EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
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This PRA document was modified in 2016 to clarify taxonomic issues (yellow note below) and in 2021 to clarify the phytosanitary measures recommended

Report of a Pest Risk Analysis for *Apriona germari, A. japonica, A. cinerea*

This PRA started in 2011; as a result, three species of *Apriona* were added to the EPPO A1 List: *Apriona germari, A. japonica* and *A. cinerea*. However recent taxonomic changes have occurred with significant consequences on their geographical distributions. *A. rugicollis* is no longer considered as a synonym of *A. germari* but as a distinct species. *A. japonica*, which was previously considered to be a distinct species, has been synonymized with *A. rugicollis*. Finally, *A. cinerea* remains a separate species. Most of the interceptions reported in the EU as *A. germari* are in fact *A. rugicollis.*
The outcomes of the PRA for these pests do not change. However *A. germari* has a more limited and a more tropical distribution than originally assessed, but it is considered that it could establish in Southern EPPO countries.

The Panel on Phytosanitary Measures agreed with the addition of Apriona rugicollis *to the A1 list.*

Details on the distribution and host plants of *Apriona cinerea*, *A. germari* and *A. rugicollis* can be retrieved in EPPO Global Database (gd.eppo.int).

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

Pests: ***Apriona germari, A. japonica, A. cinerea***
PRA area: EPPO region
Assessors: Expert Working group for PRA for *Apriona germari, A. japonica, A. cinerea*
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EPPO Secretariat
Ms Muriel Suffert
Ms Fabienne Grousset – Consultant for EPPO who has prepared the draft PRA.

Date: 2011-12-06/09. Core members (Jose Maria GUITIAN CASTRILLON, Pietr KAPITOLA, Alan MACLEOD, Françoise PETTER, Robert STEFFEK, Dirk Jan VAN DER GAAG) reviewed the draft PRA between March and May 2012. The risk management part was reviewed by the Panel on Phytosanitary Measures on 2012-10-04 and 2013-03-06.

STAGE 1: INITIATION

Reason for doing PRA: Three species of *Apriona* (Coleoptera; Cerambycidae), *A. germari*, *A. japonica* and *A. cinerea*, are important economic pests of commercial, ornamental and forest trees in parts of eastern Asia (China, Korea, Japan)

and on the Indian subcontinent. Two of these species (*A. germari* and *A. japonica*) have been intercepted in countries of the EPPO region and in the USA on a number of occasions. The EPPO Panel on Phytosanitary Measures decided in March 2011 that a PRA for these species should be performed on the basis of a Dutch PRA.
During the preparation of the PRA, another species *Apriona swainsoni* also emerged as a serious pest in China. Its distribution however, is more restricted than that of *A. germari* and its main host, *S. japonica*, and other reported hosts are trees that are used mainly as ornamentals in the PRA area. It was not considered further in the PRA because of lack of data and because measures identified against *A. germari* will cover the risk posed by *A. swainsoni*.

Taxonomic position of pest:

Insecta: Coleoptera: Cerambycidae
Genus: *Apriona*
Species:
-*germari* (Hope, 1831)
-*japonica* (Thomson, 1878)
-*cinerea* (Chevrolat, 1852)

STAGE 2: PEST RISK ASSESSMENT

PROBABILITY OF INTRODUCTION

Entry

Geographical distribution:
(see PRA record for references)

EPPO region: Absent.
Asia:
***A. germari*:** Cambodia, China, India (Jammu & Kashmir), Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan (west), Taiwan, Thailand, Vietnam. In China, it is found in the provinces of Shangai, Liaoning, Hebei, Shandong, Shanxi, Shaanxi, Gansu, Jiangsu, Zhejiang, Hunan, Hubei, Anhui, Jiangxi, Fujian, Taiwan, Hainan, Guangdong, Guangxi, Guizhou, Sichuan, Yunnan, Xizang (Tibet), Heilongjiang, Inner Mongolia, Beijing, Tianjing, Ningxia, Chongqing, Hongkong.

***A. japonica*:** Japan (Honshu, Ibaraki, Nagano, Shikoku, and Kyushu).

***A. cinerea*:** India (north-western states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Hariyana and Punjab); Pakistan (Rawalpindi, Peshawar and Parachinar, Khyber Pakhtunkhwa (North West Frontier Province)).

