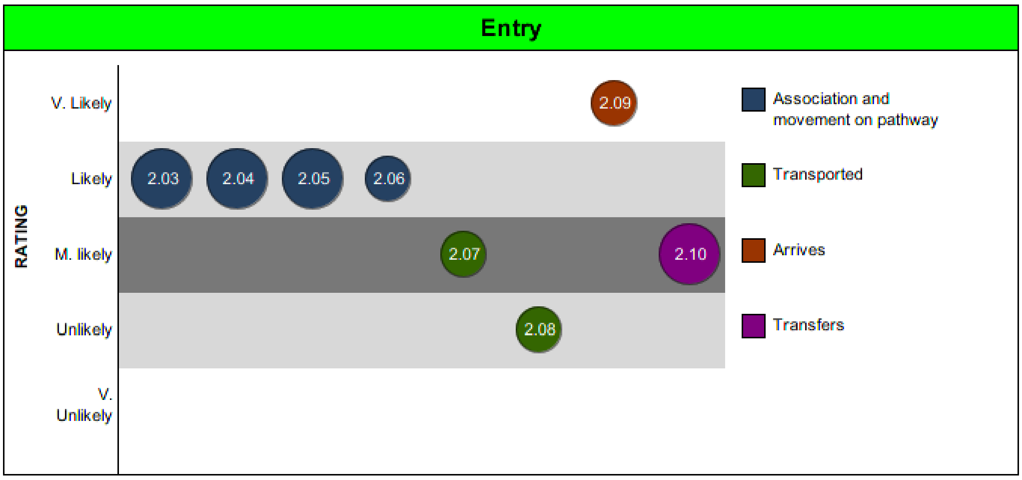
Where wood chips are intended for energy or processing (e.g. fibreboards, pulp and paper industry), transfer would be possible only if the wood chips are stored outdoors for a sufficient period prior to processing, allowing completion of development and emergence. This is why the likelihood of transfer was considered lower than for wood.

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

moderately likely

***Level of uncertainty:* medium**

The probability of entry on wood chips/waste is considered as "moderately likely". Although the volume of trade and frequency are favourable to entry, entry would require that individuals survive processing and transport, and transfer to hosts. This would be more complicated than for wood as the pest would be more exposed to desiccation, and transfer would require that wood chips are stored outdoors or used in particular conditions (mulch). There is a medium uncertainty attached to the assessment as the species composition of conifer wood chips is not known.



Entry
RATING
V. Likely
Likely
M. likely
Unlikely
V. Unlikely
2.03
2.04
2.05
2.06
2.07
2.08
2.09
2.10
Association and movement on pathway
Transported
Arrives
Transfers

Pathway 3: Bark of conifers from countries where the pest occurs

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?

Very likely

Level of uncertainty: **low**

In areas where the pest occurs, larvae, pupae and adults are likely to be associated with conifer bark in its cortical galleries.

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**

It is not known whether bark of hosts species of *P. proximus* is harvested and traded. The EWG is not aware of *Abies* bark being traded as a commodity. However, this may be the case for larch, spruce and pine, but these are not considered as preferred hosts in the current distribution of the pest.

There is little management in forests to reduce pest pressure. Signs of bark beetles' presence may be observed both in forests and during processing. The process used to obtain bark is expected to destroy many individuals, and expose others, as for wood chips. In addition galleries may be observed at processing. In the commodity itself, signs of presence may be difficult to detect. Late larvae, pupae and adults of *P. proximus* are small (<3.5 mm for adults) and remaining individuals would survive in bark pieces of any size.

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?

unlikely

Level of uncertainty: **high**

Data is lacking on the trade of bark but The EWG was not aware of *Abies* bark being traded as a commodity, and if so, whether consignments contain also the bark of host species and whether some bark would be exported by countries where *P. proximus* occurs.

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: **high**

No data were found.

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

moderately likely

Level of uncertainty: **low**

If stages are intact following processing, they will be subject to desiccation, which would lower the likelihood of survival (VKM, 2008; Kopinga *et al.*, 2011), although desiccation would be slower in the bulk of the consignments. Bark is usually stored in big piles. The outer part of the pile may be too dry, and the temperature in the core of the bulk will be too high due to composting effect. Nevertheless, part of the bark consignment is likely to present the right conditions of moisture and temperature for the survival and development of the pest. Late stages of larvae, pupae and adults are expected to survive in bark and their survival does not depend on the size of bark pieces.

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

very unlikely

Level of uncertainty: **low**

If late larvae and pupae are present in the bark, they can complete their development. However emerging adults would not multiply. Bark itself is not attractive to the adults.

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

Very likely

Level of uncertainty: **low**

Bark of conifers is generally not subject to measures (except where it is prohibited) (see 7.10). Detection would be difficult even if inspection is performed. Signs of presence would be difficult to observe in the mass of the commodity, although galleries and entry or exit holes may be observed. In addition detection would be complicated by the fact that bark of non-host species may be mixed with those of host species.

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

moderately likely

Level of uncertainty: **medium** (whether the pest would find suitable hosts nearby)

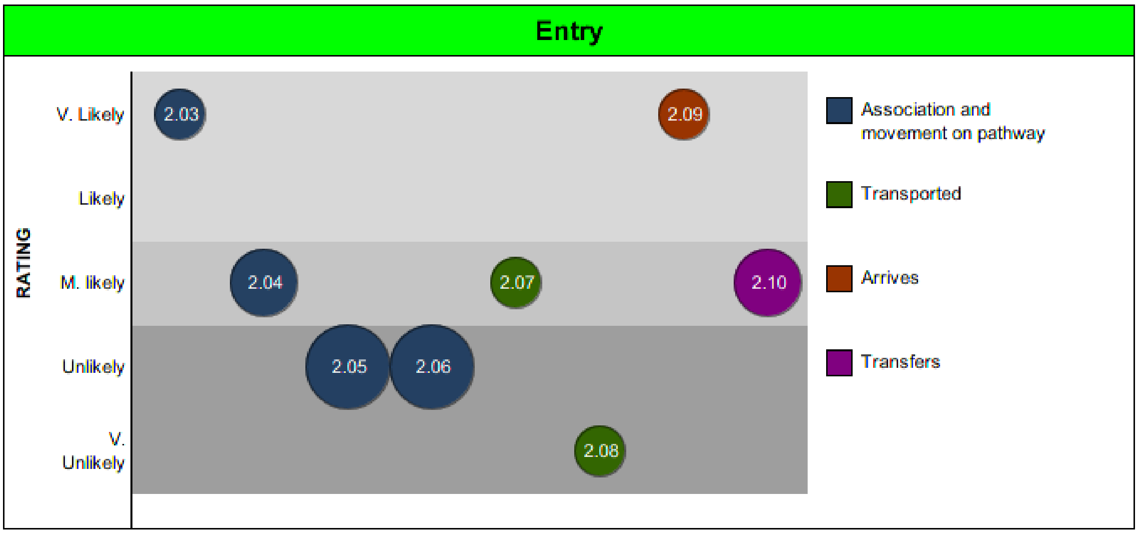
Late larvae and pupae could complete their development in bark. If adults emerge, they may be able to find hosts when bark is used outdoors.

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

moderately likely

Level of uncertainty: **medium**

The probability of entry is considered as "moderately likely" with some uncertainty. It is assumed that the traded volume is much lower than for wood chips. No data was found on the trade of bark of conifers from countries where *P. proximus* occurs.



Pathway 4: Plants for planting of Abies, Pinus, Picea, Larix and Tsuga from countries where the pest occurs

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:* medium**

Usually the pest infests mature trees, but it has been observed on stems as small as 4 cm diameter (Baranchikov, 2012, pers. comm.). Although many plants for planting of the host species would be smaller, some plants for planting may have such a large diameter. The important factor for infestation would be the thickness of the bark and possible competition with other species. Young trees measuring less than 1 m have not been observed to be attacked by *P. proximus* (Baranchikov, 2012, pers. comm.). However, bonsais are likely to be infested as their bark may be thick. All life stages could be associated to the plants. It is not known if overwintering adults could be present in the soil associated with the plants for planting, although this is documented for *P. poligraphus* (Zahradník, 2004).

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?**

likely

***Level of uncertainty:* medium**

In the area of origin of the pest, it mainly attacks weakened trees (although it also attacks healthy trees in areas on invasion such as Siberia and the Moscow region). Therefore it is unlikely to attack nursery trees in its area of origin if they are kept in good conditions.

Early infestations would be difficult to observe. Heavily infested trees would be discarded. The EWG had data on current management conditions applied where the pest occurs.

Bonsais are likely to be submitted to stricter management conditions than other plants for planting (e.g. they may be grown indoor), thus reducing the risk of association with the pest.

Import of plants for planting of host species is prohibited for many EPPO countries (e.g. the EU, see question 7.10).

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?

unlikely

***Level of uncertainty:* high (importance of trade to non-EU countries)**

Import of host plants from non-European countries is prohibited into the EU. No data is available for trade between countries where the pest occurs and the rest of the EPPO region.

However, even a very limited number of infested plants may allow the entry of a sufficient number of individuals to build a population.

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?

moderately likely

***Level of uncertainty:* high**

No data. However, import of plants for planting will be at an appropriate time of the year for the host plants and therefore the pest.

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

very likely

***Level of uncertainty:* low**

All life stages are likely to survive and complete development.

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

unlikely

***Level of uncertainty:* low**

It is unlikely that the pest completes its development and infests other trees within the consignment as transport is quite rapid. However, in infested areas, other adults from outside could be attracted to the trees if they are stored or transported in open facilities.

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

likely

***Level of uncertainty:* low**

Early stages of infestation would be difficult to detect as there will be few signs of the pest presence (e.g. only few entry holes).

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

very likely

***Level of uncertainty:* low**

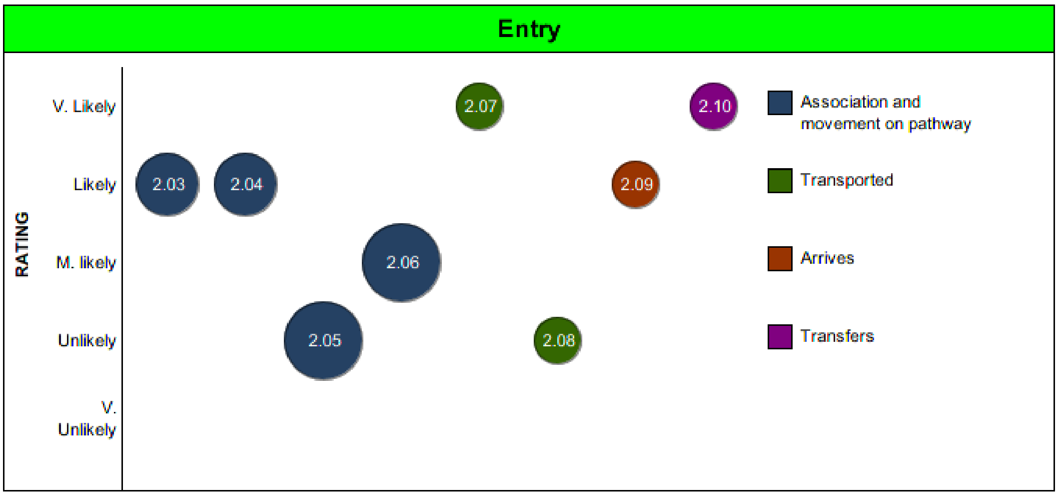
The plants for planting will be planted within a few weeks in a suitable environment and suitable host plants may be present in the vicinity.

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

likely

***Level of uncertainty:* medium**

The probability of entry on plants for planting is likely with a medium uncertainty. The major uncertainty is related to the existence of trade and to the possibility that young trees are attacked.



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

likely

Level of uncertainty: **low**

The probability of entry was considered as follows for the different pathways:

Pathway, from countries where *P. proximus* occurs	**Probability**
Untreated wood packaging material, especially dunnage	Very likely
Wood with bark of *Abies, Pinus, Picea, Larix* and *Tsuga*	Likely (low uncertainty)
Particle wood and waste wood of conifers	Moderately likely (low uncertainty)
Bark of conifers	Moderately likely (medium uncertainty)
Plants for planting of *Abies, Pinus, Picea, Larix* and *Tsuga*	Likely (medium uncertainty)
Natural spread	Unlikely (medium uncertainty)
Wood without bark (bark-free) of *Abies, Pinus, Picea, Larix* and *Tsuga*	Very unlikely (low uncertainty)
Plant parts (including cut Christmas trees)	Very unlikely (low uncertainty)

The pathways that present the highest probability of entry for *P. proximus* is wood packaging material with bark, especially dunnage (if not subject to ISPM 15 treatments) and wood with bark of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*. This is also supported by the findings in Russia. Particle wood and waste wood and bark are biologically less favourable to the pest, both for survival and transfer, but entry is considered as “moderately likely”. No data was found on the trade of bark, which was supposed to be lower. Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* would be a favourable pathway provided that there is a trade from countries where the pest occurs. Cut Christmas trees could present a risk if they are discarded in the open.

There is an uncertainty associated with all pathways regarding the volumes imported into the PRA area for the hosts of *P. proximus* (although some volumes are very high and *P. proximus* has already attacked species that are not native to its original distribution), and therefore for the association of the pest with the pathways at origin.

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.

Stage 2, Section B: Probability of establishment

In a first step, assessors should select the ecological factors that influence the potential for establishment.

The following factors may influence the limits to the area of potential establishment and the suitability for establishment within this area:

- 1 - Host plants and suitable habitats
- 2 - Alternate hosts and other essential species
- 3 - Climatic suitability
- 4 - Other abiotic factors
- 5 - Competition and natural enemies
- 6 - The managed environment
- 7 - Protected cultivation

No.	Factor	Influence on the limits to the area of potential establishment	Influence on the suitability of the area of potential establishment?	Justification
1	**Host plants and suitable habitats**	**Yes (see 3.01)**	**Yes (see 3.09)**	
2	**Alternate hosts and other essential species**	**No**	**No**	*P. proximus* does not need alternate hosts. Associated fungi may have a role in weakening the trees (see Introduction and 6.01).
3	**Climatic suitability**	**No**	**Yes (see 3.11)**	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.
4	**Other abiotic factors**	**No**	**No**	No such abiotic factors are identified in the literature available. The occurrence of forest fires would cause a stress for tree stands and increase their susceptibility to attack locally.
5	**Competition and natural enemies**	**No**	**No**	**Competition**. Several species of bark beetles, including several other *Polygraphus* spp., occur in the PRA area on host species. However, bark beetles often cohabit in infested trees provided they attack the trees at different stages, and/or places (Sauvard, 2004; Dajoz, 2007). Other wood borers also occur, and there may be competition with other species already present in the PRA area, especially scolytids or *Monochamus*. However, such competition has not prevented establishment in Siberia and the Moscow region. **Natural enemies**. There are natural enemies in the PRA area (e.g. *Rostropodus mirus,* Noyes, 2011), but it is unlikely that they will prevent establishment. More details on natural enemies are given under 6.04.
6	**The managed environment**	**No**	**Yes (see 3.14 / 3.15)**	The pest mostly attacks species that are forest trees, and to a lesser extend are used as ornamentals or for amenity purposes in a part of the PRA area. In no part of the area is the managed environment such that it would prevent establishment. However, this question is considered in details, as some parameters make the trees more prone to attack, and the presence of weakened trees is likely to help establishment.
7	**Protected cultivation**	**No**	**No**	The hosts are trees grown outdoors.

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.

Hosts are present throughout the PRA area. This section attempts to define the distribution of the different genera and species in the EPPO region. For Far-East Russia and the countries of the former-USSR, the text below uses an EPPO synthesis on the distribution of forest trees in the wild and as cultivated trees in countries of the former-USSR (EPPO, 2000) and an USDA PRA (USDA, 1991). Maps are available for some species in Annex 5.

Due to uncertainties on whether *P. proximus* could attack other hosts at destination, as it attacks non-native species such as *Picea abies*, *Pinus sibirica*, *Abies sibirica* and *A. balsamea*, details are also given below on other species in the host genera *Abies*, *Larix*, *Picea*, *Pinus* and *Tsuga*. Taking host genera into account and not only the species identified as hosts changes considerably the limits of the endangered area; host genera are grown in forests throughout the PRA area, while host species are restricted to certain parts of it and may be grown as amenity trees in other parts. If trees are used as ornamentals, it is unsure whether the bark beetles would be able to establish as colonization might be hindered by the rarity of hosts.

Abies

Abies species known as hosts

Abies nephrolepis (native from NE China, Russian Far-East, Korea)

- Former-USSR: native in Northern Far-East; not mentioned as cultivated elsewhere in the former-USSR (EPPO, 2000); Present in the mountains of Far-East, Primorsky Kray, Amur, Okhotsk, Kamtchatka, Sakhalin, Southern Ural (USDA, 1991).
- Available as ornamental (florama.pagesperso-orange.fr/Flora09/Pinaceae/ABI019.html).

A. holophylla (native to the Southern Far-East, Korea, NE China)

- Former-USSR: native in the Southern Far-East; not mentioned as cultivated elsewhere (EPPO, 2000); Present in the Far South of Primorsky province (USDA, 1991)
- Data is lacking on whether it is a forest tree in other parts of the PRA area.
- Available as ornamental (www.semencesdupuy.fr)

A. sachalinensis (incl. *A. sachalinensis* var. *mayriana*) (native from Hokkaido and Far-East Russia)

- Former-USSR: native in Southern and Northern Far-East; not mentioned as cultivated elsewhere (EPPO, 2000); Present in Sakhalin island, Schmidt peninsula and Kurile (USDA, 1991)
- Available as ornamental (http://florama.pagesperso-orange.fr/Flora09/Pinaceae/ABI028.html).

A. mariesii (native from Japan)

- Former-USSR: cultivated in CE Russia (Sankt Petersburg) (EPPO, 2000).
- Data is lacking on whether it is a forest tree in other parts of the PRA area.
- Available as ornamental

A. firma and *A. veitchii* (native from Japan)

- Former-USSR: not mentioned in EPPO (2000)
- Available as ornamental (http://florama.pagesperso-orange.fr/Flora09/Pinaceae/ABI010.html; www.semencesdupuy.fr)

A. homolepis (native from Japan)

- Former-USSR: cultivated in SE Russia, Georgia (West), Ukraine (EPPO, 2000)
- Available as ornamental (www.semencesdupuy.fr)

A. sibirica (native from Siberia)

- Former-USSR: native in NE Russia, CE Russia, N. Siberia, S. Siberia (EPPO, 2000), Kyrgyzstan (Eastwood *et al.*, 2009)
- Available as ornamental (at least in Russia, Baranchikov, pers. comm., 2012)

A. balsamea (native from North America)

- Former-USSR: cultivated in SE Russia, Ukraine, Uzbekistan (EPPO, 2000); Present in Central Russia (Moscow area; Chilahsaeva, 2008);
- Available as ornamental (www.lesarbres.fr)

Abies spp. (host status not known)
"Other *Abies* spp." are mentioned as hosts. There is a large number of other *Abies* species in the PRA area, such as:

- *A. semenovii*: Identified in USDA (1991) as another Far-East fir species that is commercially important and likely to be exported, but not specifically mentioned as a host (Central Asia, EPPO, 2000; endemic and endangered in Kyrgyzstan, Eastwood *et al.*, 2009);
- *A. alba*: probably the most widespread species in the rest of the PRA area, growing from the Western part of Russia to the North of Spain (see map in Annex 5);
- *A. nordmanniana:* originating from the Caucasus and North East Turkey. Former-USSR: native in SE Russia and Georgia (EPPO, 2000). Widely planted in the PRA area for the production of Christmas trees, and also used as ornamentals and for wood*;*
- *A. procera:* cultivated. Used in particular to produce Christmas trees. Former-USSR: cultivated in SE Russia, Georgia, Ukraine (EPPO, 2000);
- Central Asian species, such as *A. pindrov* (native from Tadjikistan and cultivated in SE Russia and Georgia; EPPO, 2000), *A. spectabilis* (native from Tadjikistan and cultivated in Georgia; EPPO, 2000), *A. gamblei* (native to Tadjikistan; EPPO, 2000);
- Other species cultivated in former-USSR according to EPPO (2000), such as *A. arizonica* (Estonia, Ukraine), *A. bracteata* (CE Russia, SE Russia, Georgia, Ukraine), *A. cephalonica* (Ukraine), *A. cilicica* (SE Russia, Georgia, Ukraine), *A. concolor* (CE Russia, SE Russia, Belarus, Baltic countries, Moldova, Ukraine) etc.

Within Russia, VNIILM (2010) gives estimates of 12.7 millions ha (1986 figures) for fir forests (without indication of species) in: Krasnoyarsk (7 million ha), Irkutsk, Kemerovo, Altai Krai and Altai Rep., Tomsk, Sverdlovsk, Perm, Komi Rep., Bashkortostan Rep. In addition, fir occurs to a lesser extent in other regions in Siberia (Tuva Rep, Tyumen, Chelyabinsk, Novosibirsk, Omsk) and the European part of Russia (Arkhangelsk, Vologda, Kirov, Udmurtia, Mari El, Tatarstan).