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

Apriona species are polyphagous and *A. germari*, *A. cinerea* and *A. japonica* have a wide host range that includes at least 70 plant species, mostly trees, in 21 different families (Betulaceae, Bombacaceae, Cornaceae, Ebenaceae, Ericaceae, Euphorbiaceae, Fabaceae, Fagaceae, Juglandaceae, Lauraceae, Lythraceae, Meliaceae, Moraceae, Platanaceae, Rosaceae, Rutaceae, Salicaceae, Scrophulariaceae, Theaceae, Ulmaceae, Urticaceae).

Hosts on which *A. germari*, *A. cinerea* and *A. japonica* are significant pests in the area of origin are as follows:
***A. germari*:** mulberry (*Morus* spp.), poplar (*Populus* spp.), willow (*Salix* spp.), apple (*Malus* spp.), fig (*Ficus carica*), paper mulberry (*Broussonetia papyrifera*), jackfruit (*Artocarpus heterophyllus*) and pagoda tree (*Sophora japonica)*

A. japonica: mulberry (*Morus* spp.), poplar (*Populus* spp.), willow (*Salix* spp.), *Malus pumila*, *Enkianthus perulatus*, loquat (*Eriobotrya japonica*), fig (*Ficus carica*), false acacia (*Robinia* pseudoacacia), keaki (*Zelkova serrata*), Japanese beech (*Fagus crenata*) and *Celtis sinensis*.

***A. cinerea*:** poplar (*Populus* spp.), apple (*Malus domestica*), mulberry (*Morus* spp.), *Prunus* spp. and pear (*Pyrus communis*).

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

- **Plants for planting (except seeds) of host plants from areas where *A. germari, A. japonica* or *A. cinerea* occur**

Eggs may be present in the bark and larvae in stems or branches. Whole plants may carry eggs and all larval stages, and cuttings/budwood may carry eggs and small larvae. The cuttings themselves will not sustain the development of the pest but the eggs/larvae may carry on their development once the cuttings are grafted. This pathway also includes bonsais.

- **Wood (round or sawn, with or without bark) of host plants from areas where *A. germari, A. japonica* and *A. cinerea* occur**

Larvae may be present and survive in the wood. This is supported by several interceptions on wood packaging material. Round or sawn wood was considered more appropriate for survival than packaging material. Some host species for which wood is used (logs, veneers, biofuel) are: *Artocarpus*, *Populus*, *Malus*, *Pyrus*, *Ulmus*, *Zelkova*. This pathway also covers firewood.

- **Wood packaging material**

Larvae may be present in wood packaging material as shown by records of interceptions. Although this reflects a certain movement on this pathway, and a risk of entry, this is not studied in detail in the PRA as it is considered that a correct implementation of ISPM 15 should address the risk.

- **Wood chips and waste wood**

All life stages of the pest may be associated at the origin with wood waste and wood chips at any time of the year. However, wood chips are usually made of the small branches and not of the main trunk and are therefore less likely to be infested according to the biology of the pests. In addition, the process of producing wood chips, i.e. grinding and chipping, is likely to reduce the concentration of the pest. Finally, currently the trade of wood chips to the PRA area is considered minimal from countries where the pests occur. Trade of wood waste is larger than trade of wood but it is not possible to know if the wood waste concerned is from host plants or not, and if this wood waste is processed (e.g. as pellet) or not.
Nevertheless, this trade may increase, and late larvae, pupae and adults may complete development if they survive the chipping process.

Pathways considered less likely

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

- **Cut branches.** Eggs and larvae may be present on and in cut branches. However, cut branches will probably be too small for the larvae to complete their development and transfer to a host where the pest could complete its life cycle is very unlikely. In addition, there is no indication that the host species considered are used for such purpose (except maybe for *Salix* species), nor that there is a trade to the PRA area from countries where the pests occur.

- **Furniture and objects made from wood of host plants**. Larvae and

pupae could be present in such objects, although processing (e.g. sawing) will destroy some of them. In addition desiccation would impair their development. Pupae are more likely to complete their development and emerge than larvae. Likelihood of transfer is limited, except if those objects are used outdoors. Therefore this pathway was considered unlikely.

- **Natural spread.** There are indications that adults of *A. germari* can fly up to 2500 m to find food with an average flight of 250 to 550 m (Pan Hong Yang, 2005). However there is no indication that natural spread has occurred towards the PRA area from countries where *A. germari*, *A. japonica* and *A. cinerea* occur.

- **Bark of host plants. Only** eggs may be associated with bark as they are laid in crevices or in a niche made by the female on the bark. Processes used to produce the bark commodity may destroy eggs, and these would also be exposed to desiccation. If larvae emerged, they would not find wood to feed on. Finally, there is no indication that there is a trade from countries where the pests occur.

Establishment

Plants at risk in the PRA area:

Many of the host species and genera attacked by *A. germari*, *A. cinerea* and *A. japonica* occur in the PRA area. They are grown for fruit production (commercially or in gardens), for ornamental purposes (private and public gardens, landscaping, cities), occur naturally or are planted in forests, including in commercial plantations. Some of the hosts or other species in the same genera grow in the wild in the PRA area. One species and 5 genera are common hosts for all three *Apriona* spp.: poplar (*Populus* spp.), mulberry (*Morus* spp.), fig (*Ficus carica*), apple (*Malus* spp.), pear (*Pyrus* spp.) and willow (*Salix* spp.). Some occur throughout the PRA area (poplar, willow, *Malus* spp.), while others (mulberry, figs) are particularly important in southern areas, especially in the Mediterranean region.

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

The climatic conditions appear appropriate in part of the PRA area for *A. germari* (Mediterranean area, South-East Europe (Balkans), Northern Turkey and oceanic areas of South-West Europe (Portugal, France and Spain). For *A. japonica* and *A. cinerea*, the area suitable for establishment is more uncertain, but would probably include at least the north of the Mediterranean Basin. Given the uncertainty on current pest distribution and the lack of data on the biology of the pests, uncertainty is medium for *A. germari*; high for A. *japonica* and *A. cinerea*.

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

Host plants are grown in plantations, orchards, parks, nurseries, outdoors and under protected conditions where they are subject to limited management. High plant density in orchards will favour establishment. Host plants are also widespread in gardens and forests, with minimal management, and in the wild without management.

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

Where climatic conditions are appropriate (e.g. Mediterranean area, South-East Europe (Balkans), Northern Turkey and oceanic areas of South-West Europe (Portugal, France and Spain)), there are also numerous hosts, including in commercial cultivation so for these areas probability of establishment is high with low uncertainty. However there are uncertainties as to the northern limit of the area of establishment because of lack of biological data for the 3 species.

POTENTIAL ECONOMIC CONSEQUENCES

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

A. germari, *A. cinerea* and *A. japonica* are generally considered as serious pests, but quantitative information about the damage and economic impact is generally lacking.

Describe damage to potential hosts in PRA area:

The main damage associated with *Apriona* spp. is caused by the larvae, which bore into the wood soon after hatching, creating long tunnels. This affects the growth of the trees and decreases the quantity and quality of the timber and longevity of the trees (*A. germari*, Shui *et al.*, 2009; Li, 1996). Trees may die and stems might be broken (*A. japonica*, Esaki, 2006). The timber becomes unsuitable for commercial use as entry of fungi and pathogens in the galleries cause discoloration of the wood, and this causes weakness, which increases the chances of wind break. Repeated attacks result in forking or mortality (Singh & Prasad, 1985; Singh *et al.*, 1994). Damage to orchards is likely to affect fruit production, but there is no estimate of impact on fruit crops.

The 3 species are reported to attack healthy trees but trees in stressed conditions suffer even heavier damage.

Damage of *A. germari* in poplar tree trunk. Youqing Luo, Beijing Forestry University

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

In areas where *Apriona* spp. could establish outdoors, the pests would attack poplars, apples, willows and other crops and plants in the natural environment, commercial orchards, gardens, plantations and urban areas. It is expected that the potential damage would be high in the southern part of the PRA area where the pest is more likely to establish outdoors, especially if it established in the wild on hosts that occurred extensively with or without management (e.g. poplar). Uncertainty on impact is medium to high as it is unclear how host preferences influence the development of populations, and whether specific hosts are needed in the life cycle of the pest for adult maturation (such as mulberry or paper mulberry), and the role of current management measures is not clear.

Environmental impact could be major if the pest reaches forests and other environments where poplar, willow, chestnut, *Crataegus*, *Robinia* etc. are present. However, there is uncertainty as to the extent to which species belonging to host genera that are present in the PRA area, but not in the area of origin, might be attacked.

CONCLUSIONS OF PEST RISK ASSESSMENT

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

Apriona spp. are pests of important fruit and forest trees in the area of origin. They may attack healthy trees and cause mortality. Host plants are widely present in part of the PRA area.If introduced in the area of potential establishment, eradication or containment would be moderately likely due to the hidden life stages of the pest and the fact that it might not be detected before it has already established and caused damage. It is also very likely that the pest would spread (natural spread as it is a strong flier; human-assisted through movement of infested material).