<u>Pinus</u>
<u>*Pinus* species known as hosts</u>
Pinus koraiensis (native from Far-East Russia, Korea, Japan, China):

- Former-USSR: natural distribution in S and N Far-East, cultivated in NE Russia (parks of forest zones), CE Russia, Baltic countries, Belarus (EPPO, 2000).
- Available as ornamental (www.semencesdupuy.fr), also used as bonsai.

Pinus densiflora (native to SE Far-East Russia, Japan, Korea, NE China):

- Available as ornamental (www.semencesdupuy.fr), also used as bonsai; mentioned as cultivated in pots for former USSR (EPPO, 2000).

Pinus sibirica (native from Siberia):

- Former-USSR: natural distribution in NE and CE Russia, NW, NE and S Siberia, widely cultivated (EPPO, 2000).
- Available as ornamental (http://apps.rhs.org.uk/rhsplantfinder/index.asp).

Other *Pinus* spp. (host status not known)
Tröltzsch *et al.* (2009) provide a map of presence of *Pinus* spp. from European Russia to Europe. *Pinus* spp. are more prevalent in Northern Europe from Scotland to Poland throughout Nordic countries, and in part of the Mediterranean area up to the extreme West and Northern Mediterranean coasts (see map 1 in Annex 5). There are a large number of *Pinus* spp. grown as forest trees (also ornamentals) throughout the PRA area.

- A large number of *Pinus* spp. are naturally distributed or cultivated in former-USSR, such as *P. murrayana*, *P. echinata*, *P. flexilis*, *P. peuce* (see EPPO, 2002).
- *Pinus sylvestris* is probably the most widespread species throughout the PRA area, and occurring through to the Far-East (USDA, 1991; EPPO, 2000) (map in Annex 5)
- Other pines are grown, especially in the Southern part of the region, and sometimes with a limited distribution (*P. brutia* in Turkey, European Russia). Some species that occur mostly in the Southern part of the region are: *P. halepensis* (map in Annex 5), *P. nigra* (map in Annex 5), *P. pinaster* (map in Annex 5), *P. pinea, P. radiata*.
- *P. cembra* is a close relative to *P. sibirica* (*P. cembra* subsp. *sibirica*) and occurs in Central Europe and the Alps.
- *Pinus contorta* (American species) is planted in the PRA area (about 600 000 ha in Sweden) (Engelmark *et al.,* 2011; widespread in UK: http://www.brc.ac.uk/plantatlas/index.php?q=node/845). It does not seem to be planted in former-USSR (not mentioned in EPPO, 2000 or USDA, 1991).

Larix
Larix species known as hosts

Larix gmelinii (=*L. dahurica*) (native to E Siberia, NE Mongolia, NE China, N Korea):

- Former-USSR: natural distribution in Transbaikalia, N & S Far East (EPPO, 2000).
- Available as ornamental (www.semencesdupuy.fr), also used as bonsai.

Larix sibirica:

- Former-USSR: natural distribution in NE European USSR, CE Russia, N & S Siberia. Widespread in European and Asian Russia from tundra to steppe zone (USDA, 1991; EPPO, 2000).
- Available as ornamental all over Siberia (Baranchikov, pers. comm., 2012)

Other *Larix* sp. (host status not known):

- Far-East species. *L. kamtchatika* (EPPO, 2000), *L. amurensis* (not mentioned in EPPO, 2000), *L. olgensis (L. gmelinii var. olgensis*; also cultivated in CE Russia; EPPO, 2000) and *L. maritima* (not mentioned in EPPO, 2000) (USDA, 1991).
- Former-USSR. Many other *Larix* spp., such as *L. occidentalis*, *L. americana* (EPPO, 2000).
- *L. decidua:* natural distribution in Ukraine (Carpatians) and cultivated in CE Russia (EPPO, 2000). Occurs throughout Europe (except extreme North and South).
- *L. kaempferi:* native from Japan and introduced into Europe. Forestry and ornamental tree in oceanic areas (http://www.forestry.gov.uk/fr/INFD-8CYJT8).
- *L. leptolepis:* (Japanese larch) is also used for plantings (Lemonnier, 2011).

Tsuga spp.:

- This genus is recorded as host at origin, without indication of species. No information was found on the species that may occur in the Far East. EPPO (2000) does not indicate any *Tsuga* spp. for the Far East. *T. canadensis* is cultivated in SE Russia, Belarus and Ukraine (West); *T. caroliniana*, *T. diversifolia* and *T. dumosa* in Georgia (Abkhazia), *T. sieboldii* in SE Russia (Sochi) and Georgia (Abkhazia).
- *T. canadensis* is used as ornamental (http://nature.jardin.free.fr/cadre4b.html).

Picea spp.
Picea species known as hosts

Picea abies (map in Annex 5):

- Former USSR. Natural distribution in NE Russia, CE Russia, SE Russia, Baltic countries, Belarus, Moldova, Ukraine (EPPO, 2002).
- Also widely distributed in the Western part of the PRA area down to the Mediterranean area.
- Also used as ornamental.

Picea glehnii:

- Former-USSR: native in S Far East; not mentioned as cultivated elsewhere (EPPO, 2000).
- Data is lacking on whether it is a forest tree in other parts of the PRA area.
- Available as ornamental.

Picea jezoensis (=*P. ajanensis*):

- Former-USSR: natural distribution in S and N Far East; cultivated in CE Russia (EPPO, 2000); Commercially important (USDA, 1991)
- Data is lacking on whether it is a forest tree in other parts of the PRA area.
- Available as ornamental (www.semencesdupuy.fr), also used as bonsai.

Other *Picea* spp. (host status not known):

- *P. obovata* is another Far-East species with commercial importance (USDA, 1991). Its natural distribution in former USSR is NE Russia, CE Russia N & S Siberia, and it is cultivated in NE Russia, CE Russia, SE Russia, Baltic countries Belarus, Moldova, Ukraine (EPPO, 2002).
- *P. shrenkiana* also occurs in the Far-East (USDA, 1991). In the EPPO study, the different synonyms of *P. shrenkiana* are mentioned as naturally distributed in Kazakhstan, Kyrgyzstan and Tadjikistan, and cultivated in CE Russia, SE Russia, Georgia and Ukraine (EPPO, 2000).
- *Picea sitchensis* is widely used in Northern oceanic parts of Europe (map in Annex 5).
- EPPO (2002) lists a number of other species with natural distribution in several parts of former USSR (but not Far-

East) and cultivated.

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.
Given that hosts occur throughout the PRA area, and that climate and other factors will not be limiting for the establishment of the pest, the area favourable to establishment is considered to be the whole PRA area.

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?

likely

***Level of uncertainty:* medium**

Areas with high densities of host plants would be more favourable to establishment (see Annex 5). It is not known whether there are differences of preference and reproductive rates between hosts. *Abies* seems to be considered as preferred hosts, while, for example, *Picea abies* may not be a preferred host although *P. proximus* reproduces on this species (Moscow region). Establishment may be less likely if the pest enters in an area where *Abies* spp. are not predominant.

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**

P. proximus occurs in a very wide range of climatic conditions at origin and in outbreak areas. It is uncertain how the pest would adapt to colder or warmer climates. However some bark beetles are well adapted to different climatic conditions (*P. poligraphus* occurs from Scandinavia to Southern Europe). Climate influences the number of generations; Kurentsov (1941) mentions areas where the pest has one or two generations in Far-East Russia.

If the host plants are planted outside their natural range, they may be more stressed and more susceptible to attacks.

The occurrence of meteorological events such as drought or storms would cause a stress for tree stands and increase their susceptibility to attack. Linder *et al.,* 2008 report that extent and/or frequency of drought, flooding and storm events are projected to intensify as a result of global climate change in particular in the Temperate Oceanic to the Temperate Continental and the Mediterranean zones. They consider that several bark beetles species (e.g. *Ips* species) will be more of concern as a result of this change.

Managed environment

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

highly favourable

***Level of uncertainty:* low**

Conifer forests in some parts of the area of potential establishment may be subject to management practices that will make the area less favourable for establishment, such as removal of damaged trees to prevent reproduction of bark beetles, not storing timber with bark during the summer in the forest. This is applied e.g. in Scandinavia but may not be in all parts of the PRA area.
P. proximus attacks are favoured by the presence of weakened trees or fallen trees. These may occur under various circumstances in the PRA area, such as drought, fires, wind damage following storms, attacks by other pests, low levels of management (including nature conservation areas). In addition, fallen trees or logs may also be present in forests.
In Norway, for *Ips amitinus* (main hosts *Picea abies* and *Pinus sylvestris*), it was considered that there are no control or husbandry measures to prevent establishment (Økland & Skarpaas, 2008).

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

likely

***Level of uncertainty:* low**

Few pest management practices are applied in forests, and they are not likely to prevent establishment. Where pest management practices are applied (e.g. for ornamentals), they would only be unfavourable for establishment if they target other bark and wood insects.

Other factors

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

likely

***Level of uncertainty:* medium** (Details are lacking on the pest biology)

P. proximus is a bivoltine species. Males create "families" comprising several females, ensuring a colonisation of suitable trees in the neighbourhood of the first infestation already in the first year. Larvae, pupae and adults are able to survive during winter. If conditions are not favourable in one year for the second generation to complete its development and emerge, the life stages can survive until the next spring-summer.

These elements are all favourable, but there is no indication on the number of individuals needed to start a population. Liebhold & Tobin (2008) note that insects exhibit co-operative behaviour such as tree-killing bark beetles can only overcome host defences if they aggregate in large numbers.

3.18 - Is the pest highly adaptable?

Yes, highly or very highly adaptable

***Level of uncertainty:* low**

P. proximus has adapted to new hosts, moving from its native Far-East hosts to other species in the same genera, such as *A. sibirica, A. balsamea* (native from North America), *Picea abies.* In addition, it is able to overwinter as larvae, pupae or adults in the trees until conditions are favourable. And finally it is present in very different climatic zones in Japan and in Russia.

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

moderately widely

***Level of uncertainty:* low**

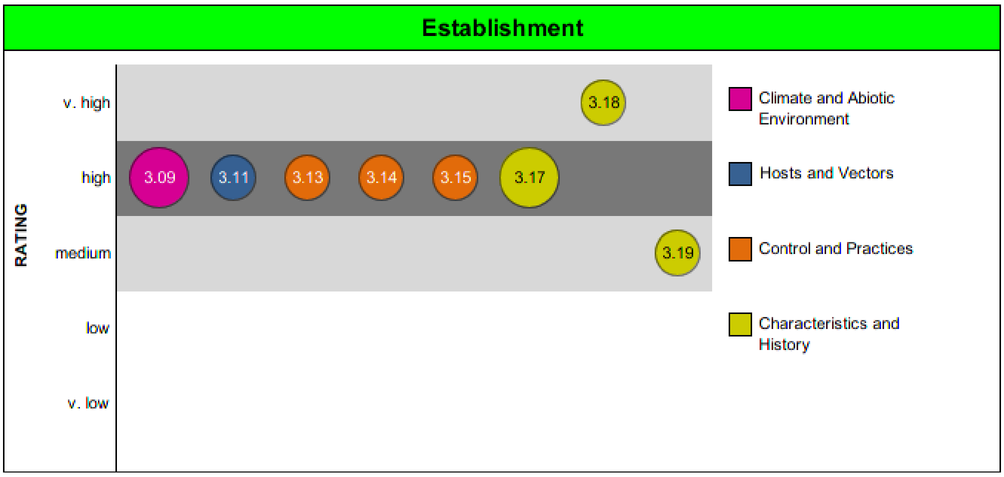
P. proximus originates from Far-East Asia (incl. Japan), and has then spread to European Russia and Siberia. Within its broad area of origin, the exact origin of the pest and its past spread are not known. Whether it has recently spread within the countries where it occurs (Japan, Korea, China, Far-East Russia) is also unknown. However, the uncertainty was rated as low as the pest did establish in Siberia and the European part of Russia.

3.20 - The overall probability of establishment should be described.

high

***Level of uncertainty:* low**

It is likely that *P. proximus* will find hosts throughout the PRA area. Climatic conditions will not have a direct influence on the pest due to its hidden life stages. The probability would be higher in areas of high density of preferred hosts (*Abies*). 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*. Its bivoltine life cycle will favour establishment, although it is not known how other biological parameters will influence establishment. However, it has already established in new areas. The probability of establishment is considered as high. It will be greater in zones with forests of its known hosts, especially *Abies* spp.



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

c1 - Conclusion on the probability of introduction.

The probability of entry was rated as “likely”, and the probability of establishment as “high”. The probability of introduction is therefore considered as “high”.

Stage 2, Section B: Probability of spread

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

high rate of spread

***Level of uncertainty:* medium**

No data were found on the distance of flight of adults and spread patterns of *P. proximus*. The mean active flight of the pest is likely to be below 10 km per year, but large number of individuals from outbreaks may also be carried by wind at long distances. The pattern of host presence (host species, age, density) will influence the spread. Where continuous presence of preferred hosts will favour build up of populations (like in Siberia), the pest may not have to fligh over long distances to find hosts.The Norwegian PRA for *Ips amitinus* reports a rate of spread of 20 km per year during 29 years in Southern Finland (Økland & Skarpaas, 2008). The spread through Finland occurred in low population conditions without outbreaks, using logging residues and single trees, in forests dominated by spruce and pine, both hosts of the species.

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**

P. proximus could be spread with any type of wood (including firewood), wood chips and bark, plants for planting, Christmas trees and wood packaging material, and is not very likely to be detected on these commodities.

4.03 - Describe the overall rate of spread

very high rate of spread

***Level of uncertainty:* low**

In newly infested areas, the rate of natural spread could be high depending on the host patterns, and spread by human activities could be very high and lead to introduction into new areas. The overall rate of spread could be very high.

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:* high**

The EWG could not answer this question. It considered that the time needed to spread in the entire area of potential establishment will depend on the trade of infested commodities, and not only on natural spread, which would take longer time. The pest is not expected to reach its maximum extent in the PRA area within a few years.

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:* low**

From a new introduction, the pest is not expected to spread significantly by natural spread during the first 5 years, and damage may not be noticed as the insect may first need population building up before spreading further, which will result in a lag phase. It could be easily introduced into new areas of the PRA area by trade.

Stage 2, 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?

very likely

***Level of uncertainty:* low**

There may be two generations per year in suitable conditions, and the pest attacks hosts that are present mostly in forests or in the wild, which would make eradication very difficult. There is no example of successful eradication of bark beetles in the EPPO region.

Commercial specific pheromones are not available, and only classical management would be possible (removing infested logs, debarking, chemical treatments of infested logs). Chemical treatments over large areas of forests are also not effective against bark beetles.

According to Gninenko & Klyukin (2011) eradication is not likely for two main reasons: 1) chemical treatments over 30-40 thousand hectares in different regions of the country are not possible for ecological reasons and 2) the chemical control at this moment is not allowed due to lack of authorized pesticides for the purpose. They recommend (for control): 1) timely sanitary measures and 2) introduction of entomophagous species.

Under favourable conditions, *P. proximus* could spread in natural habitats such as forests, but also gardens or parks. It occurs on city trees in Tomsk, where the majority of *A.sibirica* trees were damaged and killed in the last 6 years (Mizeyeva *et al.,* 2012). Early detection in forests will be difficult since specific pheromone traps are not available (and even then the pest needs to be correctly identified). It is likely that the pest would be detected only once there are numerous entry/exit holes and resin exudates on the bark of trees and those are already much weakened. Removing all potential hosts around an outbreak would also be very difficult (or impossible in most places of natural presence of hosts). An eradication programme would require large regulated areas to cover the potential flight distance of the adults, and destruction of hosts in the quarantine area, as well as some restrictions on movements of plants, wood and wood products from these areas.

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 ?

very likely

***Level of uncertainty:* low**

As for eradication, if adults emerge, they will disperse and spread. Containment will be complicated due to the main habitats of the host plants (forests, wild). Containment would require large buffer zones and intensive surveys. The pest is not expected to spread much in the first 3-5 years (Gninenko, 2010), but containment would still require extensive measures. In some parts of the PRA area this will not be possible due to the continuous presence of hosts over large areas (forests). The necessary buffer zones would be very wide taking into account the natural spread.

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 applicable as the whole area where host plants are present is considered suitable for establishment.

Stage 2, Section B: 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?

major

***Level of uncertainty:* medium (role of associated fungi, possible impact on *Abies* species not currently recorded as hosts)**

The damage was rated as major, as any impact on Siberian and Far-East forests is potentially massive, but the pest does not seem to cause much damage in its native areas as it mostly attack weakened trees (Far-East Russia, Japan, China, Korea). An uncertainty is the role of associated fungi in the damage.

Nature of the damage

P. proximus bores galleries under the bark. Massive attacks lead to discontinuation of the sap supply, and progressive die-back of the canopy. Resin flows out from entry holes, in the form of drops or of a flow along the trunk, which sometimes covers the trunk. The needles turn yellow, then brown red, and then fall down (Baranchikov *et al.* 2010, Gninenko, 2010). The bark may fall, exposing galleries (Gninenko *et al.*, 2010). In its area of origin, *P. proximus* was reported to attack mostly weakened or dying, medium-sized to large trees (Kôno & Tamanuki, 1939).

Most trees infested by *P. proximus* are visually healthy with green canopy at the beginning of the infestation. In the first year of infestation, the infested trees are extensively producing resin which covers the trunk and therefore kill the beetles. As a rule, the first infesting beetles die, but next year infestation causes less intensive resin flow. In the first year, phytopathogenic fungi carried by the beetles form small orange necrotic spots (up to 10 mm in diameter) in the places where the holes are formed in the bark. The second year, the fungal necrosis sometimes covers 50% of the bark surface, along the circumference. The canopy remains green until the last year of the tree's life. In the outbreaks of *P. proximus,* trees with partially red canopy have not been observed, which is essentially different from another important fir pest, *Monochamus urussovi* (Baranchikov *et al.*, 2011c).

Importance of the damage

Scolytids are attracted to trees that are weakened due to drought, wounds, fire, wind damage, previous biotic stresses or recently felled, although some healthy trees may be attacked during outbreaks (Sauvard, 2004 ; Dajoz, 2007). At origin, *P. proximus* is generally not considered as a factor of tree mortality, unless trees are weakened by biotic or abiotic factors (e.g. fire, landslides, drought, other pests). In the Far East, it is the most common phloeophagous species on weakened trees (Kurentsov, 1941; Baranchikov & Krivetz, 2010). Mass reproduction was observed on weakened standing trees or dying trees (fire, landslides, wind damage, stem decay and root rot, attacks by other pests) or on harvested timber (Chilahsaeva, 2008 and Gninenko *et al.*, 2010, citing Kurentsov, 1950). In the Far-East, *P. proximus* is not considered as an aggressive pest (Baranchikov *et al.*, 2011). In specific circumstances, *P. proximus* has been reported to cause damage in its area of origin: in Japan, *P. proximus* is reported as a severe pest causing mortality in local forests weakened by natural or artificial causes (Niijima, 1941), such as following wind damage (typhoon, Hara *et al.* 2008). Ohtaka *et al.* (2002a) found a relationship between the mortality of trees stressed probably by wind and bark beetles infestations. *P. proximus* is known to attack living trees of *A. sachalinensis* and kill them in Hokkaido (Japan) (Yamaoka *et al.*, 2004 citing Koizumi, 1977).

P. proximus is often a secondary pest in association with attacks by other pests, such as *Monochamus* (Chilaesaheva, 2008). In Japan (Tokuda *et al.*, 2008), attacks of *P. proximus* were observed on *Abies firma* in conjunction with defoliation by *Parendaeus abietinus* (Coleoptera: Curculionidae). Trees suffering serious needle fall were frequently attacked by *P. proximus,* and died soon after colonization, while *P. proximus* could not attack and did not cause mortality in the trees that had recovered from attacks of *P. abietinus*.

In its areas of recent introduction (Siberia, but not Moscow area yet), *P. proximus* is acting as a primary pest, and in particular has caused extensive damage on *Abies sibirica* in Siberia, with damage comparable to those by *Monochamus urussovi* (Baranchikov *et al.*, 2012). The pest has caused tree mortality after introduction (Baranchikov *et al.*, 2010; Gninenko *et al.*, 2010). In the Moscow region, trees died within 1-2 years of infestation (Chilahsaeva, 2008), and recent surveys in Siberia also show increased tree mortality (Gninenko *et al.*, 2010). In severe outbreaks in Siberia, healthy trees are reported to die within 1-4 years after the first attack (Baranchikov, 2010; Baranchikov *et al.*, 2011b; Baranchikov *et al.*, 2012, Akulov *et al.*, 2011). In Siberia, the average percentage of fir trees killed in outbreaks was 7-14% of all fir trees in the stands per year (Baranchikov *et al.*, 2011c; Baranchikov *et al.*, 2011b citing Krivetz, 2011).

Association with fungi and role in the damage

Very likely

Level of uncertainty: high

In Japan during this century *P. proximus* has been found associated with 11 species of *Ophiostoma* spp.: *O. europhioides, O. piceae, O. davidsonii, O. subalpinum, O. aoshimae, O. abieticola, O. rectangulosporum, O. microcarpum, O. nikkoense* (the last 7 were new for science) and two still unidentified *Ophiostoma* spp. – P and K (Yamaoka *et al.*, 2004; Ohtaka *et al.*, 2002, 2006). In Siberia, *O. aoshimae*, *O. rectangulosporum* and *Leptographium sibirica* were reported from *P. proximus* galleries on *Abies sibirica* (Pashenova *et al.*, 2011, 2012; Baranchikov *et al.*, 2011).
O. aoshimae was never found in Southern Siberia during 15 years of investigations on *Abies* prior to 2009 (Pashenova *et al.*, 2009). Pashenova *et al.* (2011) noted that *O. aoshimae* was present in 48-91% of nests of the beetle in Krasnoyarsk Kray and suggested that it originated from the native area of the pest, and was probably introduced with it.
Leptographium sibirica is indigenous to Siberia, and is believed to be an important factor in the weakening of firs attacked by *Monochamus urussovi* in Siberia (Baranchikov *et al.*, 2011). It is often found in *P. proximus* galleries (Pashenova *et al.,* 2011) and was probably acquired by *P. proximus* when it started feeding on its new host *Abies sibirica*. Fungi of the genus *Leptographium* were never found in *P. proximus* galleries in Japan (Dr. Yamaoka, University of Tsukuba, Ibaraki, Japan, pers. comm. 2012).
As a conclusion *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*).

The role of the fungi associated with *P. proximus* in the damage observed is not fully understood. In Japan, although many *Ophiostoma* species were associated to bark beetles neither them nor the beetles are thought to be the main cause of forest decline (Ohtaka *et al.*, 2002b). Baranchikov *et al.* (2010) reported that in Siberia *Monochamus urussovi* was previously known as the only beetle to infest and kill healthy firs and that associated blue-stain fungi can play a role in the rapid weakening of the trees. This could explain why *P. proximus* has become a serious and damaging pest in Siberia. Pathogenicity tests demonstrated that *O. aoshimae* is highly aggressive when artificially inoculated in *Abies sibirica* (Pashenova *et al.*, 2011). However, up to now it is still not known if such damages are host-specific, and if the damages observed in nature are due to the bark beetle *per-se* or if associated fungi must be present (Pashenova *et al.*, 2012).
Furthermore, little is known on the behaviour of *P. proximus* associated fungi (i.e. *O. aoshimae*) when spread to other conifer species in the EPPO region, nor on their behaviour in different climatic conditions, nor on their behaviour depending on possible other vectors. Apparently *O. aoshimae*, *O. davidsonii*, *O. subalpinum* and *Leptographium sibirica* are not present in Fennoscandia (i.e. Scandicavian Peninsula, Finland, and Lapland) (Linnakovski, 2011), although this publication focuses on *Pinus*, *Picea* and *Betula* and not *Abies*. If introduced with *P. proximus* in the EPPO region, such fungi may have a severe impact: this was the case of *Leptographium procerum* which was non pathogenic in the USA but became a serious pine pathogen in China (Linnakoski, 2011).

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 (hosts that will be attacked)**

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. *P. proximus* may kill its hosts, especially if it is associated with other pests or parasites including fungi (see 6.01), but also in other circumstances as in Siberia. Furthermore, it may cause a decrease of forest productivity.

There are already a large number of scolytids and other pests of trees in the PRA area, and it is not sure how much *P. proximus* would increase the damage.

It is likely that natural enemies in the Far-East contribute to keeping populations under control, but a hypothesis has been made that the same fauna of natural enemies may not occur in other areas where it has been introduced. In Siberia, four types of chalcids were found associated to *P. proximus* (incl. *Dinotiscus eupterus* and *Roptrocerus mirus*), but with a maximum of about 13% infestation of overwintering larvae. It is considered that parasites do not play an important role on populations of *P. proximus* (Baranchikov *et al.* 2012), although release of biological control agents was envisaged as a possible control measure (VNIILM, 2010).

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. There are other examples of bark beetles that have attacked new hosts, depending on conditions, such as:

- *Pityophthorus pityographus,* a minor European bark beetle on *Picea abies*, has become the most important bark beetle on Douglas fir (*Pseudotsuga menziesii)* in the Alps (H. Krehan, Department of Forest Protection, Vienna, Austria, 08-2012, pers. comm., and http://www.wsl.ch/forest/wus/diag/show_singlerecord.php?TEXTID=101).

- *Ips amitinus*, normally attacking spruce (*Picea abies*), also reproduces on lodge pole pine (*Pinus contorta*) in Finland (Annila *et al.* 1983).

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?

major

***Level of uncertainty:* medium**

The pest could cause death of trees, especially where large areas of forest are subject to biotic or abiotic damages weakening the trees. The area that remains to be invaded represents millions of km^2.

Conifer forests in some parts of the PRA area are subject to management practices that will make the area less favourable for *P. proximus* populations, such as removal of damaged trees to prevent reproduction of bark beetles, not storing timber with bark during the summer in the forest. This is applied in many EPPO countries (e.g. Czech Republic, Švestka *et al.,* 1996; Sweden, A. Lindelöw, pers. comm., 2013) but may be not in all parts of the PRA area. Where it is applied, such practices may reduce pest populations, but it is not known if this will be sufficient to reduce damage by *P. proximus* and associated pathogenetic fungi to an acceptable level.

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?

major

***Level of uncertainty:* medium**

Limited management measures are available. Chemical control possibilities for scolytids are limited.

The following measures could be applied:
- forestry practices: sanitation logging (felling, removal and destroying of infested trees); not leaving recently felled trees and logs lying around; eliminating fallen trees. This may not be feasible in some cases, for example in remote forest areas or mountains or in nature conservation areas;
- use of trap trees and trap logs.

These measures could reduce the impact if they are applied properly on a large scale. Because the pest also attacks small trees, sanitation may affect young stands, and these young trees have a low commercial value.

Chemical control is applied in some countries on infested logs, trap trees/logs to eliminate bark beetles (e.g. Švestka *et al.*, 1996).

There is currently no known specific pheromone for *P. proximus*. Research on *P. proximus* pheromones would be needed to be able to identify specific pheromones for survey and control.

VNIILM (2010) envisages the release of biological control agents as a mean to control the pest. However, this is not used in practice and would need research. The following natural enemies are mentioned in the literature: *Dinotiscus eupterus* (primary host); *Platygerrhus nephrolepisi* (primary host), *Roptrocerus mirus* (associate), *Roptrocerus xylophagorum* (primary host) (Hymenoptera, Chalcidoidea) (Noyes, 2011).

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?

major

***Level of uncertainty:* medium**

Applications of sanitation measures, such as destruction and removal of infested trees, removal of fallen trees, use of trap trees and trap logs will be costly.

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**

Russia and some European countries are major wood exporters.
P. proximus is currently not a quarantine pest (except within the PRA area for those countries that regulate non-

European Scolytidae) and therefore no immediate impact on trade will occur. However if the pest spread to new areas and cause damage, trade partners are likely to impose treatments or ban of some wood categories. Nevertheless conifer wood is already heavily regulated through phytosanitary measures worldwide and some measures that are already applied against other pests such as heat treatment may mitigate the risk associated with *P. proximus.*

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 *P. proximus* will mainly be local or regional. The pest may affect production at the country level if outbreaks occur on large areas (such as in the main wood-producing regions of Russia). The affected producers will probably have to bear the impact of loss of trees, as the consumers have alternative source of conifer wood.

There has been no cost estimation of losses due to *P. proximus* in Siberia (Baranchikov, pers. comm., 2012).

Økland & Skarpaas (2008) note that *Ips typographus* in Norway (last outbreak, 1971-1981) killed the equivalent of 5,000,000 m^3 of spruce timber, amounting to 1,600,000,000 NOIK (about 199,281,600 €) (2006 prices). They estimate the average loss per year by *I. typographus* to about 2,615,000 €, and estimate that this average loss per year could increase by about 1,208,000 € if *Ips amitinus* was also introduced.

Environnemental 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

There is evidence that the pest may have an environmental impact in areas where it has recently arrived, in particular Siberia.

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

N/A

***Level of uncertainty:* low**

It is expected that damage of large forest areas in Siberia will increase the risk of fire and have an impact on water management, fauna and flora on the long term. However this is not yet reported from newly infested areas of invasion.

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**

Several host species in the Far-East also occur in other areas as native plants, such as *Picea abies. Abies sibirica* and *Pinus sibirica* are also native in a large part of the PRA area. There is also a large number of native species in the genera attacked by *P. proximus* (*Abies*, *Picea*, *Pinus*, *Larix*, *Tsuga*). *P. proximus* has already expanded its host range to new species in its host genera, and could expand to other species including *Abies alba*, *Pinus sylvestris*, *Larix decidua* (see details in 3.01).

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?

High level

***Level of uncertainty:* medium**

Data are lacking on the damage caused on *Picea abies* or *Pinus sibirica* at origin, but it could be massive. Damage on *Abies sibirica* in the rest of Russia and Caucasus countries is also expected to be massive. There is an uncertainty on whether other major forest conifers will be attacked (e.g. *Abies alba, Pinus sylvestris, Picea abies, Larix decidua*).

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**

The host plants are important in forest ecosystems, including in sensitive areas such as mountains, natural parks, reserves. Those forests are recognized as playing an important role for 'carbon sequestration'.

The forests in Russia and Scandinavia account for the majority of forests in the PRA area. *Picea abies* (known host) and *Pinus sylvestris* (potential host) dominate the boreal forest zone. Forests occurring in the alpine biogeographical region are dominated by coniferous species such as *Picea abies,* and *Abies alba* (potential host) (EEA, 2006). Forests are also very important in arid areas of southern Europe, Central Asia and North Africa. Forests and woodlands in

Central Asia foothill mountains are already threatened by human and cattle pressure (Eastwood *et al.*, 2011).

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**

Forests are to a large extent subject to protection in many areas of the PRA area. They are also used for the purpose of conservation of wild fauna. They may also occur in sensitive mountain habitats, and be used for land stabilisation.

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

High risk

***Level of uncertainty:* medium**

There are some endangered or near threatened species in host genera of *P. proximus*, such as:

- *Abies nebrodensis* in Sicily (critically endangered)
- *Abies numidica* in Algeria (critically endangered)
- *Abies pinsapo* in Morocco and Spain (endangered)
- *Abies semenovii* in Kyrgyzstan (critically endangered)
- *Picea omorika* in Serbia and Bosnia Herzegovina (endangered)
- *Picea shrenkiana prostata* in Kyrgyzstan and Kazakhstan (vulnerable)
- *Pinus peuce* in Albania, Bulgaria, Greece, Montenegro, Serbia (near threatened)

(Eastwood *et al.*, 2011; IUCN, 2011).

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 may be used on infested logs (see 6.04), but is unlikely to be intensively used over wide areas.

6.09 - How important is the environmental impact likely to be in the PRA area?
(this is a summary of the answers to the subquestions 6.09.01 to 6.09.05)

Massive

***Level of uncertainty:* low**

Host plants are key forest trees and their destruction will affect the environment in the PRA area. In addition, the insect (and associated fungi) may extend its host range while invading new areas and affect rare or vulnerable species.

Social impact

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

minimal

***Level of uncertainty:* low**

Social impact is not specifically mentioned in the literature available. In its native range, *P. proximus* is not considered as a pest.

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

minor

***Level of uncertainty:* low**

P. proximus may damage host plants in amenity areas and affect the recreational value of the area. It will also affect the aesthetic value of such areas in case trees are killed. There might be a social impact in case of specific uses of the forest areas, especially for firewood, hunting, mushroom or berry-picking. Such impact will be minor at the scale of the whole PRA area but may be major at the local level.

Other impacts

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

minimal

***Level of uncertainty:* low**

This is not likely to occur, as chemical control is unlikely.

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

moderate

***Level of uncertainty:* low**

Research on pheromones and biological control will be costly, as well as establishment of the structures for production of pheromones or biological control agents. If trading partners impose phytosanitary measures (e.g. treatment, surveys), these will also add to the costs, although they should be similar or identical to measures that may already be in place against other bark beetles.

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?

major

***Level of uncertainty:* medium**

The association with fungi is not well understood, but *P. proximus* may play a role in disseminating pathogenic fungi that may cause direct damages, such as *Ophiostoma aoshimae* or *Leptographium sibirica* (see 6.01 for details).

6.15a - Describe the overall economic impact

major

***Level of uncertainty:* medium**

The overall economic impact could be massive at the local or regional scale. One major uncertainty is the role that associated fungi could play for the severity of the pest. Any attempts to establish control programmes for the pest (involving pheromones and biological control agents) will be very costly.

Uncertainty. How associated fungi will influence damage.

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

major

***Level of uncertainty:* medium**

The whole area of potential establishment as defined in 3.08 is at risk from economic, environmental and social impacts (i.e. the whole PRA area).Damage will be higher in areas with high host plant density. There is an uncertainty on the level of damage that *P. proximus* will have on its different hosts (and the possibility to extend its host range).

Stage 2, Section B: Degree of uncertainty and Conclusion of the pest risk assessment

Degree of uncertainty:

The following uncertainties have been identified, in order of importance:list sources of uncertainty

- Hosts: which species may be attacked in the genera *Abies, Pinus, Picea, Larix* and *Tsuga*; whether species that are not hosts/native at origin will be attacked; whether conifers of other genera would be attacked; whether logs of other conifers than *Abies* would be attacked.
- Impact of the pest on other hosts than *Abies.*
- Biology (Whether pupal chambers are closed with frass or not? Are adults overwintering in soil? What is the minimal size of plants attacked? Whether branches can be attacked?).
- Distribution (within Russia, Korea, China).
- Feasibility of biological control and species-specific monitoring.
- Volume of trade for all pathways, especially to non-EU countries.
- Impact and influence of the pathogenic fungi associated with *P. proximus.*

Conclusion of the pest risk assessment

The probability of introduction was rated as “likely”. *P. proximus* could be introduced by untreated wood packaging material with bark, especially dunnage (if not subject to ISPM 15 treatments), and wood with bark of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga.* Entry on wood chips and bark is considered as “moderately likely” (no data was found on the trade of bark, which was supposed to be lower). Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga* would be a favourable pathway provided that their size (diameter) allows the pest to develop and that there is a trade from countries where the pest occurs. Cut Christmas trees present a risk of entry of the pest if they are discarded in the open (e.g. in a landfill).

If *P. proximus* was introduced, it is expected to spread with a high rate naturally and very high rate by human-assistance.

Eradication and containment are not likely to be feasible in forests. In case of introduction and spread, the pest would have a massive economic impact in forests, as well as major environmental impact if it reaches forests and the natural environment. Damage may be increased if associated fungi are introduced at the same time as the pest. Introduction is also likely to cause an increase in costs for its control and associated research.

The endangered area is considered to be the whole PRA area where host plants occur (*Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*). Measures are considered at the next step.

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

Because of similarity of measures, both pathways for "Particle wood and waste wood" and "bark" are considered together, and differences are identified in the answers where appropriate.

Wood packaging material is not considered in detail in this stage (it is only listed under 7.41 and 7.45) as pest risk management is already in place. Since the adoption of ISPM 15 in 2002 (a revision 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 insects (including Scolytidae) and nematodes that are present in wood packaging material at the time of treatment.

As cut Christmas trees (and other plants parts not for planting, e.g. cut branches) present a risk of entry of the pest if they are discarded in the open, measures are considered in the pathway for plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*.

7.02 - Is natural spread one of the pathways?

yes

7.03 - Is the pest already entering the PRA area by natural spread or likely to enter in the immediate future?

yes

The pest is probably spreading from where it occurs in the PRA area, but it has not yet spread to other countries, and this is not likely to occur in the next few years except for neighbouring countries close to infested areas in Russia such as Kazakhstan and Belarus (see 4.01).

7.04 - Is natural spread the major pathway?

no

Natural spread is not the major pathway, as entry on wood or other pathways was considered much faster. *P. proximus* is still far from the borders of most other EPPO countries, except Kazakhstan and Belarus (see 4.01).

7.05 - Could entry by natural spread be reduced or eliminated by control measures applied in the area of origin?

no

Level of uncertainty: **low**

Management of the pest in forests is not practical, although any measures would help to reduce the populations, and population reduction could slow down natural spread.

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**

Surveillance could be put in place in forest areas close to the borders of Russia, such as Finland, Estonia, Kazakhstan or Belarus. There are no specific traps. However, eradication would be difficult, and establishment is still likely (see 4.01 and 5.01).

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

no

No measures have been identified, but surveillance could be put in place within Russia and in neighbouring countries to monitor the spread of the pest.

Pathway 1: Wood of Abies, Pinus, Picea, Larix and Tsuga

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

yes

Pest risk management is considered for wood with bark. Entry on wood without bark (free from bark) was considered as very unlikely.

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**

P. proximus is not a quarantine pest for all countries of the PRA area, except for those countries that regulate "non-European Scolytidae" (such as the EU, Norway, Switzerland, Montenegro, Serbia). At the scale of the whole PRA area, there are no measures that would completely prevent its introduction. Requirements in EPPO countries are presented in Annex 6 (Table 1). This annex is based on current requirements for the EU, but on older EPPO summaries of phytosanitary regulations for most other countries. However, it may give an indication of the current requirements in place, and overall the pathway seems to be open from all origins for most hosts, categories of wood and countries of the PRA area.

Note: Is Polygraphus proximus covered by the current requirements on "non-European Scolytidae" in the EU Directive 2000/29/EC?

Annex II of Council Directive 2000/29/EC lists Scolytidae (non European) in connection with plants, wood with bark, and isolated bark of conifers, originating in non-European countries. As *P. proximus* is now present in the European part of Russia, there may be questions whether this pest is covered by these requirements.

G. Cardon (EU Commission, pers. comm., 2012) explained that non European Scolytidae species refers to those species which are not native/indigenous in the European continent. In addition, Russia is a non-European country as only part of Russia is in the European continent. Therefore, the introduction into the EU of, for example, wood with bark of conifers from any part of Russia (including the European part) is banned if non-European Scolytidae are present in that wood.

As for other harmful organisms in Annex II, there are in Annex IV special requirements for the introduction into the EU of wood and plants (other than those prohibited in Annex IIIAI) of conifers in connection with non-European Scolytidae, such as point IVAI 1.5. Point IVAI 1.5 concerns conifer wood (other than chips, Wood packaging material and dunnage) originating in Russia, Kazakhstan and Turkey. Since *P. proximus* is a non-European Scolytidae, wood originating in Russia (all Russia) needs to fulfil at least one of the requirements listed in point IVAI 1.5. The first of the possible requirements that conifer wood originating in Russia could meet is that it originates in a area known to be free of non-European Scolytidae species (and non European *Monochamus* and *Pissodes* species). Since *P. proximus* is now established in some areas of the European part of Russia, those areas no longer fulfil this first requirement. Therefore wood from conifers from those areas (areas in the European part of Russia where *P. proximus* is now established) would need to fulfil one of the other special requirements in order to be allowed to be introduced in the EU (i.e. bark-free or kiln-dried to below 20% moisture content, or heat-treated, or fumigated, or chemically impregnated).

As a conclusion, the fact that *P. proximus* is now established in the European part of Russia does not mean that it is no longer regulated in the EU. The introduction of *P. proximus* into the EU is prohibited, independently of whether it is present on wood of conifers originating in the non-European or the European part of Russia.

The only prohibition relates to firewood to Turkey and *Pinus* wood to Russia (which would apply to Japan, China and Korea Rep.). However, wood of conifers (especially *Abies*, *Pinus*, *Picea*, *Tsuga*) is heavily regulated for a part of the region (including the EU.) and is subject to measures against other pests. These measures would imply either treatments that would destroy the pest, or at least inspection. In case of inspection only, it is not certain that infestations would be detected. In the EU, wood is also subject to general inspection requirements, but these would not guarantee detection of the pest. It should also be noted that, as reduced frequency of inspections (EC/1756/2004, EU 2013) is applied to conifer wood from the European parts of Russia, only 3 % of wood has to be inspected.

In most countries, wood of conifers is also subject to general requirements (e.g. import permit or phytosanitary certificate); such requirements may ensure that inspections are carried out, but detection *of P. proximus* would be difficult. Some specific requirements apply to hosts in some countries and might increase the chance of destruction or detection of the pest, although they do not target directly *P. proximus*.

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

The pest is most likely to be detected if it has built some populations (resin flow on the trunks, entry and exit holes, bark peeling off and galleries visible). Signs of dieback may also be observed, although in recent outbreaks these appeared late. In case of low infestation levels, it may not be noticed. This measure is not sufficient on its own but may be combined with others.

No specific trapping method is available.

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

no

Level of uncertainty: **low**

Not relevant.

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

no

Level of uncertainty: **low**

There are no treatments that could be applied to manage the pest in forests. Use of trap trees/logs and destruction would reduce populations, but would not eliminate the pest completely.

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

no

Level of uncertainty: **low**

No such cultivars are reported in the literature.

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**

This is not relevant for wood production.

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**

Various life stages may be associated with the wood at all periods 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.

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

spread.

high rate of spread

***Level of uncertainty:* medium**

Possible measure: pest-free area

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

yes

***Level of uncertainty:* medium**

A PFA could be envisaged according to ISPM 4. It will probably not be possible for Japan, where the pest is widespread. However, on the scale of large countries (e.g. Russia, China), it is likely that some areas are free from *P. proximus*. The establishment and maintenance of a PFA in a country where the pest is present would require extensive monitoring (there is no specific trapping, but some signs of infestation may be visible on the trees. Trap trees may be used). This would require appropriate identification capabilities to avoid misidentifications and ascertain freedom. The establishment and maintenance of a PFA in a country where the pest is present would be possible only in areas isolated by physical barriers (e.g. islands or absence of host plants on a sufficient distance) or in areas far away from infested zones with intensive monitoring.
The PFA should be officially recognized by the importing country.
Note: The EPPO Panel on Quarantine Pests for Forestry is drafting guidance on requirements to establish a PFA for this pest.

A PFA should include handling and packing methods allowing to prevent infestation of the consignment after leaving the PFA (i.e. during transport) (see 7.26).

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

Visual inspection will not easily detect early infestation because of the size of wood consignments. Signs of presence of the pest may be confused with signs of other bark beetles species. *P.proximus* may also be misidentified with other species (see Introduction). However, inspection could be used in a systems approach to verify compliance with other measures.

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

No

***Level of uncertainty:* low**

There are methods that can detect insects in branches, stems or roots (e.g. x-rays, acoustic methods, systematic destructive sampling, trained dogs, see Goldson *et al.*, 2003) but they cannot be applied currently as they are not fully developed and are not developed for bark beetles.

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

Yes in a Systems Approach

***Level of uncertainty:* low**

Possible measure: specified treatment of the consignment

The following treatment could be applied, but they should be combined with handling and packing methods preventing infestation of the consignment after treatment (in particular during transport) (see 7.26).

Heat treatment. Heat treatments have proven to be highly effective for subcortical insects and pathogens. According to EPPO Standard PM 10/6(1) *Heat treatment of wood to control insects and wood-borne nematodes*, Scolytidae 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. This is confirmed by the results of the PEKID project (PEKID, 2009).
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 based on the results from the EUPHRESCO project for other bark beetles (PEKID,

2009).

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

Processing. Processing will not be effective on its own. Conversion of the wood into sawn timber will remove part of the outer surface and destroy some larvae and pupae, and cause the wood to dry out more quickly, causing mortality. However, some larvae or pupae may survive in larger pieces of sawn wood where bark is present. Processing the wood will also expose the galleries and make it more likely that infestation will be detected.

Methyl bromide fumigation of wood. This will not be effective because of the presence of bark and of the size of the logs: according to *EPPO Standard PM 10/7(1) Methyl bromide fumigation of wood to control insects*, only wood without bark and whose dimensions does not exceed 200 mm cross section can be fumigated to destroy insect pests.

Chemical pressure impregnation. This will not be effective because of the presence of bark, the size and the moisture of the logs: chemical pressure impregnation requires wood surface clean from dirt and bark (as bark is impermeable to liquid chemicals), small wood thickness, and wood moisture below 25-30%.

Insecticide-impregnated nets. Consignments may be kept for some time under insecticide-impregnated nets (see 7.26) but this is not an approved phytosanitary treatment.

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?

Yes

***Level of uncertainty:* low**

Possible measure: removal of parts of plants from the consignment

Removal of the bark will remove most individuals, except those pupae that are in the sapwood. These would be exposed to desiccation. Removal of bark reduces the risk to an acceptable level. The bark should be completely removed to make the wood bark-free. Sanborn (1996) indicates that removal of bark makes the bark and the wood unsuitable for bark beetle breeding, and it would therefore prevent infestation after treatment.

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

Yes in a systems approach

***Level of uncertainty:* low**

The EWG envisaged whether the wood could be stored for a sufficient period in conditions preventing both its infestation (as described below) and ensuring that all individuals present in the wood are killed.

- To prevent infestation: as adults may colonize fallen trees and logs, logs should be removed from the forest area and stored in conditions preventing infestation. Alternatively, if wood is left on site, removing bark makes the wood unsuitable for colonization (Sanborn, 1996) or insecticide-impregnated nets may be used (Geráková, 2011, http://www.pestcontrol.basf.co.uk/agroportal/pc_uk/en/complion/complion.html).
- Regarding conditions ensuring that all individuals present in the wood are killed, insecticide-impregnated nets may be used to kill the pest as adults emerge from the logs; this has been used for *Ips typographus* (Knizek, 2012, pers. comm.). Sanborn (1996) also mentions covering the wood with plastic sheets for a sufficient duration (one season?), but this may have an impact on the quality of the wood because of the development of fungi and bacteria.

The EWG concluded that such a measure was not sufficient to guarantee pest freedom of the consignment, as the emerging adults may infest logs within the consignment.

Handling and packing methods need to be used in combination with other measures to avoid infestation during transport. This relates to all measures except complete removal of bark (as bark free wood would not be infested). 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.

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**

Not possible 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?

No

Level of uncertainty: **low**

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, 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. There is also an uncertainty on the flight period and the temperature at which adults will emerge. Consequently the adequate period would differ between geographical location in the PRA area and even between years, which makes it difficult to apply in practice.

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**

Surveillance can be put in place at the vicinity of facilities using the wood, but there are no specific traps. Adults can escape from surveillance and surveillance may not be sufficient to detect infestations early enough to ensure eradication (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	low
7.20	X		pest-free area	medium
7.22		X	visual inspection of the consignment	low
7.24		X	specified treatment of the consignment	low
7.25	X		removal of parts of plants from the consignment	low
7.26		X	Handling and packing methods	low

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

no

Level of uncertainty: **low**

The following individual measures reduce the risk to an acceptable level:
- PFA (including appropriate handling/packing methods to avoid infestation after leaving the PFA area)
or
- Complete removal of bark

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?

yes

Level of uncertainty: **low**

The following measures are not sufficient on their own:
- treatment (heat treatment, irradiation)
- visual inspection at the place of production
- visual inspection of the consignment prior to export
- handling and packing methods to prevent infestation during transport

The following combination reduces the risk to an acceptable level: treatment + handling/packing methods to prevent infestation of the consignment after treatment.

Other measures cannot be combined 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**

There is a high volume of trade of wood especially from Russia. The measures would interfere with trade, but there are already many measures in place, including against non-European Scolytidae, that already apply to some countries where *P. proximus* occurs.

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 create additional costs. Heat treatment and irradiation may not be cost effective in comparison with the value of the wood (e.g. firewood). PFA may be cost effective for part of Russia or China where the pest does not occur (provided freedom can be reliably ascertained).

Importing countries would have costs of inspection related to the requirement for a PC, but Scolytidae or other wood boring pests are already subject to PC in the PRA area. There would be costs of identification following inspection, but such costs are currently incurred under current measures.

Exporting countries will have to apply surveillance.

This pest would be difficult to eradicate if introduced, will have a high impact if it established, especially if it is introduced with associated fungi. Therefore measures preventing introduction will be cost effective.

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:
- PFA (including appropriate handling/packing methods to prevent infestation after leaving the PFA)
or
-Complete removal of bark
or
- Treatment (heat treatment, or irradiation) + handling/packing methods allowing to prevent infestation of the consignment after treatment.

Pathway 2: Particle wood and waste wood of conifers
Pathway 3: Bark of conifers

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

yes

Because of similarity of measures, the pathways for 'particle wood and waste wood' and for bark are considered together, and differences identified in the answers where appropriate.

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**

P. proximus is not a quarantine pest in countries of the PRA area, except for those countries that regulate "non-European Scolytidae" (such as the EU).
Isolated bark of conifers (Coniferales), originating in non-European countries can only be imported in the EU if it:
(a) has been subjected to an appropriate fumigation with a fumigant approved in accordance with the procedure laid down in Article 18.2.
or
(b) has undergone an appropriate heat treatment to achieve the minimum temperature of 56 °C for at least 30 minutes, the latter to be indicated on the certificates referred to in Article 13.1.(ii).

For particle wood and waste wood, there are no measures that would completely prevent its introduction on the pathway. Requirements in EPPO countries are presented in Annex 6 (Table 2). This annex is based on current requirements for the EU, but on older EPPO summaries of phytosanitary regulations for most other countries. However it gives an indication of the requirements in place, and overall both pathways seems to be open for all or most countries in the PRA area from all origins. Particle wood and waste wood (including wood chips) are not prohibited. The pathway is open for all origins. However, where wood chips of conifers are subject to measures against other pests (e.g. in the EU or Turkey), these would also ensure destruction of *P. proximus*. Where wood chips of conifers are subject to general requirements (e.g. import permit or phytosanitary certificate), these may ensure that inspections are carried out, but detection *of P. proximus* would be difficult.

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**

As for wood.

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?

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.

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

high rate of spread

***Level of uncertainty:* medium**

Possible measure: pest-free area

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

yes

***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**

The pest would be difficult to detect in wood chips and in bark.

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

no

***Level of uncertainty:* low**

As for wood.

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

yes in a Systems Approach

***Level of uncertainty:* low**

Possible measure: specified treatment of the consignment

Some treatments could be effective but their practical implementation should be defined based on further research. For particle wood and waste wood, any treatment should be combined with handling and packing methods preventing infestation of the consignment after treatment (in particular during transport) (see 7.26).

Wood could also be treated prior to chipping (see 7.24 for the wood pathway), this could be equivalent to treatment of wood chips. This would also apply to bark.

- Heat treatment. As for wood. It should ensure that a sufficient temperature (i.e. 56°C for 30 min) is applied throughout the profile of the material.
- Fumigation. In New Zealand, requirements for wood chips against insects are methyl bromide or sulphuryl fluoride fumigation (80 g/m^3), in separate units no larger than 2 m^3, for more than 24 continuous hours at a minimum temperature of 10°C. In Israel (Israel, 2009b), methyl-bromide fumigation is required against internal and external pests for 16 hours at 80 g/m^3 at 10-20°C or at 48g/m^3 for 16 hours at 21°C or more.

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).

New Zealand regulates wood chips, sawdust and wood for a number of pests (MAF, 2003). Treatment options required for import in New Zealand are either heat treatment or fumigation.

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?

yes

Level of uncertainty: **low**

Possible measure: removal of parts of plants from the consignment

Wood chips could be produced from wood which is bark-free.

This is not relevant for the bark pathway.

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

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, part of the wood chips consignment/pile is likely to present the right conditions of moisture and temperature for the survival and development of the pest. If any adults emerge, they may infest some wood chips in the same pile. This measure would also be difficult to check in practice.

For particle wood or waste wood, handling and packing methods need to be used in relation to other measures to avoid infestation during transport. This relates to all measures except complete removal of bark (as bark free wood for chips would not be infested). This may be achieved by transporting these commodities outside of the flight period of *P. proximus*, or through PFA areas, or packed in a way preventing infestation.

Bark itself is not attractive to the adults.

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 would not be applied for wood chips or bark.

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**

The consignments could be accepted for immediate processing at a time when adults cannot emerge. However, such measures are difficult to implement and control (ensuring immediate processing, mixing consignments of wood chips, etc.).

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.	Standalone	Systems Approach	Possible Measure	Uncertainty
7.13		X	visual inspection at the place of production	low
7.20	X		pest-free area	medium
7.24		X	specified treatment of the consignment	low
7.25	X		removal of parts of plants from the consignment	low
7.26		X	specific handling/packing methods	low

For bark, of the measures above, only visual inspection at the place of production, pest-free area and treatment (effective on its own), were identified.

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

no

Level of uncertainty: **low**

The following measures reduce the risk to an acceptable level.

For wood chips:
- PFA (including handling and packing methods preventing infestation after leaving the PFA)
or
- Production from bark-free wood

For bark:
- PFA
or
- Treatment

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?

yes

Level of uncertainty: **low**

The following measures were identified that do not reduce the risk to an acceptable level on their own.

For wood chips:
- Visual inspection at the place of production
- Treatment
- Handling and packing methods

Treatment and handling packing methods could be combined and reduce the risk to an acceptable level.

For bark:
- Visual inspection at the place of production

There is no possible combination.

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

Level of uncertainty: **low**

For wood chips, the measures will interfere with trade, as most countries of the PRA area do not require measures so far. However, those which have a high volume of trade (in the EU, Finland), already impose measures for wood chips,

and the same could be applied for *P. proximus*.
For bark, the volume of the trade is not known. However, the pathway is already regulated in some countries with some general measures, and this would not interfere more with trade.

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 proposed at origin would have costs linked to monitoring and treatment. However, similar measures are applied against other forestry pests. P. proximus could be difficult and costly to eradicate or contain if introduced. The direct impacts 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 following measures reduce the risk to an acceptable level.

For wood chips:
- PFA (including handling and packing methods preventing infestation after leaving the PFA)
or
- Treatment + handling and packing methods preventing infestation after treatment
or
- Produced from bark-free wood

For bark:
- PFA
or
- Treatment

Pathway 4: Plants for planting of host species

7.06 - Is the pathway that is being considered a commodity of plants and plant products?
yes
This pathway cover plants for planting of *Abies, Pinus, Picea, Larix and Tsuga* species (except seed and cutting)

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
According to Annex III of the EU Directive 2000/29, the introduction of'Plants of *Abies* Mill., *Cedrus* Trew, *Chamaecyparis* Spach, *Juniperus* L., *Larix* Mill., *Picea* A. Dietr., *Pinus* L.,*Pseudotsuga* Carr. and *Tsuga* Carr.,other than fruit and seeds' from non-European countries is prohibited.

The EWG was not aware of measures applied on host plants for planting for EPPO non-EU countries.

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
Inspection may detect some infestation 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).
There is no specific trapping system.

7.14 - Can the pest be reliably detected by testing at the place of production?
no
Level of uncertainty: low
Not relevant.

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
If available, suitable insecticide treatments will only lower pest populations. In some countries there are no pesticides registered against bark beetles.

7.16 - Can infestation of the commodity be reliably prevented by growing resistant cultivars?
no
Level of uncertainty: low
No resistant cultivars are known.

7.17 - Can infestation of the commodity be reliably prevented by growing the crop in specified conditions?
yes in a Systems Approach
Level of uncertainty: medium *(it is not common practice for the host species)*
Possible measure: specified growing conditions of the crop
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.

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?

yes as standalone measure

Level of uncertainty: high *(the size specified is based on observations but not on published data, there was no dedicated studies on this subject)*

Possible measure: specified size of the plant

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 (Baranchikov, pers. comm., 2012).

This measure cannot be applied to bonsais because the bark of bonsais may be thick enough to allow pest development.

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 pest.

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

high rate of spread

Level of uncertainty: medium

Possible measure: pest-free area

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

yes

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?

yes in a Systems Approach

Level of uncertainty: medium

Possible measure: visual inspection of the consignment

The pest would be difficult to detect in a large consignment of plants for planting, although signs of the pest may be detected on individual plants.

Early infestations may be overlooked.

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

no

Level of uncertainty: low

As for wood.

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

no

Level of uncertainty: medium

There is no publication of specific data on efficacy of insecticide against *P. proximus* and application will not guarantee freedom.

Irradiation may be effective but may affect the viability of the plant. Research is needed to define an appropriate schedule.

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

It is not possible to remove the bark without killing the plant.

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

There is a need to avoid infestation during transport. This may be ensured by transporting the plants outside of the flight period, or through PFA areas, or packed in a way preventing infestation.

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

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.

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

Plants for ornamental purposes are widely distributed. Surveillance is not possible as no specific trapping system exist.

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	low
7.15		X	specified treatment of the crop	medium
7.17		X	specified growing conditions of the crop	medium
7.18	X		specified size of the plant (but not for bonsais)	high
7.20	X		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	low

			and post-entry quarantine	

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

no

Level of uncertainty: low

PFA

Post-entry quarantine

Plants of a specific size (less than 4 cm diameter), except bonsais.

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?

yes

Level of uncertainty: high

Grow the plants under complete physical protection, inspection and transport in conditions preventing infestation.

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

Level of uncertainty: low

Requirements on import of conifer plants already exist for import to many EPPO countries (e.g. the EU). For other countries, measures will interfere to a certain extent with trade, but it is thought that trade from countries where *P. proximus* occurs is limited.

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

Eradication or containment of *P. proximus* will be very unlikely if introduced, and will have a high impact if established, especially if it is introduced with associated fungi. Therefore measures preventing introduction will be cost effective.

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

PFA + handling and packing.

Grown under protected conditions + handling and packing.

Plants of a specific size (less than 4 cm diameter), except bonsais.

Post-entry quarantine.

7.41 - Consider the relative importance of the pathways identified in the conclusion to the entry section of the pest risk assessment

The pathways considered are:

- Untreated wood packaging material (including dunnage)
- Wood with bark of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*
- Wood chips of conifers
- Bark from host species
- Plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*
- Natural spread
- Plant parts (including Cut Christmas trees) of *Abies, Pinus, Picea, Larix* and *Tsuga*

7.45 - Conclusions of the Pest Risk Management stage.

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

The measures identified are listed below. They are not relevant for countries that already apply measures that would prevent entry of the pest (see C1).

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 appropriate handling/packing methods to preve infestation after leaving the PFA) officially recognized by th importing country or -Complete removal of bark or - Treatment + handling/packing methods allowing to preve 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 preventir infestation after leaving the PFA) officially recognized by th importing country or - Treatment + handling and packing methods preventing infestatic 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 - Treatment
Rooted plants for planting of *Abies*, *Pinus*, *Picea*, *Larix* and *Tsuga*	Likely (medium uncertainty)	Yes in the EU (hosts from non-European countries)	PC and - PFA* (including handling and packing methods preventir infestation after leaving the PFA) officially recognized by th importing country

			or - Post Entry Quarantine or - Plants less than 4 cm stem diameter (except bonsais) or - grown under protected conditions with handling and packir methods preventing infestation after leaving the protecte conditions.
Natural spread	Unlikely, except for Kazakhstan and Belarus	-	No measure proposed, but if control measures are applied, th 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 preventir infestation after leaving the PFA) officially recognized by th 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 EPPO Panel on Panel on Quarantine Pests for Forestry.

The main uncertainties in the management part are:

- Feasibility of a PFA in countries where the pest occurs
- Minimum size of the plants that are not attacked by the pest

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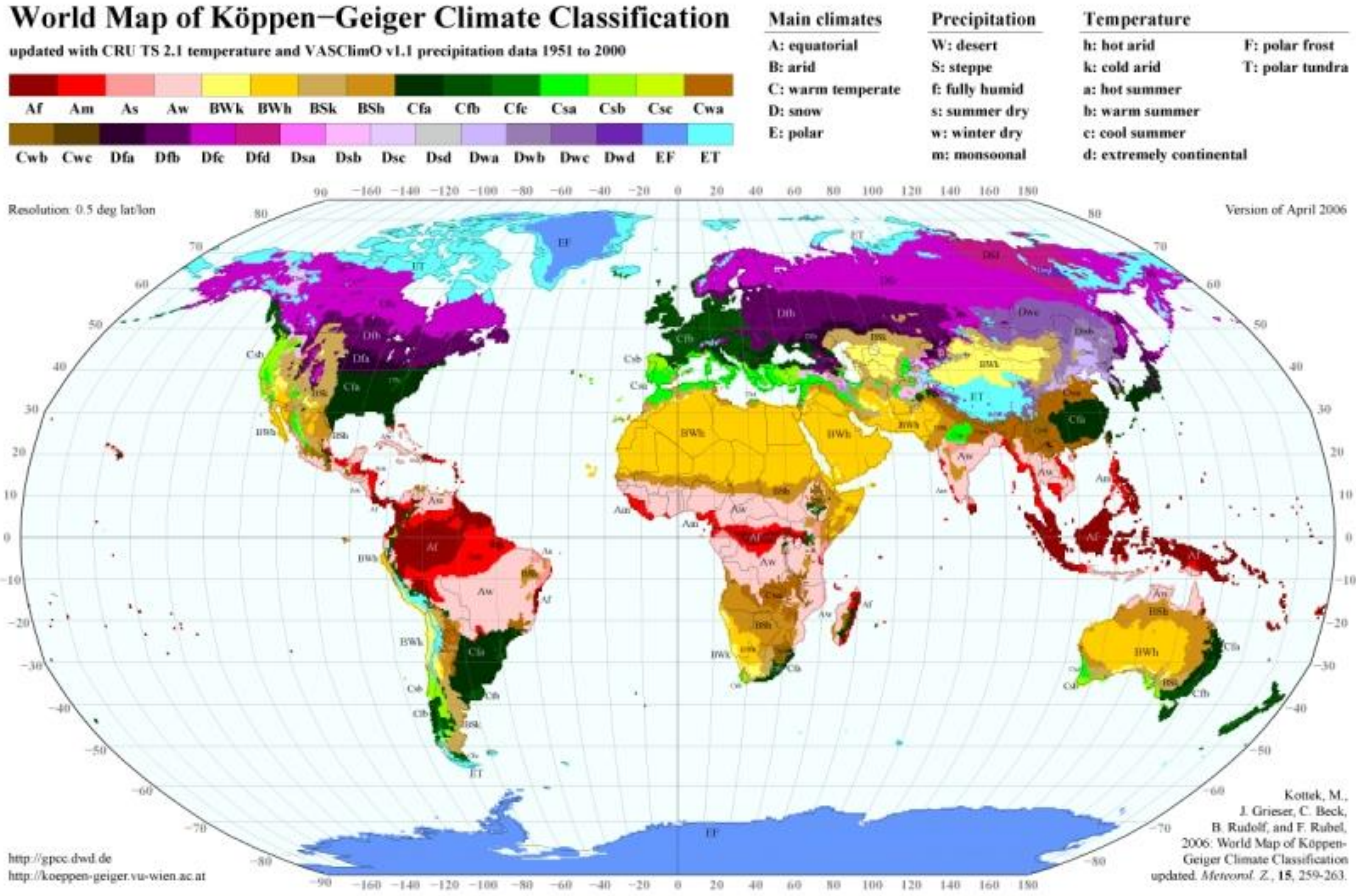
Annex 1 – World Map of Köppen-Geiger Climate Classification



Annex 2. Imports of Christmas trees and conifer branches from countries where *P. proximus* occurs

Table 1. Christmas trees (06049120) and conifer branches (06049140) (without indication of species, i.e. host and non-hosts plants) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 05-2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from the Russian Federation, Korea Rep, Korea Dem. Rep. and Japan.

		China						
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Christmas trees	Belgium	:	:	:	:	:	0	:
	Denmark	:	:	:	1	:	:	:
	UK	247	:	:	:	:	:	:
	Ireland	:	0	0	:	:	:	0
conifer branches	Austria	0	:	:	4	4	:	:
	Germany	:	:	:	48	:	:	:

Annex 3. Imports of wood from countries where *Polygraphus proximus* occurs (China, Japan, Korea Dem. Rep., Korea Rep., Russia)

Firewood

Table 1. Firewood (44011000) (host and non-hosts species, including deciduous) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below, as well as years without imports. "0" indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

	China							Korea, Rep.		Japan		Russia						
	2005	2006	2007	2008	2009	2010	2011	2006	08	2006	07	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	:			:	43.070	269.794	2.714	212	1.854	:
Belgium	:	:	:	:	:	1	:	:	:			:	:	437	:	22.466	701	2.918
Cyprus	:	:	:	:	:	:	:	:	:			:	250	:	:	:	:	:
Czech Republic	:	:	:	:	210	:	:	:	:			:	431	:	:	:	:	644
Germany	:	:	:	13	190	:	:	:	:			:	1.844	12.428	53.068	5.308	152.777	72.516
Denmark	:	:	:	0	:	:	:	:	:			:	5.864	2.851	90.547	108.923	53.696	262.499
Estonia	:	:	:	:	:	:	:	:	:			1.049	8.802	22.593	12.107	206	:	9.572
Finland	:	:	:	:	:	:	:	:	:			1.010.999	828.021	706.496	530.908	2.857.992	435.947	230.296
France	:	:	:	15	:	:	:	:	:			:	:	:	:	94	:	:
United Kingdom	:	100	:	:	43	190	200	:	:			:	:	195	:	:	:	:
Greece	:	:	:	36	:	:	20	:	:			:	:	:	:	:	:	:
Hungary	:	:	:	:	:	:	:	:	:			:	200	200	:	:	107	:
Ireland	1	:	282	6.450	2	5	:	:	:			:	:	75	:	100	:	230
Italy	:	2.508	3.573	:	:	:	166	240	240		0	550	672	:	218	415	1.286	1.040
Lithuania	:	:	0	:	:	:	:	:	:			3.434	22.494	16.816	190	1.107	2.739	1.275
Latvia	:	:	:	:	:	:	:	:	:			2.578	2.385	15.523	:	130	475	3.997
Netherlands	49	2.675	21	:	:	41	0	:	:	0		:	:	:	:	:	2.589	1.099
Poland	:	:	:	:	:	:	:	:	:	0		:	:	341	1.662	:	:	:
Sweden	:	:	0	:	:	:	:	:	:			492.718	696.307	286.582	486.318	1.833.249	563.213	1.083.405
Slovakia	:	:	:	:	:	:	:	:	:			:	:	:	:	:	1.171	:
Total	**50**	**5.283**	**3.876**	**6.514**	**445**	**237**	**386**	**240**	**240**	**0**	**0**	**1.511.328**	**1.610.340**	**1.334.331**	**1.177.732**	**4.830.202**	**1.216.555**	**1.669.491**

Rough wood, whether or not stripped of bark or sapwood, or roughly squared

Table 2. Rough wood of *Picea abies* or *Abies alba* - sawlogs (44032011) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria		:	:	:	:	:	:	7.496	645	6.871	:	45.299	52.353	979
Czech Rep.		:	:	:	:	:	:	:	25.698	:	:	:	:	:
Germany		:	:	:	:	:	:	3.366.553	5.082.462	1.879.648	149.163	152.512	750.110	1.241.782
Estonia		:	:	:	:	:	:	5.073.652	4.764.824	3.370.387	61.860	:	:	:
Spain		:	:	:	:	:	:	6.452	:	:	:	:	:	:
Finland		:	:	:	:	:	:	19.736.518	15.255.839	7.412.423	3.769.288	2.893.479	1.910.826	1.152.844
France		3	200	:	:	:	:	:	:	:	:	:	:	:
Greece		:	:	:	:	:	:	28.838	35.124	30.793	:	:	:	:
Hungary		:	:	:	:	:	:	9.658	:	500	:	:	:	440
Lithuania		:	:	:	:	:	:	18.472	65.281	200.263	14.082	:	:	:
Latvia		:	:	:	:	:	:	2.611.869	3.042.752	3.508.367	180.729	:	:	:
Poland		:	:	:	:	:	:	:	:	1.200	7	:	:	:
Romania		:	:	:	:	:	:	35.159	967.051	388.724	:	:	:	:
Sweden		:	:	:	370	:	:	3.147.045	1.800.617	1.449.155	374.556	205.826	337.601	500.729
Total	**0**	**3**	**200**	**0**	**370**	**0**	**0**	**34.041.712**	**31.040.293**	**18.248.331**	**4.549.685**	**3.297.116**	**3.050.890**	**2.896.774**

Table 3. Rough wood of *Picea abies* or *Abies alba* – other than sawlogs (44032019) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	2.500	3.395	62.906	53.401	50.482	:
Belgium	:	:	:	:	:	:	:	:	8.677	:	:	:	:	:
Czech Rep.	:	:	:	:	:	:	:	:	2.174	:	:	:	:	:
Germany	:	:	:	:	:	:	:	190	406	3.711	506	:	3.409	:
Denmark	:	:	:	:	:	:	:	:	620	:	:	:	:	:
Estonia	:	:	:	:	:	:	:	275.426	515.941	384.584	5.246	:	:	:
Finland	:	:	:	:	:	:	:	11.859.948	11.393.419	7.834.394	8.231.527	966.844	2.036.401	2.369.704
United Kingdom	:	:	:	:	:	:	:	204.536	218.412	200.146	127.440	32.910	12.753	:
Greece	:	:	:	:	:	:	:	:	375	:	:	:	:	:
Ireland	:	:	:	15	:	:	:	:	:	:	:	:	:	:
Lithuania	:	:	:	:	:	:	:	:	620	6.226	:	:	:	:
Latvia	:	:	:	:	:	:	:	10.255	4.000	44.577	:	:	:	:
Netherlands	:	:	:	:	:	:	13	:	:	227	:	:	:	:
Poland	:	:	:	:	:	:	:	471	:	:	:	:	:	:
Romania	:	:	:	:	:	:	:	:	2.850	:	:	:	:	:
Sweden	:	:	:	:	:	:	:	320.200	455.784	428.016	166.922	:	63.940	:
Slovakia	:	:	:	:	:	:	:	:	:	:	:	2.220	:	:
Total	**0**	**0**	**0**	**15**	**0**	**0**	**13**	**12.671.026**	**12.605.778**	**8.905.276**	**8.594.547**	**1.055.375**	**2.166.985**	**2.369.704**

Table 4. Rough wood of *Pinus sylvestris*–sawlogs (44032031) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	65	:	:	:	:	:
Bulgaria	:	:	:	:	:	:	:	:	2.132	195	:	:	:	:
Czech Rep.	:	:	:	:	:	:	:	34	:	:	:	:	:	:
Germany	:	:	:	:	:	:	:	945	863	244.378	2.796	:	243	:
Estonia	:	:	:	:	:	:	:	3.897.497	4.738.510	4.234.066	509.444	82.877	:	:
Spain	:	:	:	:	:	:	:	14.734	22.604	701	:	:	:	:
Finland	:	:	:	:	:	:	:	12.448.588	10.293.954	5.980.741	3.691.185	3.507.273	2.450.167	1.523.312
Greece	:	:	:	:	:	:	:	:	12.582	9.096	5.810	728	355	195
Hungary	:	:	:	:	:	:	:	38.728	167	4.908	2.860	:	:	:
Ireland	3.250	3.962	13.415	202	:	:	:	:	:	:	:	:	:	:
Italy	:	:	:	:	:	:	:	67	:	:	:	:	:	:
Lithuania	:	:	:	:	:	:	:	13.484	6.216	63.132	6.116	:	:	:
Latvia	:	:	:	:	:	:	:	1.163.755	1.591.216	2.431.411	106.312	:	:	341
Netherlands	:	:	:	:	:	:	:	252	:	:	:	:	52	:
Poland	:	:	:	:	:	:	:	5.853	10.390	4.800	:	92	:	:
Romania	:	:	:	:	:	:	:	1.842	4.993	:	2.709	:	:	:
Sweden	:	:	:	:	:	:	:	579.255	535.119	535.978	122.339	669	:	:
Total	**3.250**	**3.962**	**13.415**	**202**	**0**	**0**	**0**	**18.165.034**	**17.218.811**	**13.509.406**	**4.449.571**	**3.591.639**	**2.450.817**	**1.523.848**

Table 5. Rough wood of *Pinus sylvestris*–other than sawlogs (44032039) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	:	86.730	181.240	345.757	204	:
Belgium	:	:	:	:	:	:	:	:	18.781	:	:	:	:	:
Bulgaria	:	:	:	:	:	:	:	:	58	15	:	:	:	:
Czech Rep.	:	:	:	:	:	:	:	2	:	:	:	:	:	:
Germany	:	:	:	:	:	:	:	1.576	1.004	25.811	1.673	:	24.570	:
Denmark	:	:	:	:	:	:	:	:	:	605	:	:	:	:
Estonia	:	:	:	:	:	:	:	1.207.925	1.474.907	742.751	73.471	128	:	:
Spain	:	:	:	:	:	:	:	259	348	:	:	:	:	:
Finland	:	:	:	:	:	:	:	9.978.804	8.082.772	7.376.845	7.710.632	497.535	2.248.500	2.023.836
France	:	:	:	:	:	:	:	2.175	3.429	191	868	:	:	:
United Kingdom	1.446	210	:	:	:	:	:	:	:	:	:	8.607	:	:
Greece	:	:	:	:	:	:	:	:	:	28.306	26.151	:	:	:
Hungary	:	:	:	:	:	:	:	:	14	:	:	:	:	:
Ireland	382	:	:	:	:	:	:	:	:	:	:	:	:	:
Italy	:	:	:	:	:	:	:	993	4.931	13.601	80	217	186	:
Lithuania	:	:	:	:	:	:	:	2.736	2.372	1.978	:	:	:	:

Luxembourg	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Latvia	:	:	:	:	:	:	:	28.794	45.333	200.294	17.287	:	:	:
Netherlands	:	:	:	:	:	:	:	:	218	218	161	:	:	:
Poland	:	:	:	:	:	:	:	5.698	4.360	:	652	20	:	:
Romania	:	:	:	:	:	:	:	7.150	16.876	1.596	450	:	:	:
Sweden	:	:	:	:	:	:	:	1.708.697	190.376	761.993	1.008.993	223.184	247.356	459.630
Total	**1.828**	**210**	**0**	**0**	**0**	**0**	**0**	**12.944.809**	**9.845.779**	**9.240.934**	**9.021.658**	**1.075.448**	**2.520.816**	**2.483.466**

Table 6. Rough wood of other conifers - sawlogs (44032091) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne. There was no import from Korea Dem. Rep. and Japan.

	China							Korea Rep.							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	:	:	:	:	:	:	25.244	33.356	5.021	3.725	2.103	1.757	768
Belgium	:	:	:	:	:	:	:	:	:	:	:	:	:	:	292.937	331.370	203.915	:	:	:	:
Bulgaria	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	0	:
Czech Rep.	:	:	:	:	:	:	:	:	2	:	:	:	:	:	:	:	:	:	:	:	:
Germany	:	:	:	:	:	:	:	:	:	:	:	:	:	:	16.079	18.831	29.991	20.925	6.766	21.357	32.871
Estonia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	1.956	450	:	:	:	:	:
Finland	:	:	:	:	:	:	:	:	:	:	:	:	:	:	1.471	:	145	790	:	:	:
Greece	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	3.044	308	:	385	:
Hungary	:	:	:	:	:	:	:	:	:	:	:	:	:	:	13.389	13.953	3.051	594	:	:	:
Italy	:	:	77	:	:	:	:	:	:	:	:	:	:	:	5.000	204	:	:	:	:	:
Lithuania	:	:	:	:	:	:	:	:	:	:	:	:	:	:	57.612	20.836	13.917	2.828	3.339	7.528	1.795
Latvia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	17.469	19.663	6.601	150	658	:	378
Netherlands	:	:	:	:	:	:	:	:	:	:	:	:	:	:	88.430	:	:	:	:	:	:
Poland	:	:	:	:	:	:	:	:	:	:	:	:	:	:	6.504	1.082	:	:	:	:	:
Romania	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	2.100	:	:	:	188	:
Sweden	:	:	:	:	:	:	:	:	:	:	:	:	:	:	77.181	53.192	:	184	361	17.850	:
Slovenia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	370	:	190	1.995	4.574	:	:
Total	**0**	**0**	**77**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**603.642**	**495.037**	**265.875**	**31.499**	**17.801**	**49.065**	**35.812**

Table 7. Rough wood of other conifers – other than sawlogs (44032099) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne. There was no import from Korea Dem. Rep. and Korea Rep.

	China							Japan							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:							76	4.992	2.157	582	:	:	1.069	:
Czech Rep.	:	:	:	:	:	:	:								:	:	1.085	:	:	:	:
Germany	:	:	:	:	:	:	:								:	:	864	517	1.034	32.786	190
Denmark	:	:	:	:	:	:	:								15.517	57.690	30.684	:	15.936	19.568	15.631
Estonia	:	:	:	:	:	:	:								:	1.350	:	:	:	:	:
Spain	:	:	:	:	:	:	48								:	:	:	:	:	:	:
Finland	:	:	:	:	:	:	:				229				269.858	239.002	79.575	8.755	:	6.400	:
France	:	:	:	:	:	:	:								:	195	:	:	:	:	:

United Kingdom	:	:	:	:	:	:	:								5.300	:	:	:	:	548	668
Greece	:	:	:	:	:	:	:								162.671	121.405	91.088	34.021	:	:	:
Ireland	:	:	3	:	:	1	:								:	:	:	:	:	:	:
Italy	:	:	:	:	:	:	:								41.910	8.835	10.306	11.460	:	:	:
Lithuania	:	:	:	:	:	:	:								660	6	170	:	:	209	:
Latvia	:	:	:	:	:	:	:								4.169	3.250	3.759	:	:	:	:
														7							
Poland	:	:	:	:	:	:	:								660	1.230	1.360	:	:	:	:
Portugal	:	:	:	:	:	:	:								:	:	:	:	:	:	540
Romania	:	:	:	:	:	:	:								:	:	:	:	:	835	:
Sweden	:	:	:	:	:	:	:								132.357	10.693	388	:	:	:	:
Slovenia	:	:	:	:	:	:	:								:	:	:	989	:	:	:
Total	**0**	**0**	**3**	**0**	**0**	**1**	**48**	**0**	**0**	**0**	**229**	**0**	**0**	**83**	**638.094**	**445.813**	**219.861**	**55.742**	**16.970**	**61.415**	**17.029**

Table 8. Coniferous - hoopwood; split poles; piles, pickets and stakes of wood, pointed but not sawn lengthwise; wooden sticks, roughly trimmed but not turned, bent or otherwise worked, suitable for the manufacture of walking sticks, umbrellas, tool handles or the like; chipwood and the like (44041000) (host and non-hosts plants) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).

Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Belgium	:	:	30	:	:	:	:	:	231	:	:	:	:	:
Cyprus	3	:	:	:	:	:	:	287	:	:	:	:	:	:
Denmark	:	:	:	:	:	:	:	:	228	:	:	518	362	:
Estonia	:	:	:	:	:	:	:	13.101	4.830	8.271	3.545	3.791	2.035	2.982
Finland	:	:	:	:	:	:	:	172	480	:	:	:	:	:
France	:	:	26	:	:	:	:	709	2.051	220	219	955	:	:
Germany	:	:	:	10	:	:	:	:	653	:	920	4.328	6.229	:
Hungary	:	13	22	:	:	:	:	:	:	:	:	:	:	:
Ireland	:	:	:	28	:	:	:	:	:	:	200	187	:	:
Italy	:	432	979	3.783	258	80	1	443	149	2.077	11.000	5.978	2.811	1.133
Latvia	:	:	:	:	:	:	:	31.321	17.343	10.221	5.429	:	11.722	6.714
Lithuania	:	:	:	:	:	:	:	8.682	7.826	6.085	1.714	753	38	:
Netherlands	:	:	:	:	3	527	268	215	430	403	182	256	:	:
Poland	1	0	0	0	:	1	:	1.215	:	:	:	1.521	:	:
Slovakia	:	:	:	1	:	:	:	:	:	:	:	:	0	:
Spain	:	:	:	:	:	:	:	:	:	:	:	:	:	8.089
Sweden	:	:	:	:	:	:	:	:	:	429	165	66.011	29.631	:
UK	89	:	281	:	:	:	:	626	1.059	:	204	:	:	:
Total	**93**	**445**	**1.338**	**3.822**	**261**	**608**	**269**	**56.771**	**35.280**	**27.706**	**23.578**	**84.298**	**52.828**	**18.918**

Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness exceeding 6 mm

Table 9. Sawn wood of *Picea abies* or *Abies alba* (planed - 44071031) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

	China			Korea, Rep.	Japan			Russia						
	2009	2010	2011	2007	2006	2008	2009	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:				2.318	:	424	1.082	222	:	1.393
Belgium	:	:	:	:				:	660	2.576	213	:	209	411
Cyprus	:	:	:	:				9.394	:	:	13.877	6.564	3.927	407
Czech Rep.	:	:	:	:				413	1.132	1.620	175	133	186	:
Denmark	:	:	:	:				209	465	859	:	605	414	:
Estonia	:	:	:	:				4.112	3.907	15.823	4.749	5.689	8.291	9.527
Finland	:	:	:	:		59		93.468	108.404	52.181	89.116	45.108	117.806	78.136
France	:	:	:	:				1.263	315	1.574	:	1.302	990	1.394
Germany	:	:	:	:				5.078	12.743	5.074	3.090	3.711	3.530	5.352
Greece	:	:	:	:				:	864	:	:	:	:	:
Hungary	:	:	:	:				239	:	:	:	:	1.209	:
Ireland	:	:	:	1				95	:	230	:	:	:	:
Italy	:	:	:	:				:	436	210	:	:	236	391
Latvia	:	:	:	:				6.020	15.520	6.525	806	644	1.786	61
Lithuania	:	:	:	:				3.351	1.640	1.736	432	491	:	893
Netherlands	:	:	3	:				17.101	5.783	19.837	9.137	13.890	5.140	5.625
Poland	:	:	:	:				1.729	55	880	8.847	2.188	135	2.516
Romania	:	130	:	:				:	207	:	:	:	:	:
Slovakia	:	:	:	:				:	:	:	378	633	594	579
Slovenia	:	:	:	:				200	:	:	:	:	1.556	757
Spain	:	:	:	:				6.340	10.619	3.873	:	:	673	:
Sweden	587	:	:	:	1008		1452	53.424	630	4.582	8.101	:	:	:
UK	:	:	:	:				:	:	:	:	1.453	2.374	2.519
Total	**587**	**130**	**3**	**1**	**1.008**	**59**	**1.452**	**204.754**	**163.380**	**118.004**	**140.003**	**82.633**	**149.056**	**109.961**

Table 10. Sawn wood of *Picea abies* or *Abies alba* (other than planed - 44071091) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. "0" indicates quantities below 1 tonne. There was no import from Korea Rep. and Korea Dem. Rep.

	China							Japan		Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	660	:	:	:			657.164	357.153	56.435	147.742	569.808	386.996	185.408
Belgium	:	:	:	:	:	:	:			472.672	518.917	625.425	425.058	175.157	317.052	295.776
Bulgaria	:	:	:	:	:	:	:			1.286	3.920	2.157	3.856	3.492	1.014	1.945
Cyprus	:	:	:	:	:	:	:			14.714	21.462	39.143	19.746	1.507	8.120	:
Czech Rep.	210	:	:	:	:	:	:			272.830	238.694	142.185	176.737	118.249	145.138	141.402
Denmark	:	:	:	:	:	:	:			17.022	16.334	18.861	13.119	2.856	4.462	4.679
Estonia	:	:	:	:	:	:	:			1.718.124	1.944.469	2.198.736	1.004.231	1.146.207	1.297.324	1.377.799
Finland	:	:	:	:	:	:	:		205	1.568.501	1.909.927	1.475.571	1.140.672	1.469.750	1.665.602	1.269.583
France	:	:	:	:	:	:	:			1.780.407	1.596.014	1.534.945	1.293.770	1.048.794	1.221.073	1.020.754
Germany	:	:	230	:	396	:	:	17		2.634.828	3.093.985	2.257.964	1.611.213	1.746.028	1.497.707	1.304.741
Greece	:	:	:	:	:	:	:			257.145	257.132	148.908	64.918	16.100	1.878	835
Hungary	:	:	:	:	214	:	:			272.575	361.073	258.211	194.988	84.367	44.747	23.130
Ireland	:	:	1.340	:	:	:	:			237.507	864.974	250.810	168.995	94.640	62.393	35.270
Italy	:	:	:	:	:	:	:			388.082	541.414	336.530	280.242	203.728	197.418	352.670
Latvia	:	:	:	:	:	:	:			1.266.681	1.158.870	1.400.174	502.931	121.183	167.255	93.467
Lithuania	:	:	:	:	:	:	:			1.231.562	1.123.002	1.049.280	358.312	174.784	205.188	204.212
Netherlands	:	:	:	:	:	:	:			1.506.091	1.344.337	1.330.911	1.502.102	867.604	1.040.583	1.125.937
Poland	:	:	:	:	:	:	:	196		30.922	20.578	21.260	99.359	117.471	90.902	75.302
Romania	:	:	:	:	:	:	:			1.666	2.749	:	751	:	:	:
Slovakia	:	:	:	:	:	:	:			1.278	13.950	5.791	44.635	15.782	15.964	5.506
Slovenia	:	:	:	:	:	:	:			6.543	5.943	2.132	605	630	169.217	1.678
Spain	:	:	:	:	:	:	:			174.845	120.825	95.397	16.671	875	12	:
Sweden	:	:	:	:	:	:	:			:	430	6.418	45	708	3.335	1.093
UK	:	:	:	:	:	:	:			1.538.869	847.043	948.074	308.503	50.737	75.753	54.091
Total	**210**	**0**	**1.570**	**660**	**610**	**0**	**0**	**213**	**205**	**16.051.314**	**16.363.195**	**14.205.318**	**9.379.201**	**8.030.457**	**8.619.133**	**7.575.278**

Table 11. Sawn wood of *Pinus sylvestris* (planed - 44071033) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	:	376	552	:	220	1.011
Belgium	:	:	:	:	:	:	:	176	:	361	227	:	:	:
Bulgaria	:	:	:	:	:	:	:	1.205	:	213	:	410	:	:
Cyprus	:	:	:	:	:	:	:	:	:	18.896	9.594	853	986	:
Czech Rep.	:	:	:	:	:	:	2	109	994	1.197	:	:	:	:
Denmark	:	:	:	:	:	:	:	1.812	875	657	17	:	596	:
Estonia	:	:	:	:	:	:	:	5.209	1.713	12.709	1.333	4.179	1.252	2.218
Finland	:	:	:	:	:	248	:	30.684	56.773	53.301	25.397	3.762	3.191	537
France	:	:	:	:	:	:	:	5.693	19.335	17.524	21.235	10.564	12.378	14.487
Germany	:	:	:	:	:	:	:	2.313	4.863	10.501	520	609	280	558
Greece	:	:	:	:	:	:	:	:	134	285	100	:	:	:
Hungary	:	:	:	:	:	:	:	73	919	3.362	4.997	4.106	558	:
Italy	:	:	437	:	:	:	:	29.469	250	641	567	55	78	:
Latvia	:	:	:	:	:	:	:	12.353	5.224	2.414	576	:	749	28
Lithuania	:	:	:	:	:	:	:	4.541	4.057	3.039	1.954	2.318	3.669	:
Malta	:	:	:	16	:	:	:	:	:	200	:	:	:	:
Netherlands	:	:	:	:	:	:	:	204	:	1.371	211	15	:	229
Poland	:	:	:	:	:	:	:	18.874	19.204	17.608	27.171	23.895	18.219	21.686
Portugal	:	:	:	:	:	:	:	:	:	:	902	484	:	:
Romania	:	:	:	:	:	:	:	:	204	:	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	:	:	49	55	271	1.879
Slovenia	:	:	:	:	:	:	:	:	:	1.824	1.054	969	767	530
Spain	:	:	220	395	:	:	:	27.750	23.285	44.514	13.477	3.812	5.505	:
Sweden	:	:	:	:	:	5	:	:	2.370	4.465	1.424	:	1.793	6.965
UK	:	:	:	:	:	:	:	7.821	407	:	:	:	:	:
Total	**0**	**0**	**657**	**411**	**0**	**253**	**2**	**148.286**	**140.607**	**195.458**	**111.357**	**56.086**	**50.512**	**50.128**

Table 12. Sawn wood of *Pinus sylvestris* (other than planed - 44071093) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

	China							Korea Rep.	Japan			Russia						
	2005	2006	2007	2008	2009	2010	2011	2006	2006	2009	2010	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	:	:	:	:	:	:	38.010	10.702	13.617	13.208	60.231	31.379	15.327
Belgium	:	:	:	:	:	:	:	:	219	:	:	143.029	257.590	173.634	153.428	160.538	205.266	265.976
Bulgaria	:	:	:	:	:	:	:	:	:	:	:	777	:	425	1.265	:	116	:
Cyprus	:	:	:	:	:	:	:	:	:	:	:	21.858	50.851	93.424	31.068	18.593	3.144	:
Czech Rep.	:	:	:	:	:	:	:	:	:	:	:	57.045	29.623	24.819	47.141	11.075	16.432	13.864
Denmark	:	218	2.603	520	178	98	:	:	:	:	:	30.471	25.841	12.416	3.416	20.377	29.902	15.409
Estonia	:	:	:	:	:	9	:	:	:	:	:	989.009	1.177.120	1.315.872	488.065	326.690	518.720	562.756
Finland	:	:	:	:	:	:	:	:	:	256	208	480.781	409.054	785.636	567.133	660.211	961.351	779.113

France	:	:	:	:	:	190	:	:	:	:	:	260.713	327.821	367.642	278.991	341.504	222.172	158.456
Germany	:	0	:	:	:	:	:	:	:	:	:	142.641	236.921	262.643	210.853	145.025	121.505	120.967
Greece	254	:	:	:	:	:	:	:	:	:	:	208.823	255.143	242.627	159.206	73.108	21.345	11.994
Hungary	:	:	:	:	:	:	:	:	:	:	:	296.502	327.359	299.342	203.218	109.005	86.666	69.889
Ireland	:	:	:	:	:	:	:	:	:	:	:	16.350	:	105	105	:	:	:
Italy	:	:	356	:	:	:	:	:	:	:	:	83.990	161.267	46.169	20.604	13.307	9.443	16.506
Latvia	:	:	:	:	:	:	:	214	:	:	:	1.182.013	1.144.361	1.492.414	325.819	55.325	121.037	79.287
Lithuania	:	:	:	:	:	:	:	:	:	:	:	522.750	461.649	798.155	190.704	43.499	50.447	53.335
Netherlands	:	:	:	:	:	:	:	:	:	:	:	65.332	80.028	76.018	63.219	47.468	52.351	84.792
Poland	:	:	:	:	:	:	:	:	:	:	:	193.480	70.193	52.416	69.101	87.589	45.147	21.929
Portugal	:	:	:	:	:	:	:	:	:	:	:	1.759	:	250	1.170	:	:	:
Romania	:	:	:	:	:	:	:	:	:	:	:	586	:	576	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	:	:	:	3.113	733	110	:	169	9.611	11.606
Slovenia	:	:	:	:	:	:	:	:	:	:	:	:	:	116	15	:	15.377	5.669
Spain	:	:	:	:	:	:	:	:	:	:	:	332.159	289.881	310.812	34.989	6.166	11.525	2.162
Sweden	:	:	:	:	:	:	:	:	:	:	:	3.911	5.176	20.826	8.339	9.857	6.308	6.901
UK	:	:	:	:	:	12.017	2.681	:	:	:	:	642.567	773.974	781.631	400.990	106.202	311.064	127.777
Total	**254**	**218**	**2.959**	**520**	**178**	**12.314**	**2.681**	**214**	**219**	**256**	**208**	**5.717.669**	**6.095.287**	**7.171.695**	**3.272.047**	**2.295.939**	**2.850.308**	**2.423.715**

Table 13. Sawn wood of conifers (Sanded; end-jointed, whether or not planed or sanded (no distinction of species) 44071015) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).

Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep., Korea Dem. Rep. and Japan.

	China							Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Belgium	:	:	:	:	150	35	940	:	220	415	:	:	1.659	:
Bulgaria	:	:	:	53	1	:	:	172	:	:	:	:	:	:
Cyprus	20	:	:	:	:	:	:	:	:	:	:	:	3.853	692
Czech Rep.	:	:	:	:	:	:	:	:	:	1.507	4.155	3.444	4.289	3.705
Denmark	0	:	214	:	758	1.326	1.461	177	:	:	197	:	:	:
Estonia	:	:	:	:	:	:	:	30	597	1.095	24	388	205	:
Finland	:	:	:	:	:	:	:	62	199	:	288	:	112	:
France	:	628	240	923	873	1.296	4.016	:	390	:	:	240	480	:
Germany	400	:	:	:	2	:	230	695	189	180	635	220	167	:
Greece	:	:	:	134	:	:	:	:	:	:	:	:	:	:
Hungary	:	:	:	:	:	:	:	1.316	:	801	1.491	836	:	:
Ireland	1.064	181	581	8	1.222	462	2.900	:	:	:	:	:	:	:
Italy	:	93	368	417	405	1.095	4.175	9.809	807	:	7.488	:	423	:
Latvia	:	:	:	:	:	:	:	:	373	16.907	2.270	:	:	41
Lithuania	:	:	:	:	:	:	:	2.320	1.049	839	:	:	25	:
Netherlands	:	:	625	:	255	494	28	:	859	9.415	1.666	:	455	215
Poland	:	:	:	29	:	:	:	99.315	139.734	150.948	165.904	118.606	110.701	131.895
Portugal	:	:	:	200	258	:	:	:	:	:	:	:	:	:
Romania	:	:	:	:	:	:	:	64	:	:	:	:	:	:

Slovenia	:	:	:	:	:	:	:	:	:	3.322	3.726	3.041	3.642	3.551
Spain	199	:	:	897	:	217	229	3.324	2.504	395	185	:	52	:
Sweden	:	724	631	938	:	:	:	:	649	1.054	:	:	:	:
UK	:	:	36	:	:	:	:	:	:	:	:	:	:	:
Total	**1.683**	**1.626**	**2.695**	**3.599**	**3.924**	**4.925**	**13.979**	**117.284**	**147.570**	**186.878**	**188.029**	**126.775**	**126.063**	**140.099**

Table 14. Sawn wood of other conifers (planed - 44071038) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012).
Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Rep. and Korea Dem. Rep.

	China							Japan		Russia						
	2005	2006	2007	2008	2009	2010	2011	2009	2010	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	18	:	:	:	:			1.683	1.236	190	555	:	709	1.078
Belgium	:	:	542	:	:	:	:		0	:	226	:	2.110	:	3.302	:
Bulgaria	:	:	8	1.394	:	:	:			:	:	:	:	:	:	:
Cyprus	:	:	:	138	:	:	:			10.587	5.423	2.013	:	:	:	2.892
Czech Rep.	:	:	:	:	:	220	:			113	:	:	:	577	:	212
Denmark	:	:	:	:	:	:	:			210	305	627	140	:	:	:
Estonia	:	:	:	:	:	:	:			0	:	2.666	2.866	1.076	960	:
Finland	:	:	:	73	79	87	:			380	154	30	:	:	:	:
France	:	3	298	260	:	58	58			657	244	:	1.034	1.430	723	208
Germany	:	150	327	:	458	278	:			13.486	9.273	21.021	10.356	5.119	2.164	7.328
Greece	:	:	:	:	:	:	:			380	773	24	:	:	:	:
Hungary	:	:	:	:	:	:	:			111	1.264	5.287	3.111	:	:	:
Ireland	:	:	:	:	274	:	:			637	:	:	:	:	:	:
Italy	:	:	1.178	348	388	:	:			1.263	518	1.969	420	13.758	44.387	37.893
Latvia	:	:	:	:	:	:	:			826	1.571	261	196	:	:	:
Lithuania	:	:	:	:	:	:	:			195	688	549	1.163	1.410	284	775
Netherlands	:	13	:	:	:	:	:			111.221	150.111	139.266	146.328	144.021	103.015	79.997
Poland	:	:	:	:	:	:	:			188.822	234.250	308.501	160.224	142.242	51.820	28.097
Portugal	:	:	:	:	:	:	:			:	:	:	1.391	:	:	:
Slovakia	:	:	:	:	:	:	:			3.014	:	:	:	40	:	:
Slovenia	:	:	:	:	254	:	:			:	:	5.409	8.625	8.826	9.110	7.580
Spain	39	:	690	:	100	:	130			63.167	45.813	67.067	18.959	:	242	:
Sweden	:	:	:	:	3	:	:	1		7.531	1.012	32.604	795	:	1.089	1.417
UK	126	:	240	:	:	:	:			395.184	479.204	269.717	74.763	109.034	199.142	179.147
Total	**165**	**166**	**3.301**	**2.213**	**1.556**	**643**	**188**	**1**	**0**	**799.467**	**932.065**	**857.201**	**433.036**	**427.533**	**416.947**	**346.624**

Table 15. Sawn wood of other conifers (other than planed - 44071098) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

	China							Korea Rep.		Japan					Russia						
	2005	2006	2007	2008	2009	2010	2011	2005	2010	2005	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Austria	238	:	690	725	:	:	:	:	:	:	17	:	:	:	513.190	197.099	247.879	235.240	131.416	94.397	94.953
Belgium	15	:	210	781	443	2.514	1.296	:	:	:	:	:	:	:	781.349	774.820	913.917	399.888	517.393	601.270	724.148
Bulgaria	:	:	:	11	457	:	:	:	:	:	:	:	:	:	:	81	221	1.215	595	1.292	384
Cyprus	:	:	:	:	:	:	:	:	:	:	:	:	:	:	114.859	63.458	53.549	36.185	5.669	1.168	2.970
Czech Rep.	171	408	1.181	1.314	306	870	2.039	:	:	:	:	:	:	:	19.952	20.622	51.183	39.865	39.767	48.698	28.753
Denmark	189	221	291	:	192	:	:	:	:	:	:	:	:	:	250.732	203.865	173.736	80.610	16.495	475	4.356
Estonia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	84.862	36.381	89.018	37.289	44.949	59.071	58.563
Finland	:	:	:	:	:	:	233	:	:	:	:	:	:	:	80.311	97.393	110.033	76.075	15.488	24.495	24.172
France	27	5	15	85	76	24	255	22	:	:	:	:	30	:	393.034	295.361	376.235	286.669	314.669	402.555	507.434
Germany	1.873	440	1.494	1.674	1.675	2.056	1.901	:	:	3	1020	:	:	20	1.079.656	1.874.140	2.550.446	1.570.520	1.339.504	1.991.805	2.295.034
Greece	:	:	:	:	:	:	:	:	:	:	:	:	:	:	397.577	458.499	408.819	168.109	86.544	110.736	58.476
Hungary	25	:	:	:	:	:	:	:	:	:	:	:	:	:	47.847	35.606	9.459	9.029	11.992	4.708	6.555
Ireland	393	371	:	3	0	:	:	:	:	:	:	:	:	:	173.142	140.012	94.482	28.727	:	25.571	:
Italy	:	1.134	1.633	2.415	223	660	2.034	:	:	:	:	:	:	:	876.828	845.565	976.840	897.584	296.409	267.575	347.549
Latvia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	32.543	42.558	110.055	54.381	27.402	53.534	24.905
Lithuania	:	:	:	:	:	:	:	:	:	:	:	:	:	:	161.147	172.390	231.024	183.865	90.314	125.892	157.461
Malta	:	:	:	54	180	171	176	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Netherlands	299	0	300	916	:	317	702	:	:	:	:	1	59	:	318.392	962.625	381.249	7.014	116.807	200.312	179.718
Poland	:	:	:	:	:	:	:	:	:	:	:	:	:	:	137.557	71.394	79.682	57.138	21.636	37.187	13.655
Portugal	:	:	:	:	:	:	:	:	:	:	:	:	:	:	16.822	9.112	22.460	1.391	3.646	7.989	5.395
Romania	:	:	:	:	:	:	:	:	:	:	:	:	:	:	1.598	1.480	:	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	5.833	3.053	2.328	206	970	500	2.400
Slovenia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	13.075	17.690	8.638	4.588	1.541	4.988	1.831
Spain	750	391	1.689	:	:	81	:	:	:	:	:	:	:	:	37.060	49.343	6.031	10.199	6.499	4.679	:
Sweden	234	:	:	0	:	:	:	:	:	:	:	:	:	:	20.285	20.438	69.386	50.034	68.339	124.078	95.594
UK	127	317	1.071	136	202	:	:	:	287	:	:	:		:	2.433.694	2.806.132	2.157.407	1.436.717	1.296.176	1.226.426	1.342.085
Total	**4.341**	**3.287**	**8.574**	**8.114**	**3.754**	**6.693**	**8.636**	**22**	**287**	**3**	**1.037**	**1**	**89**	**20**	**7.991.345**	**9.199.117**	**9.124.077**	**5.672.538**	**4.454.220**	**5.419.401**	**5.976.391**

Table 16. Export of Conifer Industrial roundwood from China, Japan, Republic of Korea and Russian Federation in 2005-2010 to EPPO non EU countries (in m^3). Source: FAOstat, accessed in December 2012. (countries without export were deleted from the table below)

reporter	Russian Federation						China				Japan		Rep. of Korea
years	2005	2006	2007	2008	2009	2010	2005	2006	2008	2010	2006	2008	2009
Albania						561							
Azerbaijan	6957	14632	10463	9343	24018	8213							
Belarus	6342	13838	55553	28217	3662	2160							
Georgia	395		5432										
Israel	158	351	603	1437	2687		45	247	139				
Jordan		41699	37297										
Kazakhstan	166394	160938	184309	171866	112172	81647		7					35
Kyrgyzstan	8820	2703	7571	19123	20211	4996				375			
Morocco		16660											
Norway	64139	232530	2000	300000	304	1000				288			
Moldova	1435	11985	1038	3073	442	151							
Russian Federation							253	244			24		3
Switzerland	261	444	11851			96				2		48	
Turkey	908671	814387	1117000	650000	124000	114000	2014						
Ukraine	10126	28102	10611	6449	766	1088							
Uzbekistan	198472	320400	320000	657491	354927	343804							
total	**1372170**	**1658669**	**1763728**	**1846999**	**643189**	**557716**	**2312**	**498**	**139**	**665**	**24**	**48**	**38**

Table 17. Export of Conifer sawnwood from China, Japan, Republic of Korea and Russian Federation in 2005-2010 to EPPO non EU countries (in m^3). Source: FAOstat, accessed in December 2012. (countries without export were deleted from the table below)

reporter	Russian Federation						China						Japan					Republic of Korea					
years	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010	2005	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Albania	237	741		58	226	48		18															
Algeria	80354	13868	4000	12000	342			48			92	509		9	6								
Azerbaijan	780455	498640	716073	702000	700000	609000				16													
Belarus	26714	33924	34357	14910	3688	3052																	
Bosnia and Herzegovina	34	33	65	56	20	112			45	37		21											
Georgia	380	5920	4798	6530	7482	97																	
Israel	134047	172541	92563	29840	35591	31143	37		915		56												
Jordan	28086	41058	20263	27442	6958	10083							94	12	18	56							
Kazakhstan	516678	779575	748000	399000	603000	228450		2	147	336	9								75	358		70	
Kyrgyzstan	114262	134483	115100	115314	123584	104367	8	25	89		3	509								59		22	47
Morocco	7715	219	1000	1000	1000	344			105														
Norway	3454	1953	53000	1000	1000	1000		40	130	68	43	67											
Republic of Moldova	51684	88095	27278	9402	5582	2566																	
Russian Federation							1	26	373	7	7	53	1		18		70	3	47	1	16		
Switzerland	17898	16365	17425	5457	6816	11926	282	38	25					20			48						
Tunisia	43767	9916	2446	15687	8968	18307																	
Turkey	286052	344341	157075	171000	83976	100753			34	7			24										
Ukraine	5543	6807	1825	2055	1118	1155				134													
Uzbekistan	909870	1192298	924509	1033454	1010138	1379000																	
total	**3007230**	**3340777**	**2919777**	**2546205**	**2599489**	**2501403**	**328**	**197**	**1863**	**605**	**210**	**1159**	**119**	**41**	**42**	**56**	**118**	**3**	**122**	**418**	**16**	**92**	**47**

Monthly imports of rough wood and firewood in 2011

Table 18. Monthly imports of firewood and rough wood categories for 2011 into EU Member States (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below. “0” indicates quantities below 1 tonne. There was no import from Korea Dem. Rep. and Korea Rep.

44011000. Firewood

44032011. Rough wood of *Picea abies* or *Abies alba* – sawlogs 44032019. Rough wood of *Picea abies* or *Abies alba* – other than sawlogs 44032031. Rough wood of *Pinus sylvestris*–sawlogs

44032039. Rough wood of *Pinus sylvestris*–other than sawlogs 44032091. Rough wood of other conifers – sawlogs 44032099. Rough wood of other conifers – other than sawlogs

	2011	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
		CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU	CN	RU
44011000	Belgium	:	735	:	:	:	:	:	:	:	:	:	201	:	:	:	223	:	:	:	362	:	1.397	:	:
	Czech Rep.	:	:	:	:	:	:	:	:	:	214	:	215	:	215	:	:	:	:	:	:	:	:	:	:
	Germany	:	1.730	:	2.178	:	2.283	:	210	:	17.816	:	5.250	:	1.079	:	9.511	:	1.632	:	2.187	:	13.623	:	15.017
	Denmark	:	22.817	:	16.703	:	9.178	:	10.847	:	20.504	:	21.341	:	20.135	:	31.730	:	10.157	:	57.524	:	13.245	:	28.318
	Estonia	:	:	:	38	:	202	:	217	:	217	:	214	:	:	:	197	:	624	:	1.097	:	5.907	:	859
	Spain	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Finland	:	6.102	:	12.092	:	13.913	:	15.110	:	17.392	:	13.087	:	3.829	:	12.286	:	16.681	:	16.389	:	6.682	:	96.733
	UK	:	:	175	:	25	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Greece	:	:	:	:	:	:	:	:	20	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Ireland	:	:	:	:	:	:	:	:	:	230	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Italy	:	:	:	:	:	:	:	:	:	:	12	:	:	:	:	:	:	1.040	:	:	154	:	:	:
	Lithuania	:	:	:	:	:	:	:	:	:	411	:	216	:	216	:	432	:	:	:	:	:	:	:	:
	Latvia	:	440	:	653	:	222	:	:	:	430	:	:	:	:	:	:	:	192	:	395	:	811	:	854
	Netherlands	:	435	:	:	:	:	:	:	:	:	:	:	:	:	:	444	:	:	:	220	:	:	0	:
	Portugal	2	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Sweden	:	7.539	:	16.406	:	10.638	:	188	:	94.605	:	80.719	:	99.377	:	148.349	:	114.719	:	225.566	:	140.847	:	144.452
44032011	Austria	:	813	:	:	:	:	:	:	:	166	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Germany	:	58.559	:	:	:	191.722	:	50.942	:	:	:	31.360	:	144.516	:	150.170	:	189.641	:	111.704	:	233.301	:	79.867
	Finland	:	140.765	:	118.697	:	132.942	:	77.536	:	63.276	:	135.663	:	102.179	:	88.101	:	87.967	:	71.208	:	65.966	:	68.544
	Hungary	:	:	:	:	:	:	:	:	:	220	:	:	:	:	:	220	:	:	:	:	:	:	:	:
	Sweden	:	43.561	:	30.000	:	33.813	:	:	:	48.754	:	:	:	35.599	:	11.500	:	10.925	:	72.578	:	35.919	:	178.080
44032019	Finland	:	179.358	:	154.302	:	139.173	:	273.429	:	243.275	:	204.495	:	376.317	:	260.269	:	187.545	:	141.252	:	105.793	:	104.496
	Netherlands	:	:	:	:	:	:	:	:	:	:	:	:	:	:	13	:	:	:	:	:	:	:	:	:
44032031	Finland	:	92.293	:	122.120	:	139.258	:	149.991	:	161.106	:	224.579	:	132.263	:	146.862	:	101.551	:	100.472	:	67.283	:	85.534
	Greece	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	195	:	:	:	:	:	:
	Latvia	:	:	:	:	:	:	:	:	:	:	:	341	:	:	:	:	:	:	:	:	:	:	:	:
44032039	Finland	:	85.214	:	98.885	:	181.093	:	152.989	:	236.765	:	341.000	:	234.797	:	191.634	:	118.231	:	117.468	:	115.869	:	149.891
	Sweden	:	21.277	:	31.159	:	:	:	:	:	:	:	108.382	:	118.454	:	:	:	105.504	:	45.690	:	29.164	:	:
44032091	Austria	:	:	:	:	:	768	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Germany	:	5.160	:	45	:	4.686	:	4.831	:	7.836	:	3.971	:	1.218	:	1.804	:	2.630	:	690	:	:	:	:
	Lithuania	:	333	:	301	:	779	:	193	:	189	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Latvia	:	:	:	:	:	378	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
44032099	Germany	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	190	:	:	:	:
	Denmark	:	:	:	:	:	:	:	11.746	:	:	:	2.258	:	:	:	1.627	:	:	:	:	:	:	:	:
	Spain	:	:	:	:	:	:	48	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

	UK	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	668
	Portugal	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	540	:	:	:	:	:	:	:	:

Annex 4. Imports of wood chips of conifers, and of wood waste, from countries where *Polygraphus proximus* occurs (China, Japan, Korea Dem. Rep., Korea Rep., Russia)

Table 1. Coniferous wood chips or particles (44012100) (host and non-hosts species) into EU Member States in 2005-2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below, as well as years without imports. "0" indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

	China						Korea Rep.	Japan		Russia						
	2006	2007	2008	2009	2010	2011	2011	2008	2009	2005	2006	2007	2008	2009	2010	2011
Austria	:	:	:	:	:	0	:			:	2	:	0	:	:	:
Belgium	:	0	:	:	4	0	:			:	:	:	:	:	:	:
Denmark	:	:	:	:	:	:	:			:	:	:	:	:	292	:
Estonia	:	:	:	:	:	:	:			900	:	:	620	:	:	:
Finland	:	:	1	:	:	:	:			6.302.147	6.948.996	6.638.482	7.532.187	12.346.681	13.501.141	12.309.273
Germany	:	:	:	:	17	:	36			:	:	:	:	23.737	80.744	55.917
Ireland	:	:	:	6	:	:	:			:	:	18.224	:	:	:	:
Italy	93	:	:	:	:	1	:			:	:	:	:	:	:	:
Latvia	:	:	:	:	:	:	:		128	:	:	:	1.020	:	:	:
Lithuania	:	:	:	:	:	:	:			184	3.517	1.483	35.762	7.650	:	1
Netherlands	:	:	:	:	:	:	:			:	:	:	:	:	:	10.459
Poland	:	:	:	:	:	:	:	3		:	:	160.904	84.460	24.837	9.296	:
Sweden	:	:	:	:	5	:	:			:	:	:	29.571	196.015	288.416	462.517
UK	:	:	:	:	14	:	:			:	:	:	17.994	:	:	:
Total	**93**	**0**	**1**	**6**	**40**	**1**	**36**	**3**	**128**	**6.303.231**	**6.952.515**	**6.819.093**	**7.701.614**	**12.598.920**	**13.879.890**	**12.838.167**

Table 2. Monthly imports from Russia into EU Member States in January-December 2011 (quantity in 100 kg) (Eurostat, accessed 29-03-2012). Note: EU countries without imports were deleted from the table below. There was no import from Korea Dem. Rep.

	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May. 2011	Jun. 2011	Jul. 2011	Aug. 2011	Sep. 2011	Oct. 2011	Nov. 2011	Dec. 2011	2011 Total
Finland	904.072	901.108	1.176.248	1.116.824	1.078.967	929.756	918.085	1.156.185	1.144.247	931.556	1.073.407	978.818	12.309.273
Germany	:	:	:	:	16.698	1	13.058	:	13.496	12.664	:	:	55.917
Lithuania	:	:	:	:	:	:	:	:	:	:	1	:	1
Netherlands	:	:	647	191	7.110	980	:	1.531	:	:	:	:	10.459
Sweden	20.287	24.963	:	:	:	23	78.464	48.737	92.679	23.803	57.776	115.785	462.517

Table 3. Import of waste wood (host and non-hosts species) into EU Member States in 2007-2012 (quantity in 100 kg) (Eurostat, accessed 28-03-2013). Note: EU countries without imports were deleted from the table below, as well as years without imports. “0” indicates quantities below 1 tonne. There was no import from Korea Dem. Rep.

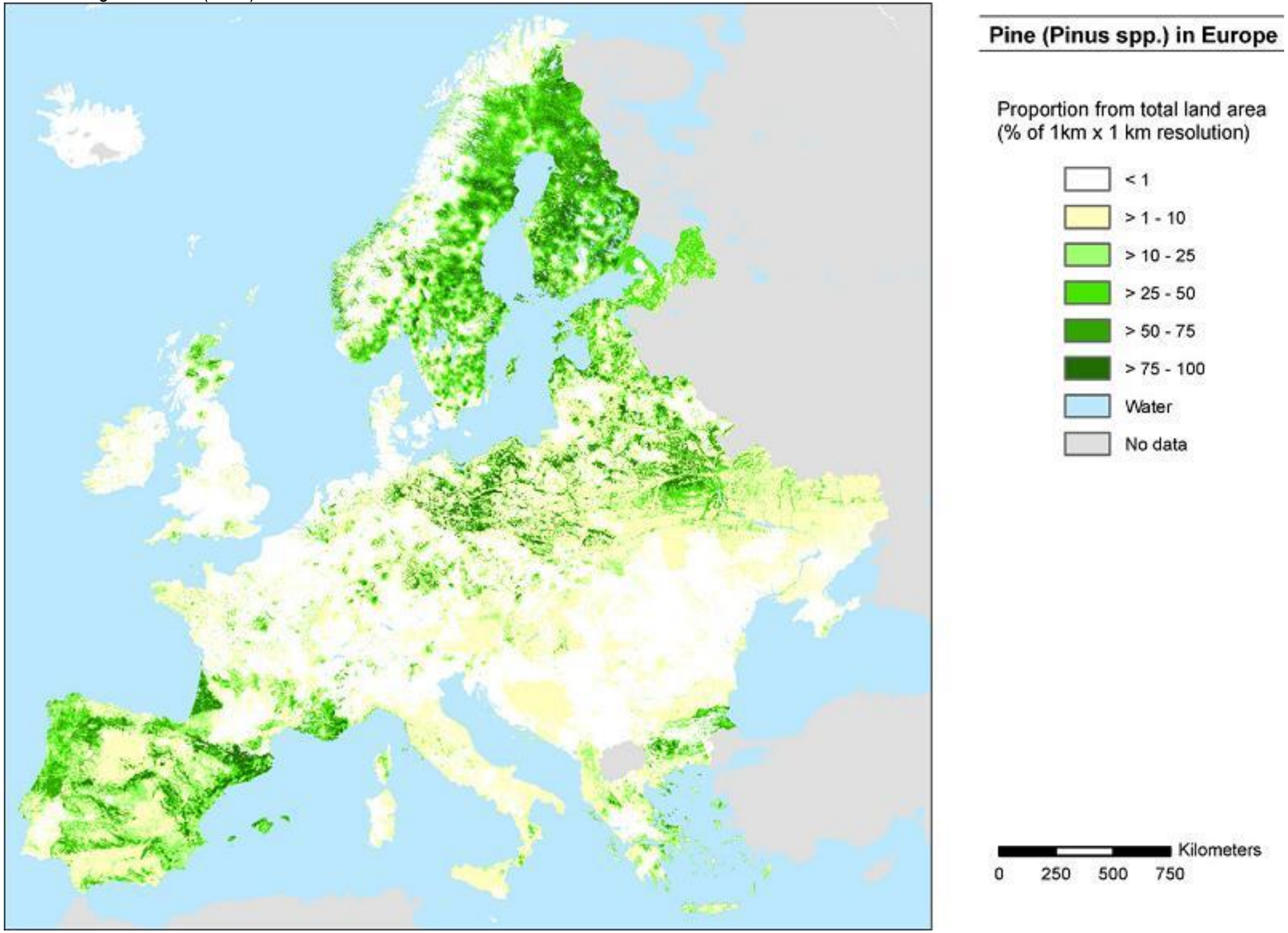
Wate wood correspond to the following CN codes

44013080	Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms
44013090	Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms
44013980	Wood waste and scrap, not agglomerated (excl. sawdust)
44013990	Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms.

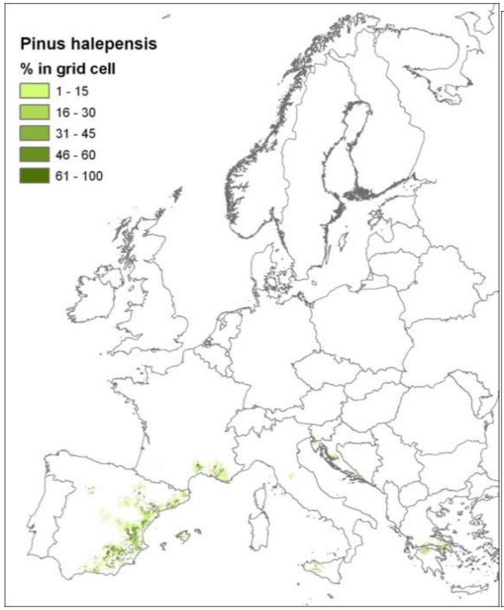
	China						Japan					Russia					
REPORTER/PERIOD	2007	2008	2009	2010	2011	2012	2007	2008	2010	2011	2012	2007	2008	2009	2010	2011	2012
Austria	:	:	0	:	:	:	:	:	:	:	:	1 820	:	8 540	1 079	:	1
Belgium	2	387	318	415	83	3 406	:	:	:	174	:	:	2 587	1 296	4 705	23 283	1 955
Bulgaria	5	:	:	:	:	15	:	:	:	:	:	0	:	:	:	37	:
Cyprus	:	:	:	:	:	150	:	:	:	:	:	:	:	:	:	:	:
Czech republic	:	:	:	165	:	230	:	:	:	:	:	195	:	:	418	1 731	1 065
Germany	244	317	179	:	:	:	81	17	:	:	6	18 291	27 374	183 895	189 369	326 851	160 523
Denmark	552	1 241	:	:	1 740	670	:	:	:	:	:	273 630	108 394	48 129	120 559	255 105	186 990
Estonia	:	:	:	:	:	:	:	:	:	:	:	373	4 224	19 852	2 029	3 657	114 611
Spain	40	1 442	:	:	0	:	:	:	:	:	:	:	:	:	:	:	:
Finland	:	3	9	:	:	4	:	:	1	:	:	524 147	1 589 711	1 079 223	1 215 059	1 521 877	1 933 374
France	186	71	255	53	48	41	:	12	:	:	:	:	:	:	:	:	:
United kingdom	1 586	43	1 072	2 185	1 775	185	:	:	:	1	:	142 364	827 432	:	:	202	:
Hungary	152	:	1	13	11	59	:	:	:	:	:	:	2 573	231	2 922	18 873	:
Ireland	2 015	274	24	830	:	:	:	:	:	18	:	28 179	874	894	220	:	:
Italy	12 309	1 001	778	4	:	1 866	3	:	:	0	:	18 729	:	1 073	10 254	210	:
Lithuania	:	:	:	:	42	:	:	:	:	:	:	5 272	9 450	888	34 129	69 049	32 798
Latvia	:	:	:	:	:	:	:	:	:	:	:	2 021	29 899	10 075	628	1 692	8 413
Netherlands	725	195	397	271	1 161	352	:	:	:	:	:	114 439	35 392	:	:	:	:
Poland	0	:	:	:	:	1	:	:	:	35	15	2 191	37 050	11 367	8 145	211 388	29 568
Romania	:	:	:	:	:	1	:	:	:	:	:	:	:	:	:	:	:
Sweden	34	:	:	0	6	182	:	:	:	:	:	686 103	1 253 383	14 795	97 910	108 293	122 620
Slovenia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	210	100
Slovakia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	596
EU27	**17 850**	**4 974**	**3 033**	**3 936**	**4 866**	**7 162**	**84**	**29**	**1**	**228**	**21**	**1 817 754**	**3 928 343**	**1 380 258**	**1 687 426**	**2 542 458**	**2 592 614**

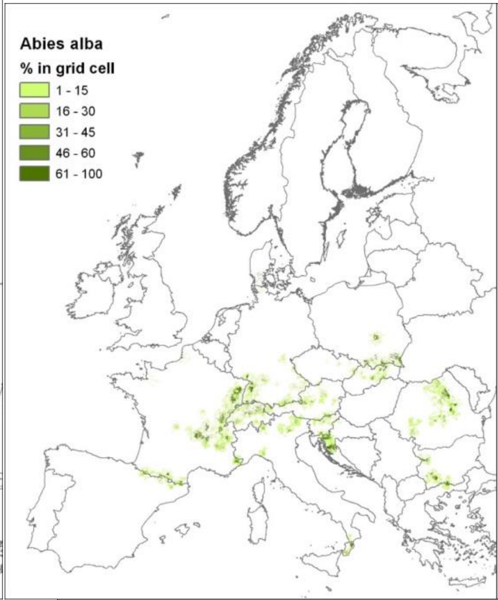
Annex 5. Maps of some species in host genera in Europe

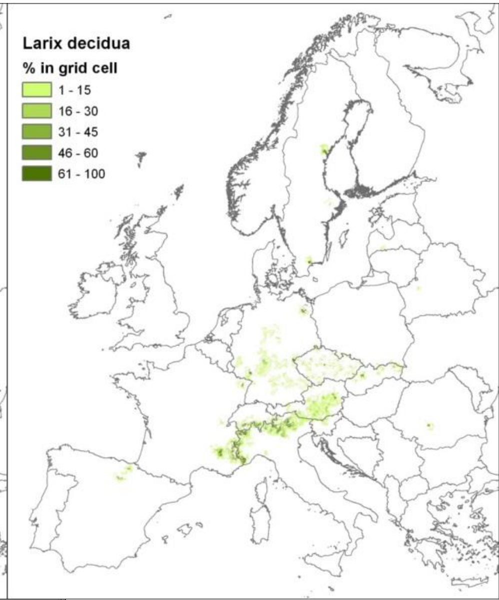
Map 1. Distribution of pine in Europe. From Tröltzsch K, Van Brusselen J, Schuck A. 2009. Spatial occurrence of major tree species groups in Europe derived from multiple data sources. Forest Ecology and Management 257 (2009) 294–302

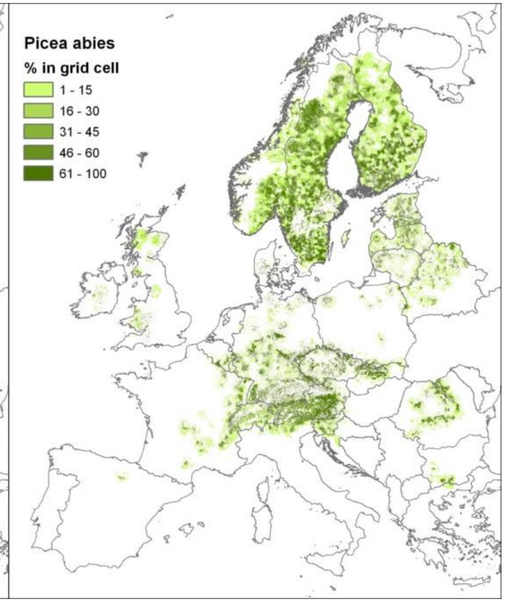


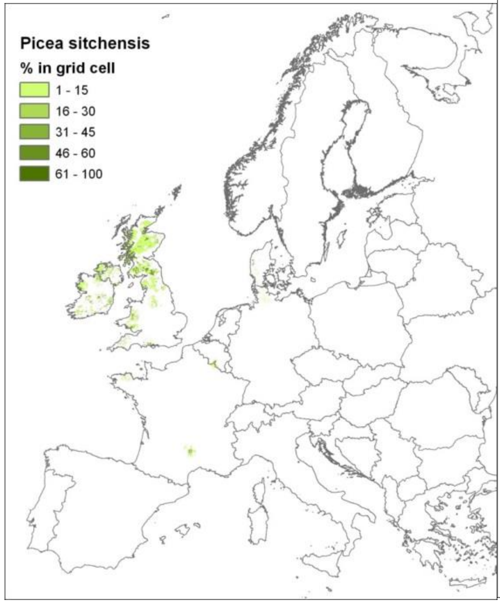
Maps 2 – 9 below. From: Köble R. and Seufert G. 2001. Novel maps for forest tree species in Europe. Proceedings of the 8th European Symposium on the Physico-Chemical Behaviour of Air Pollutants: "A Changing Atmosphere!", Torino (It) 17-20 September 2001

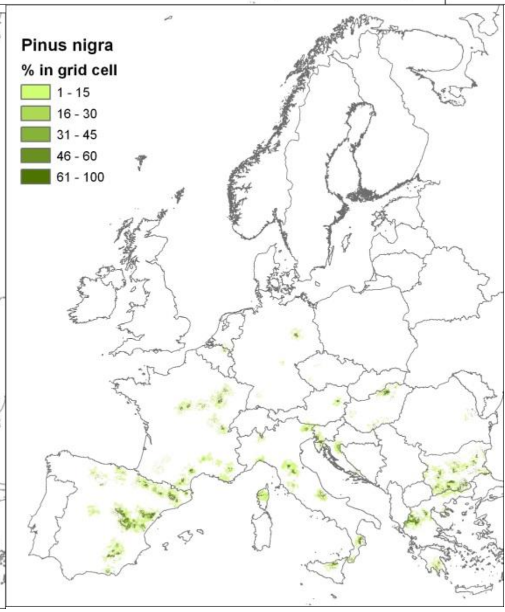

Pinus halepensis
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

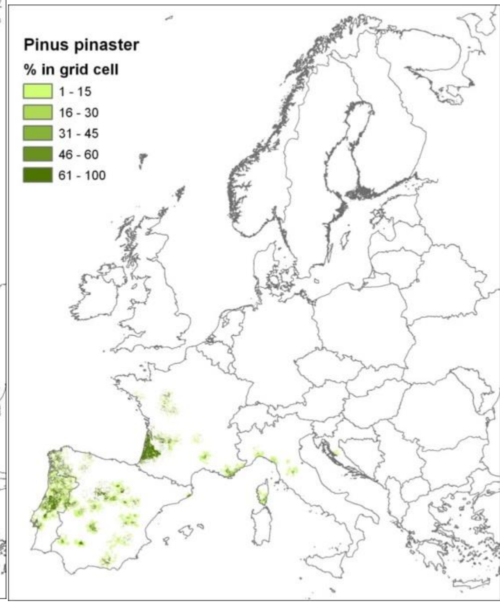

Abies alba
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

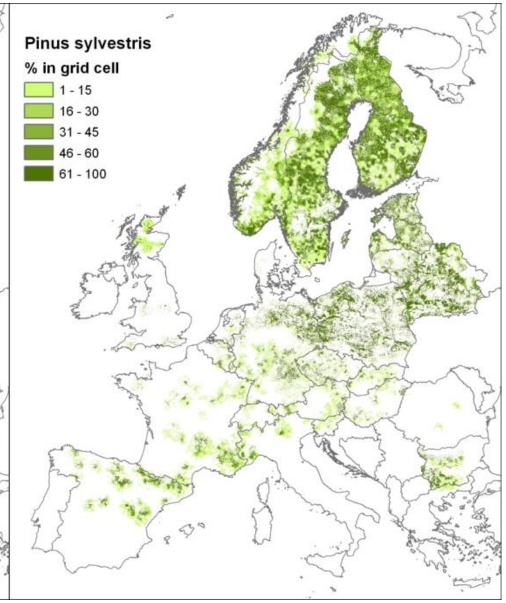

Larix decidua
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100


Picea abies
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

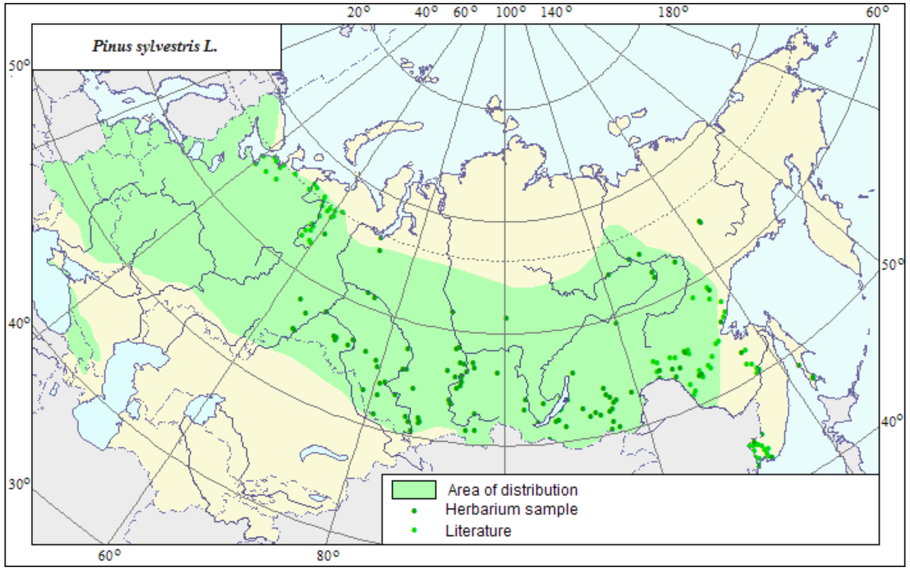

Picea sitchensis
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

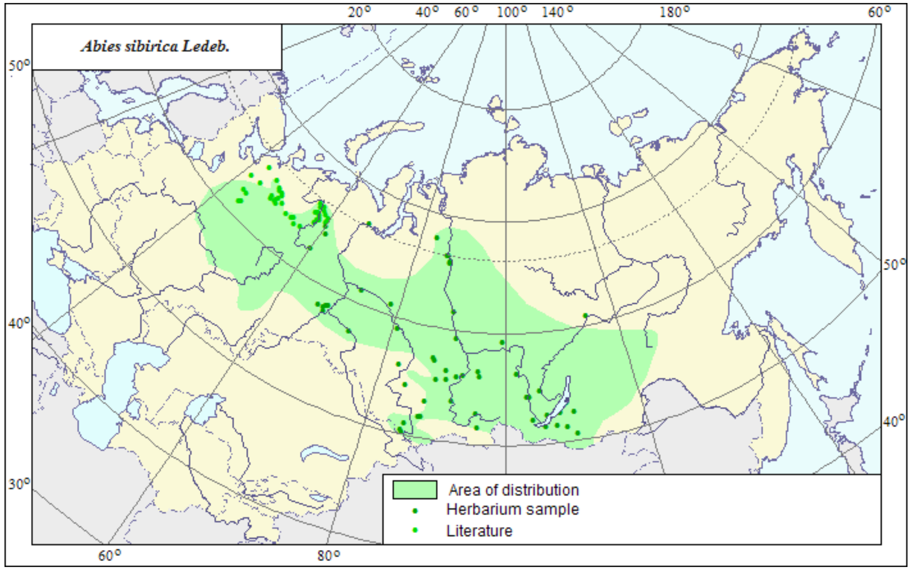

Pinus nigra
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

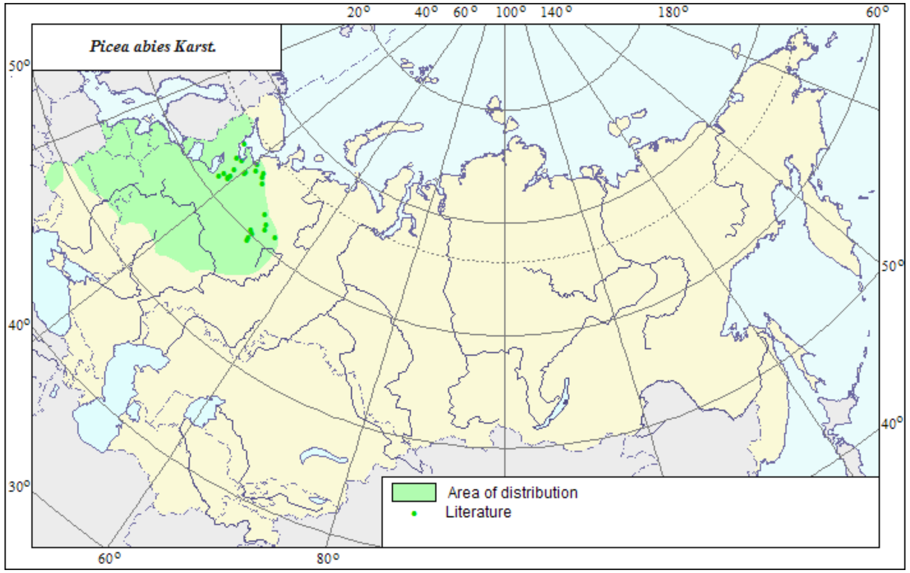

Pinus pinaster
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

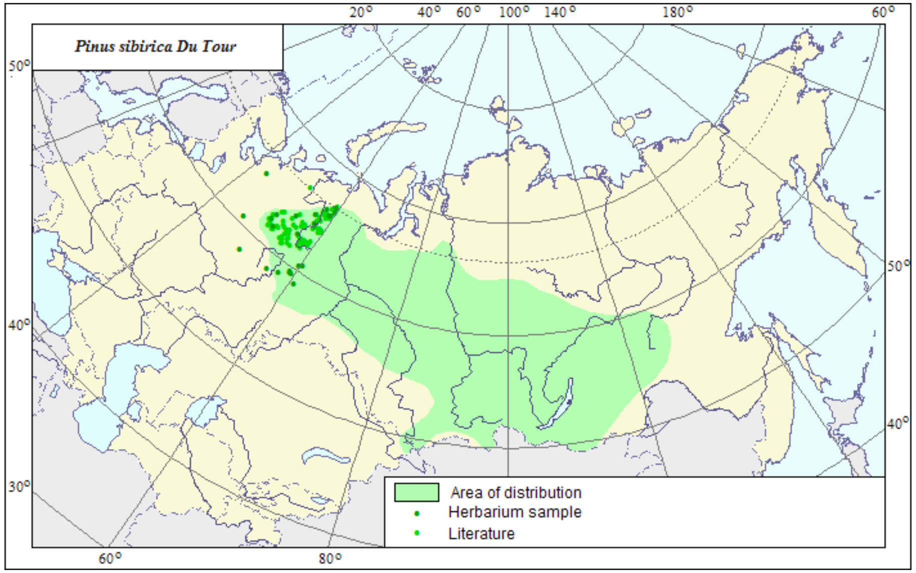

Pinus sylvestris
% in grid cell
1 - 15
16 - 30
31 - 45
46 - 60
61 - 100

Maps 10 – 14 below. From Doronina AJ, Terekhina NV. 2009. Interactive agricultural ecological atlas of Russia and neighboring countries. http://www.agroatlas.ru/en/content/related/



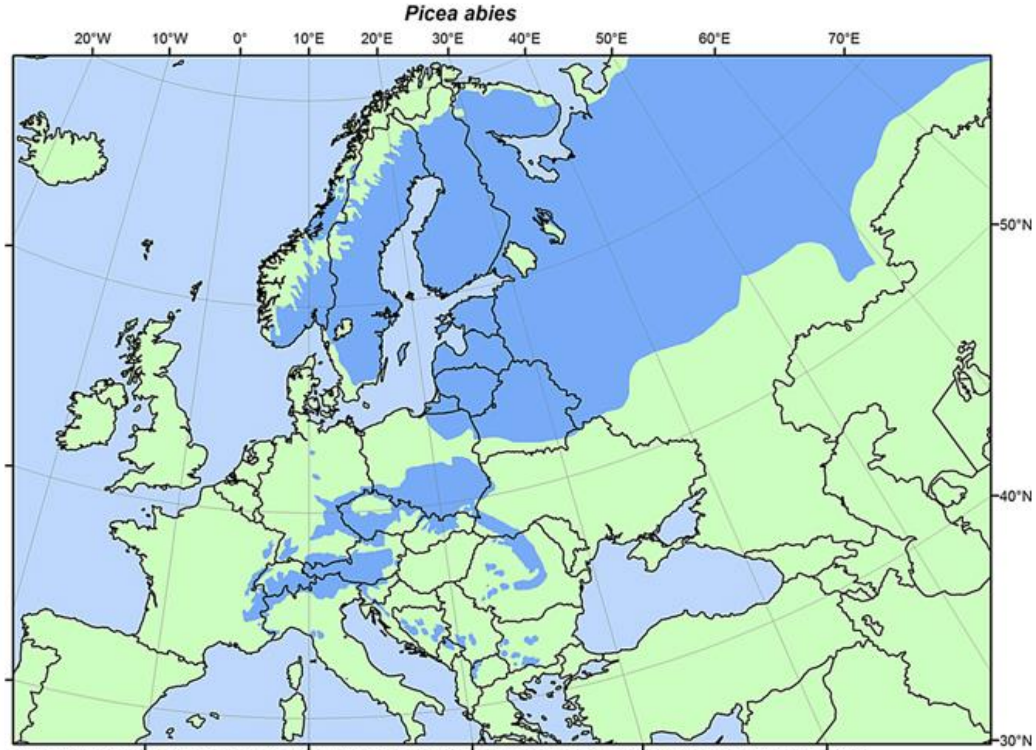






http://www.euforgen.org/distribution_maps.html

EUFORGEN



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and other maps at:
www.euforgen.org

This distribution map, showing the natural distribution area of *Picea abies* was compiled by members of the EUFORGEN Networks based on an earlier map published by H. Schmidt-Vogt in 1977 (Die Fichte, Verlag Paul Parey, Hamburg and Berlin, p.647).

Citation: Distribution map of Norway spruce (*Picea abies*) EUFORGEN 2009, www.euforgen.org.

0 375 750 1,500 Km

First published online in 2003 - Updated on 13 September 2013

Annex 6. 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.
- for Israel, also Plant Import Regulations (February 2009) (available on http://www.eppo.int/ABOUT_EPPO/EPPO_MEMBERS/countries/animation/israel.htm)
- for Turkey, also Regulation on Agricultural Quarantine (2007-01-23) (available at http://www.eppo.int/ABOUT_EPPO/EPPO_MEMBERS/countries/animation/turkey.htm)
- for Serbia, Rule on pest lists and lists of plants, plant products and regulated objects (Official Gazette of the Republic of Serbia br. 7/10) – Specific phytosanitary requirements for imports of certain types of plants, plant products and regulated objects.
- **no information was available for EPPO countries that are not listed in the tables below.**

Non-EU countries were asked to indicate their measures and answers were received from: Croatia[3], Norway, Russia, Switzerland.

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

Warning: the tables below for non-EU countries were developed based on EPPO summaries of phytosanitary regulations (prepared between 1999 and 2003), and, where available, on later documents published on the EPPO website. Regulations of some countries might have changed in the meantime, but it still gives some indication of the measures in place.

Table 1. Wood of host species

Country	Prohibitions or requirements implying prohibition from countries where *P. proximus* occurs	Other general and specific requirements
Albania		✓ Squared wood and non-squared wood: IP, PC
Algeria		✓ Squared wood and non-squared wood: PC ✓ **Conifer** squared wood and non-squared wood: Free from *Bursaphelenchus xylophilus* ✓ **Conifer** non squared wood with bark: Free from Dendroctonus spp. and *Ips* spp ✓ ***Pinus*** squared wood and non-squared wood: Free from *Mycosphaerella dearnessii, Mycosphaerella gibsonii* and *Mycosphaerella pini*
Belarus		✓ Squared and non-squared wood: IP, PC
EU, Croatia, Norway, Switzerland, Montenegro,		Wood of conifers (Coniferales) (other than chips, particles, sawdust, and various categories) but including that which has not kept its natural round surface: ✓ originating in Canada, China, Japan, the Republic of Korea, Mexico, Taiwan and the USA, where *Bursaphelenchus xylophilus* is known to occur. (IV 1.1) (except that of *Thuja* L): heat treatment or fumigation or chemical pressure. (IV, A, 1.1) [Norway: squared and heat

[3] Croatia joined the EU in June 2013

Country	Prohibitions or requirements implying prohibition from countries where *P. proximus* occurs	Other general and specific requirements
Serbia		treatment] ✓ originating in Russia, Kazakhstan and Turkey.(Annex IV, B, 1.5): wood originating in areas known to be free from *Monochamus* spp. (non-European), *Pissodes* spp. (non-European) or Scolytidae spp. (non-European), or bark-free and free from grub holes, caused by the genus *Monochamus* spp. (non-European), defined for this purpose as those which are larger than 3 mm across, or kiln-dried, or heat treatment, or appropriate fumigation, or chemical pressure impregnation.[not Norway] ✗ in third countries (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. (non-European), defined for this purpose as those which are larger than 3 mm across, or kiln-drying, or fumigation, or chemical pressure impregnation, or heat treatment. [Norway: no mention of fumigation or chemical pressure impregnation] ✓ Requirements for inspection: wood of conifers (Coniferales), including wood which has not kept its natural round surface, originating in non-European countries, Kazakhstan, Russia and Turkey (including firewood, wood in the rough, split poles etc., coniferous wood, sawn or chipped lengthwise etc. ✗ Wood of *Taxus brevifolia* from the USA: from areas where Phytophthora ramorum not known to occur, or stripped from bark, or if residual bark, that the wood has been kiln-dried ✗ Some requirements for wood of Portugal and Spain for *Bursaphelenchus xylophilus*
Israel		✓ Squared wood and non-squared wood: IP, PC ✓ Debarked logs: fumigation with phosphine or methyl bromide, in accordance with the requirements detailed in the Treatment Manual. ✗ Logs with bark. Originating in Europe or South Africa; and inspected prior to shipment and found free from pests; and fumigation with phosphine or methyl bromid, in accordance with the Treatment Manual.
Jordan		✓ Squared wood and non-squared wood: IP
Kyrgyzstan		✓ Squared wood and non-squared wood: IP, PC; Place of production and buffer zone inspected during the last growing season and found free from quarantine pests of Lists A1 and A2 (AD); Fumigation before dispatch (AD)
Moldova		✓ Squared wood and non-squared wood: PC, IP and disinfection
Morocco		✓ Non-squared wood with bark: PC
Russia	✓ ***Pinus*** non-squared wood originating in countries where *Bursaphelenchus xylophilus* occurs	
Tunisia		✓ Squared wood and non-squared wood: PC ✓ **Conifer** non-squared wood originating in countries outside Europe and the Mediterranean area: debarking
Turkey	✓ Wood from conifers as fuel wood (i.e. also firewood)	✓ Squared wood and non-squared wood: PC ✓ **Conifer** wood: industrial wood, logs and roots should be stripped of theirs barks; free from grub holes, caused by *Monochamus* spp. which are larger than 3 mm across or dried to below 20% moisture content, expressed as a percentage of dry matter (and declaration on PC that free from diseases and pests). ✓ **Conifer** timber: a) not containing bark pieces; b) free from grub holes, caused by *Monochamus* spp. which are larger than 3 mm across, and c) dried to below 20% moisture content, expressed as a percentage of dry matter, or d) marked as kiln-dried
Ukraine		? No requirements for wood?

Table 2. Wood chips of conifers from countries where *P. proximus* occurs

Country	Prohibitions or requirements implying prohibition from countries where *P. proximus* occurs	Other general and specific requirements
Albania		? No requirements for wood chips?
Algeria		? No requirements for wood chips?

Country	Prohibitions or requirements implying prohibition from countries where *P. proximus* occurs	Other general and specific requirements
Belarus		? No requirements for wood chips?
EU, Croatia Norway, Switzerland, Montenegro, Serbia		✓ Wood of conifers (except Thuja) in the form of chips originating in Canada, China, Japan, the Republic of Korea, Mexico, Taiwan and the USA, where *Bursaphelenchus xylophilus*is known to occur. (IV, 1.2): heat treatment or fumigation. ✓ Wood in the form of chips, etc. obtained in whole or in part from conifers (Coniferales), originating in Russia, Kazakhstan and Turkey, non-European countries other than listed above: wood originating in areas known to be free from *Monochamus* spp. (non-European), *Pissodes* spp. (non-European), *Scolytidae* spp. (non-European) or produced from debarked round wood, or kiln-drying, or fumigation, or heat treatment. ✓ Conifer wood chips: specific requirement for inspection (Annex B)
Israel		✓ Wood chips: IP, PC (do not include bark and treatment with methyl bromide in accordance with treatment manual)
Jordan		? No requirements for wood chips?
Kyrgyzstan		? No requirements for wood chips?
Moldova		? No requirements for wood chips?
Morocco		? No requirements for wood chips?
Russia		? No requirements for wood chips?
Tunisia		? No requirements for wood chips?
Turkey		✓ Conifer wood chips: produced from wood that has been fumigated or stripped of its bark, or has been dried to below 20% moisture content, expressed as a percentage of dry matter; and carried in sealed or closed containers so as to prevent contamination by harmful organisms from the surroundings areas.
Ukraine		? No requirements for wood chips?

Table 3. Bark of host species

Country	Prohibitions or requirements implying prohibition from countries where *P. proximus* occurs	Other general and specific requirements
Albania	✓ All isolated bark: prohibited	
Algeria		✓ All isolated bark: PC
Belarus		? No requirement for isolated bark.
EU, Craotia, Norway, Switzerland, Montenegro, Serbia		✓ Conifers isolated bark from non-European countries: fumigation or heat treatment (Annex IV, A, 7.3), and requirement for inspection (Annex V, B, 1, 5)
Israel		✓ All isolated bark: IP, PC (treatment with methyl bromide as spcified in treatment manual)
Jordan		✓ All isolated bark: IP
Kyrgyzstan		✓ All isolated bark: IP, PC
Moldova		✓ All isolated bark: PC, IP and disinfection
Morocco		✓ Non-dried bark: PC
Russia	✓ ***Pinus*** isolated bark originating in countries where *Bursaphelenchus xylophilus** occurs (covering China, Japan, Korea Rep. But not Korea Dem. Rep.): prohibited	
Tunisia	✓ Isolated bark of forest trees: prohibited	
Turkey		? No requirement for isolated bark
Ukraine		✓ Quarantine pests: *Ips hauseri* * (Russia), *Ips subelongatus* * (Russia), *Scolytus morawitzi* * (Russia) (all attacking some hosts of *P. proximus*; all present in Russia)