Estimate the probability of

The probability of entry is considered **unlikely with a medium**

entry:	**uncertainty**. There is uncertainty regarding the volumes imported into the PRA area (although they are considered to be low), as well as for the association of the pest with the pathways at origin. Low volumes of imports are the main reason for the low likelihoods of entry attributed to the pathways, and the assessment would change if volumes increased, especially for wood of poplar. In addition, it should be noted that entry does occur with wood packaging material as interceptions have been reported, even after the adoption of ISPM 15 worldwide. This may reflect a bad implementation of ISPM in practice.
Estimate the probability of establishment:	The probability of establishment is **high (with a low uncertainty)** in the following area: Mediterranean area, South-East Europe (Balkans), Northern Turkey and oceanic areas of South-West Europe (Portugal, France and Spain). There are uncertainties on the northern limit of the area of potential establishment because of lack of data on thermal threshold for the pests and ability to have a longer life cycle.
Estimate the probability of spread:	The rate of spread of the pests is likely to be **high (with a low uncertainty)** as they pest can move with plants for planting, wood (including firewood), bark and untreated wood packaging.
Estimate the potential economic impact:	The potential economic impact in the core area of potential establishment is considered as **major with medium uncertainty**. Precise data is lacking on economic impact at origin. There are uncertainties on the possible host range in the PRA area. Impact will be lower in the northern part of the area of potential establishment where the pests may need 3 years to complete their life cycle.
Degree of uncertainty	The main uncertainties are : -limits of the area of potential establishment (because of lack of data on thermal thresholds, on flexibility of life cycle and uncertainties on the current distribution, the importance of certain climatic factors such as humidity and winter cold (for diapause) for establishment in the PRA area), -current and potential host range (e.g. whether the adults require particular hosts for maturation feeding or can use other hosts when these favoured species are absent, whether they can to attack other hosts in the PRA area, -economic impact at origin and potential impact in the PRA area (quantitative information is lacking for the area of origin).
OVERALL CONCLUSIONS	Introduction of the pests in the PRA area is rated as moderately likely. Interceptions have already occurred. Early detection of an outbreak is unlikely and eradication or containment of these pests would therefore be difficult The southern part of the PRA area is at risk of important economic impact in case of introduction of these pests.

STAGE 3: PEST RISK MANAGEMENT

IDENTIFICATION OF THE PATHWAYS

Pathways studied in the pest risk management

- **Plants for planting (except seeds) of host plants**
- **Wood (round or sawn, with or without bark) of host plants**
- **Wood chips and wood waste of hardwood species**

The main uncertainty for management is the host list for each *Apriona*

species. Therefore the Panel on Phytosanitary measures agreed that measures should be required at the genus level for wood and plants for planting, whereas all hardwood wood chips and waste should be regulated (as several genera may be mixed in one consignment)

IDENTIFICATION OF POSSIBLE MEASURES

Possible measures for pathways

- **Plants for planting (except seeds) of host plants**

Measures related to the crop or to places of production:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Treatment of the plants cannot guarantee pest freedom. No treatments are mentioned to kill eggs.
- No resistant cultivars exist.
- Plants should come from a Pest-free area in countries where the pests are not known to occur (based on specific surveys)
- Plants should come from a Pest-free site under complete physical protection (for high value material) in authorized facilities: the plants should be grown throughout their life under protection.

Measures related to consignments:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Treatment: no specific data is available.
- Post-entry quarantine: This would require keeping the plants in post-entry quarantine for a sufficient time to detect the symptoms of larval activity (ejection holes and frass) (a maximum of 6 months in conditions similar to origin, otherwise longer). This measure is likely to be applicable only for small scale imports.

Systems approach: no measures can be combined in a systems approach to reach an appropriate level of protection.

- **Wood (round or sawn, with or without bark) of host plants**

Measures related to the crop or to places of production:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Treatment of the trees cannot guarantee pest freedom and is not possible for wood production.
- Wood should come from a Pest-free area in countries where the pest is not known to occur (based on specific surveys)

Measures related to consignments:

- Treatment for quality logs (heat treatment at 56°C for 30 min, irradiation).
- Processing into sawn wood will not destroy all pests (as shown by interception on wood packaging material).
- Storing the wood in the exporting country under strict control of the NPPO for some time before expert would be a possible option in theory but there is no data on how long the pest may survive in cut wood and this measure is difficult to apply in practice.
- Import of wood for processing during periods of the year outside of the flight period, and processing before the next flight period of the pest, provided that conditions in storage do not allow emergence of the pest (e.g. temperatures below 10°C). The Panel on Phytosanitary Measures considered that this option should not be recommended as the endangered area has a climate with mild winters during which the temperatures will not stay long below 10°C and there are some uncertainty about the exact threshold for each species.

- **Hardwood wood chips and wood waste**

Measures related to the crop or to places of production:

- Pest-free area in countries where the pest is not known to occur (based on specific surveys)

Measures related to consignments:

- Treatment (chipping to pieces of less than 3 cm in any dimension' or heat treatment at 56°C for 30 min throughout the material)
- Storage in the country of export: in theory, wood chips and wood waste could be stored in the exporting

country under strict control of the NPPO for a sufficient period, i.e. 2 years for wood waste and 1 year for wood chips, since only prepupae, and pupae would be likely to survive the chipping process and should have emerged as adults within this period of time. However the Panel on Phytosanitary Measures considered that given the difficulty to control the application of this measure in practice, it was not an appropriate option for imported material

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

The trade in the commodities from outside the EPPO region is limited so impact on trade should be minor. In addition, these pests would be difficult to eradicate or contain if introduced.

Degree of uncertainty Uncertainties in the management part are:

- Host range on which measures should be required
- Data on natural spread for PFA
- Exact thermal threshold for import during specific periods of the year

IDENTIFICATION OF POSSIBLE MEASURES

PC= Phytosanitary certificate, RC=Phytosanitary certificate of re-export

Pathway	Measures
Host plants for planting[1] (excluding seeds) of *A. germari*	PC and, if appropriate, RC and • Pest-free area in countries where the pest is not known to occur, or • Pest-free site under complete physical protection or • Post-entry quarantine
Host plants for planting[2] (excluding seeds) of *A. japonica*	
Host plants for planting[3] (excluding seeds) of countries where *A. cinerea* occurs	
Round wood and sawn wood, with or without bark, of host species[1,2,3] of *A. germari*, *A. japonica* or *A. cinerea*	PC and, if appropriate, RC and • Pest-free area in countries where the pest is not known to occur or • Treatment (heat, irradiation)
Hardwood wood chips and wood waste	PC and, if appropriate, RC and • Pest-free area in countries where the pest is not known to occur, or • Treatment (chips should be smaller than 3 cm in any dimensions or heat treated)
Wood packaging material (including dunnage) containing host species[1,2,3] of *A. germari*, *A. japonica* or *A. cinerea*	• -Treated according to ISPM 15

1. Known hosts (see PRA record for details): *Alnus* spp. *Artocarpus* spp., *Artocarpus* spp, *Bombax* spp, *Broussonetia* spp, *Cajanus* spp, *Camellia* spp, *Castanea* spp., *Celtis* spp, *Cinnamomum* spp., *Citrus* spp., *Cunninghamia* spp., *Dalbergia* spp., *Eriobotrya* spp., *Ficus* spp., *Juglans* spp., *Maclura* spp., *Malus* spp., *Melia* spp., *Morus* spp., *Populus* spp. and hybrids, *Prunus pseudocerasus*, *Pterocarya* spp., *Pyrus* spp., *Robinia* spp., *Salix* spp., *Sapium* spp., *Schima* spp., *Sophora* spp., *Trema* spp. *Ulmus* spp., *Vernicia* spp., *Xylosma* spp.

2. Known hosts (see PRA record for details): *Caesalpinia* spp., *Celtis* spp., *Cercis* spp., *Chaenomeles* spp., *Cinnamomum* spp., *Citrus* spp., *Cornus* spp., *Crataegus* spp., *Debregeasia* spp., *Diospyros* spp., *Eriobotrya* spp., *Enkianthus* spp., *Fagus* spp., *Ficus* spp., *Firmiana* spp., *Gleditsia* spp., *Hovenia* spp., *Lagerstroemia* spp., *Malus* spp., *Morus* spp., *Platanus* spp., *Platycarya strobilaceae*, *Populus* sp., *Pterocarya rhoifolia*, *Pterocarya stenoptera*, *Punica granatum*, *Pyrus* spp., *Robinia* spp., *Salix* spp., *Spiraea* spp., *Thea* spp., *Ulmus* spp., *Villebrunea* spp., *Zelkova* spp.

3. Known hosts (see PRA record for details): *Debregeasia* spp., *Ficus* spp., *Maclura* spp., *Malus* spp., *Morus* spp., *Populus* spp. and hybrids, *Prunus* spp., *Pyrus* spp., *Salix* sp.

References

See PRA Record (doc 20-25978). EPPO (2013) Pest risk analysis for *Apriona germari*, *A. japonica*, *A. cinerea*. EPPO, Paris.
Available at http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm