Adopted: 19 June 2024

DOI: 10.2903/j.efsa.2024.8892

SCIENTIFIC OPINION

efsa JOURNAL

Commodity risk assessment of maple veneer sheets from Canada

EFSA Panel on Plant Health (PLH) | Claude Bragard | Paula Baptista | Elisavet Chatzivassiliou | Francesco Di Serio | Josep Anton Jaques Miret | Annemarie Fejer Justesen | Alan MacLeod | Christer Sven Magnusson | Panagiotis Milonas | Juan A. Navas-Cortes | Stephen Parnell | Roel Potting | Philippe Lucien Reignault | Emilio Stefani | Hans-Hermann Thulke | Wopke Van der Werf | Antonio Vicent Civera | Jonathan Yuen | Lucia Zappalà | Andrea Battisti | Eugen Christoph | Hugo Mas | Daniel Rigling | Massimo Faccoli | Alžběta Mikulová | Olaf Mosbach-Schulz | Fabio Stergulc | Franz Streissl | Paolo Gonthier

Correspondence: plants@efsa.europa.eu

Abstract

The European Commission requested the EFSA Panel on Plant Health to deliver a risk assessment on the likelihood of pest freedom from Union quarantine pests and pests subject to measures adopted pursuant to Article 30 of Regulation (EU) No 2016/2031 for the maple veneer sheets manufactured according to the process set out by Canada, with emphasis on the freedom from *Davidsoniella virescens* and *Phytophthora ramorum* (non-EU isolates). The assessment was conducted for veneer sheets of up to 0.7 mm and up to 6 mm thickness, taking into account the different phases in the veneer production in a systems approach. Some of those phases, taken alone, including the heat treatment of logs in a water bath, the cutting into thin veneer sheets and the final high heat drying of veneer sheets are expected to be effective against some of the pests, without uncertainties, making the system approach fully effective. The panel considers that no insects would survive cutting of logs into thin veneer sheets of 0.7 mm and that *Xylella fastidiosa* will not survive the temperatures in the water bath and final drying of veneers. The degree of pest freedom for the different groups of organisms is generally very high with slightly lower degree of pest freedom for veneer sheets of 6 mm thickness because of lower temperatures reached in the final drying of veneer sheets compared to thinner sheets. *P. ramorum* is not expected to survive the high heat drying of thin veneer sheets, but it may survive the lower temperatures inside thicker veneer sheets. The Expert Knowledge Elicitation (EKE) indicated, with 95% certainty, that between 9989 and 10,000 veneer sheets (thickness 6 mm) per 10,000 will be free from living *P. ramorum*. For *D. virescens,* the EKE indicated, with 95% certainty, that between 9984 and 10,000 veneer sheets (0.7 mm) per 10,000 and that between 9954 and 10,000 veneer sheets (6 mm) per 10,000 will be free from living inoculum. For other relevant groups of pests, the greatest likelihood of pest presence was observed for wood decay fungi. The EKE indicated, with 95% certainty, that between 9967 and 10,000 veneer sheets (0.7 mm) per 10,000 and that between 9911 and 10,000 veneer sheets (6 mm) per 10,000 will be free from living wood decay fungi.

KEYWORDS

Acer, commodity risk assessment, European Union, plant health, plant pest

CONTENTS

1 | INTRODUCTION

1.1 | Background and Terms of Reference as provided by European Commission

1.1.1 | Background

Special requirements apply to the introduction of wood of maple (*Acer* spp.) originating from Canada, as laid down in Annex VII to Regulation (EU) 2019/2072[1]:

- Point 85 of the Annex provides that for wood of maple, other than in the form of wood intended for the production of veneer sheets, chips (and particles etc.) and wood packaging material must have undergone kiln-drying to below 20% moisture content;
- Point 86 of the Annex provides that maple wood intended for the production of veneer sheets must originate from areas known to be free from *Davidsoniella virescens*;
- Point 111 of the Annex provides that wood from *Acer macrophyllum* shall originate in areas free from *Phytophthora ramorum* (non-EU isolates) or shall have undergone an appropriate treatment, e.g. drying, kiln drying or disinfection with hot air or hot water;
- Wood (including veneer sheets) from *Acer saccharum* and *Acer macrophyllum* originating in Canada must be accompanied by a phytosanitary certificate.

In January 2022, Canada introduced a request to recognise a specific process used in the production of maple veneer as a systems approach to address the phytosanitary concerns related to the introduction of maple veneer from Canada. The systems approach includes several steps of processing of the wood after harvest and until cutting into veneer slices of less than 7 mm thickness.[2] It was agreed with Canada that, for consistency reasons, the value for the thickness of the veneer slices shall be interpreted as 6 mm or less.

In support of the request, a background document was submitted, which contains a description of the systems approach and references to relevant scientific literature.

1.1.2 | Terms of Reference

EFSA is requested, pursuant to Article 29 of Regulation (EC) No 178/2002,[3] to provide a scientific opinion.

In particular, EFSA is requested to assess, based on the information provided by Canada, the likelihood of freedom from Union quarantine pests and pests subject to measures adopted pursuant to Article 30 of Regulation (EU) No 2016/2031[4] for the maple veneer sheets manufactured according to the process set out by Canada. Emphasis shall be put on the freedom from *Davidsoniella virescens* and *Phytophthora ramorum* (non-EU isolates).

The assessment shall include veneer sheets of a thickness of 6 mm or less made from maple (*Acer* spp.) originating from Canada.

In this assessment, EFSA shall take into account the available scientific information, and in particular the scientific and technical information provided by Canada, as well as existing international phytosanitary standards. If necessary to complete its assessment, EFSA may ask additional technical information or clarifications regarding the Canadian request to recognise a systems approach for the manufacturing of veneer sheets from maple wood. Following the provision of such information, EFSA shall proceed with the assessment.

1.2 | Interpretation of the Terms of Reference

The likelihood of pest freedom from Union quarantine pests and pests subject to measures adopted pursuant to Article 30 of Regulation (EU) No 2016/2031 with emphasis on *Davidsoniella virescens* and *Phytophthora ramorum* for the maple veneer sheets manufactured according to the process set out by Canada was assessed. The reference to article 30 of Regulation 2016/2031 was interpreted as a requirement to assess all pests qualifying potentially as quarantine pests which could be associated with maple. The object of the assessment was veneers produced with wood of any *Acer* species grown and processed in Canada. Consistently with the terms of reference, the likelihood of pest freedom was assessed for veneers up to 6 mm thick. The applicant country indicated in the additional information that, different to their original application, only

[1]Commission Implementing Regulation (EU) 2019/2072 of 28 November 2019 establishing uniform conditions for the implementation of Regulation (EU) 2016/2031 of the European Parliament and the Council, as regards protective measures against pests of plants, and repealing Commission Regulation (EC) No 690/2008 and amending Commission Implementing Regulation (EU) 2018/2019. OJ L 319, 10.12.2019, p. 1–279.

[2]In the original Dossier the slices of veneer sheets were indicated as up to 7 mm. However, the EU Commission agreed with Canada that the value for the thickness of the veneer slices shall be interpreted as 6 mm or less.

[3]Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, pp. 1–24.

[4]Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) 228/2013, (EU) 652/2014 and (EU) 1143/2014 of the European Parliament and of the Council and repealing Council Directives 69/464/EEC, 74/647/EEC, 93/85/EEC, 98/57/EC, 2000/29/EC, 2006/91/EC and 2007/33/EC. OJ L 317, 23.11.2016, pp. 4–104.

thin veneers of 0.6–0.7 mm are intended for export to the EU (Dossier Sections 2.1 and 2.2). Taking into consideration the originally agreed thickness of veneers (see mandate above) and for applicability of the assessment also for thicker veneer sheets of 6 mm, it was agreed with the European Commission that the assessment is conducted separately for maple veneer sheets with a thickness of 0.7 and 6 mm. Veneer sheets with a thickness up to 0.7 mm and up to 6 mm are considered to be covered by the assessment in the current opinion. Pest freedom was assessed at the end of production of the veneer sheets. Therefore, the risk of secondary infestation by pests after veneer production (e.g. during storage and transport) was not evaluated and hence is not covered by the current assessment.

2 | DATA AND METHODOLOGIES

2.1 | Data

2.1.1 | Data provided by the applicant

The Panel considered all the data and information (hereafter called 'the Dossier') provided by Canadian Food Inspection Agency-Agence Canadienne d'Inspection des Aliments (CFIA-ACIA) in January 2022 including the additional information provided by CFIA-ACIA in January 2024, after EFSA's request. The Dossier is managed by EFSA.

The structure and overview of the Dossier is shown in Table 1. The number of the relevant section is indicated in the Opinion when referring to a specific part of the Dossier.

TABLE 1 Structure and overview of the Dossier.

Dossier Section	Overview of contents	Filename
1.0	Technical dossier	CFIA_ACIA+-#15945694+–+v1+–+PMADD_2021-4_Canada_-_EU_ Maple_Veneer
2.1	Additional information: answers to EFSA queries provided in January 2024	CFIA_ACIA-#20570290-v1-Canada_s response to EFSA_s Questionnaire re_maple veneer (EFSA-Q-2023-00206)
2.2	Additional information: supplementary document	Supplementary document_Veneer Process
3.0	Additional information: answers to EFSA queries provided in April 2024	EFSA-Additional_questions_(2)-Qestions_to_the_applicant_on_ maple_veneer_Final

The data and supporting information provided by CFIA-ACIA formed the basis of the commodity risk assessment.

2.1.2 | Literature searches performed by EFSA

2.1.2.1 | *Pest list compilation*

The list of *Acer* species present in Canada (excluding *Acer palmatum*) was retrieved from the literature (Canada's National Forest Inventory, 2023). Literature searches in different databases were undertaken by EFSA to complete a list of pests potentially associated with those *Acer* species present in Canada having a commercial significance for their wood: *Acer circinatum*, *A. ginnala*, *A. glabrum* var. *douglasii*, *A. macrophyllum*, *A. negundo*, *A. nigrum*, *A. pensylvanicum*, *A. platanoides*, *A. pseudoplatanus*, *A. rubrum*, *A. saccharinum*, *A. saccharum*, *A. saccharum* var. *saccharum*, *A. spicatum* and *A.* × *freemanii*. The following searches were combined: (i) a general search to identify pests reported on *Acer* species in the databases, (ii) a search to identify any EU quarantine pest reported on *Acer* as genus and subsequently (iii) a tailored search to identify whether the above pests are present or not in Canada. The searches were run between September and November 2023. No language, date or document type restrictions were applied in the search strategy.

The Panel used the databases indicated in Table 2 to compile the list of pests associated with the tree species listed above. As for Web of Science, the literature search was performed using a specific, ad hoc established search string (see Appendix B). The string was run in 'All Databases' with no range limits for time or language filters. This is further explained in Section 2.2.1.

TABLE 2 Databases used by EFSA for the compilation of the pest list associated with *Acer* species.

Database	Platform/link
Aphids on World Plants	https://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm
BIOTA of New Zealand	https://biotanz.landcareresearch.co.nz/
CABI Crop Protection Compendium	https://www.cabi.org/cpc/
Database of Insects and their Food Plants	https://www.brc.ac.uk/dbif/hosts.aspx
Database of the World's Lepidopteran Hostplants	https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml
EPPO Global Database	https://gd.eppo.int/
EUROPHYT	https://food.ec.europa.eu/plants/plant-health-and-biosecurity/europhyt_en
Leaf-miners	https://www.leafmines.co.uk/html/plants.htm
Nemaplex	https://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx
Plant Pest Information Network	https://www.mpi.govt.nz/news-and-resources/resources/registers-and-lists/plant-pest-information-network/
Scalenet	https://scalenet.info/associates/
Spider Mites Web	https://www1.montpellier.inra.fr/CBGP/spmweb/
USDA ARS Fungal Database	https://fungi.ars.usda.gov/
Web of Science: All Databases (Web of Science Core Collection, CABI: CAB Abstracts, BIOSIS Citation Index, Chinese Science Citation Database, Current Contents Connect, Data Citation Index, FSTA, KCI-Korean Journal Database, Russian Science Citation Index, MEDLINE, SciELO Citation Index, Zoological Record)	https://www.webofknowledge.com
World Agroforestry	https://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749

Additional searches, limited to retrieve documents, were run when developing the Opinion. The available scientific information, including previous EFSA opinions on the relevant pests and diseases and the relevant literature and legislation (e.g. Regulation (EU) 2016/2031; (EU) 2019/2072).

2.1.2.2 | *Temperature survival literature search*

A systematic literature search was performed by EFSA in order to retrieve information on whether wood colonising pests could survive the temperature and moisture levels in wood during veneer production. A general search on the extreme conditions of survival was conducted for any kind of organism (insects, mites, nematodes, fungi, oomycetes, bacteria, viruses) and, additionally, a tailored search on the same conditions was performed on specific maple wood pests selected for further evaluation. Details on the literature review including the search string is provided in Appendix C.

2.1.3 | Further information provided by experts

The WG group consulted a specialist on wood physics to get estimates for the temperatures reached in the inner wood tissues during selected phases of the veneer production such as the temperature inside logs during the water bath and the temperature inside veneer sheets during the final heat drying phase. Details on the calculations are provided in Appendix E.

2.2 | Methodologies

2.2.1 | Identification of pests potentially associated with the commodity

To evaluate the pest risk associated with the commodity from Canada, a pest list was compiled. The pest list is a compilation of all plant pests reported as potentially associated with *Acer* species based on information provided in the Dossier Sections 1.0, 2.1, 2.2 and 3.0 on searches performed by the Panel as indicated above in Section 2.1.2.1. The search strategy and search syntax were adapted to each of the databases listed in Table 2, according to the options and functionalities of the different databases and CABI keyword thesaurus.

The scientific names of the host plant (i.e. *Acer circinatum*, *A. ginnala*, *A. glabrum* var. *douglasii*, *A. macrophyllum*, *A. negundo*, *A. nigrum*, *A. pensylvanicum*, *A. platanoides*, *A. pseudoplatanus*, *A. rubrum*, *A. saccharinum*, *A. saccharum*, *A. saccharum* var. *saccharum*, *A. spicatum*, and *A.×freemanii*) were used when searching in the EPPO Global database and CABI Crop Protection Compendium. The same strategy was applied to the other databases excluding EUROPHYT and Web of Science.

EUROPHYT was investigated by searching for the interceptions associated with *Acer* spp. imported from the whole world from 1995 to May 2020 and TRACES-NT from May 2020 to 30 April 2024, respectively. For the pests selected for further evaluation, a search in the EUROPHYT and/or TRACES-NT was performed for the years between 1995 and April 2024 for the interceptions from the whole world, at species level.

The search strategy used for Web of Science Databases was designed combining English common names for pests and diseases, terms describing symptoms of plant diseases and the scientific and English common names of the commodity and excluding pests which were identified using searches in other databases. The established search string is detailed in Appendix B and it was run on 12 March 2024.

The titles and abstracts of the scientific papers retrieved were screened and the pests associated with *Acer* were included in the pest list. The pest list was eventually further compiled with other relevant information (e.g. EPPO code per pest, taxonomic information, categorisation, distribution) useful for the selection of the pests relevant for the purposes of this Opinion.

The compiled pest list (see Microsoft Excel® in Appendix H) includes all identified pests that use as host *Acer circinatum*, *A. ginnala*, *A. glabrum* var. *douglasii*, *A. macrophyllum*, *A. negundo*, *A. nigrum*, *A. pensylvanicum*, *A. platanoides*, *A. pseudoplatanus*, *A. rubrum*, *A. saccharinum*, *A. saccharum*, *A. saccharum* var. *saccharum*, *A. spicatum* and *A.×freemanii*.

The evaluation of the compiled pest list was done in two steps: first, the relevance of the EU-quarantine pests was evaluated (Section 4.1); second, the relevance of any other plant pest was evaluated (Section 4.2).

2.2.2 | Listing and evaluation of different phases in the production of maple veneer sheets proposed in a system approach for the reduction of risks associated with plant pests

The applicant suggests a systems approach for the reduction of risks associated with harmful pests that might be associated with maple veneers. It should be noted that the system approach was not specifically designed for mitigating the risks associated with plant pests, but rather it includes different phases routinely implemented for the production of veneers. The cumulative effect of the different phases in the veneer production would result in a greater pest risk reduction than single phases separately. The different phases include the selection of high-quality trees, heating logs in water bath, debarking and rounding of logs, slicing and high heat drying of veneer sheets (for details on the production process, see Section 3).

The current assessment evaluates the risk mitigation potential separately for each phase of the system approach as well as for the whole system approach (see Section 6). The system approach was considered fully effective in mitigating the risk posed by a given pest of concern if that pest will be killed or removed, without uncertainties, during at least one of the phases of the system approach. Therefore, the risk of those pests was not assessed quantitatively via an Expert Knowledge Elicitation (EKE). The risk posed by the remaining pests (those that will not be completely killed or removed during at least one of the phases of the system approach or those about which there were uncertainties) was quantitatively assessed through EKE (see Section 7).

3 | THE COMMODITY

3.1 | Description of the commodity

Veneer sheets are produced from *A. saccharum* and *A. saccharinum* with a size of 1270 mm width × 3124 mm length. The current assessment was conducted for veneer sheets of 0.7 mm based on the information provided in the Dossier (Dossier Sections 1.0, 2.1 and 3) and of 6 mm thickness in agreement with the mandate received (see Section 1.2).

3.2 | Growing areas of maple trees used for veneer production

Acer trees grow predominantly in eastern regions of North America. *A. saccharum* and *A. saccharinum* are the major species used for veneer production. *A. saccharum* is the only *Acer* species used for decorative veneer. The trees for veneer production are from Eastern and South-eastern Canada.

3.3 | Production and handling processes

3.3.1 | Source and handling of logs used for veneer production

The trees originate from determined areas following a silvicultural strategy in mixed stands. Mixed stands include spruce (*Picea*), fir (*Abies*), beech (*Fagus*), poplar (*Populus*), red oak (*Quercus*), cedar (*Thuja*), ash (*Fraxinus*), white birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), Eastern white pine (*Pinus strobus*). Given the thickness of the final product, the logs have to be from healthy stands with minimal pest damage which could affect the quality (Dossier Section 2.1).

Selective harvesting is performed. Veneer logs are selected based on the highest quality criteria (straight, free of major defects, free from pest damage, no rot, round and well formed).

Marking of trees is performed and harvest is done within a maximum of 3 years after marking. Trees are harvested between 15 August and 15 March to avoid the sap flow. Veneer logs are cut from the basal section of the tree (above the roots and below the upper trunk section or approximately the first 5 m of the tree). The log diameter is 22–71 cm. No roots or branches are used for veneer production (Dossier Section 2.1).

Receiving inspection is performed at site to validate veneer log criteria such as freedom from defects, rot and shape (Dossier Section 2.1).

Felled trees should be removed from the forest and transported to the sawmills within 2 months. Logs are stored outside and should be processed within 12 months of reception (Dossier Section 2.1).

3.3.2 | Veneer production system

The following summarises the information provided by the applicant in Dossier Sections 1.0, 2.1, 2.2 and 3.0.

Water bath (vat)

Logs are conditioned in hot water to soften the wood for downstream processing. The schedule for heat treatment in the water bath varies depending on the season and the size of the logs. A programmable monitoring system adjusts the temperature and duration in the water bath. Detailed information from the applicant is provided in Table 3 below for different seasons and log diameters of 25–56 cm. The logs remain in the water bath until the core temperature reaches 50°C. To verify the core temperature, a log is removed from the water and a core temperature reading is taken with an infrared thermometer or a hole is drilled and a temperature sensor is inserted.

A programmable monitoring system adjust the temperature and duration in the water bath.

TABLE 3 Thermal treatment schedule in the vat (water bath) for different seasons and log sizes.

	Stage 1	Stage 2	Stage 3	Stage 4
Summer				
25–36 cm	15 h at 48°C	14 h at 50°C	14 h at 60°C	5 h at 62°C
38–56 cm	20 h at 40°C	20 h at 50°C	20 h at 63°C	5 h at 66°C
Spring/Fall				
25–36 cm	10 h at 40°C	12 h at 50°C	18 h at 60°C	13 h at 67°C
38–56 cm	12 h at 40°C	20 h at 52°C	20 h at 61°C	13 h at 68°C
Winter				
25–36 cm	10 h at 40°C	10 h at 55°C	20 h at 60°C	13 h at 64°C
38–56 cm	10 h at 40°C	20 h at 55°C	30 h at 61°C	10 h at 64°C

The logs are further processed 20–45 min after exit from the vats.

Debarking and rounding

Bark is completely removed during the process of debarking and rounding of logs. During rounding of logs, the outer sapwood of 3–10 mm under the bark is removed depending on the shape of the log.

Rotary cutting

Rotary cutting of round wood sections results in thin veneer sheets. The current assessment was conducted for veneer sheets of a thickness of 0.7 and 6 mm.

High heat drying

A rapid high heat treatment is applied to dry veneer sheets to a moisture content of 8%–12%. The temperature and drying time vary with the veneer sheet thickness. In the Dossier Section 1.0, it is stated that the drying temperature is 122–145°C for 2–3 min for veneer sheets of 6 mm or less thickness. Further information on the temperature and duration of drying was received in Dossier Section 3.0:

- Veneer sheets of 0.6–0.7 mm are dried with temperatures of 100–110°C (Zone 1) and 90–100°C Zone 2 for 90–120 s total drying time.

3.4 | Overview of interceptions

Data on the interception of harmful organisms on 'wood and article of wood/wood and bark' of *Acer* can provide information on some of the organisms that can be present on *Acer* despite the current measures taken. According to EUROPHYT (2024) (accessed on 15 May 2024) and TRACES-NT (2024) (accessed on 15 May 2024), there were no interceptions of 'wood and article of wood/wood and bark' of *Acer* from Canada destined to the EU Member States due to the presence of harmful organisms between the years 1995 and 30 April 2024.

In total, there were seven interceptions of 'wood and article of wood/wood and bark' of *Acer* (*Acer saccharum* and *Acer rubrum*) from the USA destined to the EU Member States due to the presence of harmful organisms (Coleoptera, Insecta) between the years 1995 and 30 April 2024 (EUROPHYT, 2024).

4 | IDENTIFICATION OF PESTS POTENTIALLY ASSOCIATED WITH THE COMMODITY

The search for potential pests associated with the commodity rendered 2188 pest species (see Microsoft Excel® file in Appendix H).

4.1 | Selection of relevant EU-quarantine pests associated with the commodity

The EU listing of union quarantine pests and protected zone quarantine pests (Commission Implementing Regulation (EU) 2019/2072) is based on assessments concluding that the pests can enter, establish, spread and have potential impact in the EU.

77 EU-quarantine pests that are reported to use the commodity as a host plant were evaluated (Table 4) for their relevance of being included in this Opinion

The relevance of an EU-quarantine pest for this opinion was based on evidence that:

a. the pest is present in Canada;
b. the commodity is host of the pest;
c. one or more life stages of the pest can be associated with logs to be used for veneer production.

Pests that fulfilled all criteria were selected for further evaluation.

Table 4 presents an overview of the evaluation of the 77 EU-quarantine pest species that are reported as associated with the commodity.

Of these 77 EU-quarantine pest species evaluated, 17 pests (*Arrhenodes minutus*, *Cryphonectria parasitica*, *Davidsoniella virescens*, *Entoleuca mammata*, *Phytophthora ramorum* (non-EU isolates), *Xylella fastidiosa*, *Anisandrus obesus*, *Anisandrus sayi*, *Corthylus columbianus*, *Euwallacea validus*, *Hylocurus rudis*, *Monarthrum fasciatum*, *Monarthrum mali*, *Pityophthorus lautus*, *Procryphalus utahensis*, *Xyleborus ferrugineus*, *Xyloterinus politus*) are present in Canada and can be associated with logs to be used for veneer production and hence were selected for further evaluation.

TABLE 4 Overview of the evaluation of the 77 EU-quarantine pest species for which information was found in the Dossier, databases and literature searches that use *Acer* as a host plant for their relevance for this opinion.

No.	Pest name according to EU legislation[a]	EPPO code	Group	Pest present in Canada	*Acer* confirmed as a host (reference)	Pest can be associated with the commodity[b]	Pest relevant for the Opinion
1	*Anoplophora chinensis*	ANOLCN	Insects	No	Yes (Sjöman et al., 2014)	Not assessed	No
2	*Anoplophora glabripennis*	ANOLGL	Insects	No	Yes (Sjöman et al., 2014)	Not assessed	No
3	*Arrhenodes minutus*	ARRHMI	Insects	Yes	Yes (Solomon, 1995)	Yes	Yes
4a	*Bemisia tabaci* (non-European populations)	BEMITA	Insects	Yes	Yes (Li et al., 2011; Yassin & Bendixen, 1982)	No	No
4b	*Bemisia tabaci* (European populations)	BEMITA	Insects	No	Yes (Li et al., 2011; Yassin & Bendixen, 1982)	Not assessed	No
5	*Choristoneura conflictana*	ARCHCO	Insects	Yes	Yes (EPPO, 2024a; Robinson et al., 2024)	No	No
6	*Choristoneura parallela*	CHONPA	Insects	Yes	Yes (Heppner & Habeck, 1976)	No	No
7	*Choristoneura rosaceana*	CHONRO	Insects	Yes	Yes (EPPO, 2024a; Robinson et al., 2024)	No	No
8	*Cryphonectria parasitica*	ENDOPA	Fungi	Yes	Yes (Anderson & Babcock, 1913; Shear et al., 1917; Spaulding, 1961)	Yes	Yes
9	*Davidsoniella virescens*	CERAVI	Fungi	Yes	Yes (Kessler, 1972)	Yes	Yes
10	*Diabrotica undecimpunctata*	DIABUN	Insects	No	Yes (Clark et al., 2004)	Not assessed	No
11	*Entoleuca mammata*	HYPOMA	Fungi	Yes	Yes (Manion & Griffin, 1986)	Yes	Yes
12	*Euwallacea fornicatus* sensu lato	XYLBFO	Insects	No	Yes (Eskalen et al., 2013)	Not assessed	No
13	*Homalodisca vitripennis*	HOMLTR	Insects	No	Yes (Hoddle et al., 2003)	Not assessed	No
14	*Longidorus diadecturus*	LONGDI	Nematodes	Yes	Yes (Ye et al., 2004)	No	No
15	*Lopholeucaspis japonica*	LOPLJA	Insects	No	Yes (Kosztarab, 1962; Suh, 2020)	Not assessed	No
16	*Lycorma delicatula*	LYCMDE	Insects	No	Yes (Barringer & Ciafré, 2020)	Not assessed	No
17	*Meloidogyne chitwoodi*	MELGCH	Nematodes	No	Yes (den Nijs et al., 2004)	Not assessed	No
18	*Meloidogyne fallax*	MELGFA	Nematodes	No	Yes (den Nijs et al., 2004)	Not assessed	No
19	*Neocosmospora ambrosia*	FUSAAM	Fungi	No	Uncertain	Not assessed	No
20	*Neocosmospora euwallaceae*	FUSAEW	Fungi	No	Yes (Eskalen et al., 2013)	Not assessed	No
21	*Oemona hirta*	OEMOHI	Insects	No	Yes (Kuschel, 1990)	Not assessed	No
22	*Phymatotrichopsis omnivora*	PHMPOM	Fungi	No	Yes (Anonymous, 1960)	Not assessed	No
23	*Phytophthora ramorum* (non-EU isolates)	PHYTRA	Oomycetes	Yes	Yes (Brown & Brasier, 2007; King et al., 2015)	Yes	Yes
24	*Popillia japonica*	POPIJA	Insects	Yes	Yes (Fleming, 1972)	No	No
25	*Scirtothrips dorsalis*	SCITDO	Insects	No	Yes (Hodges et al., 2005)	Not assessed	No

TABLE 4 (Continued)

No.	Pest name according to EU legislation[a]	EPPO code	Group	Pest present in Canada	*Acer* confirmed as a host (reference)	Pest can be associated with the commodity[b]	Pest relevant for the Opinion
26	*Trirachys sartus*	AELSSA	Insects	No	Yes (Temreshev, 2023)	Not assessed	No
27	*Xiphinema americanum* sensu stricto	XIPHAA	Nematodes	Yes	Yes (Xu & Zhao, 2019)	No	No
28	*Xiphinema rivesi* (non-EU populations)	XIPHRI	Nematodes	Yes	Yes (Xu & Zhao, 2019)	No	No
29a	*Xylella fastidiosa*	XYLEFA	Bacteria	Yes	Yes (Desprez-Loustau et al., 2021; EFSA, 2023)	Yes	Yes
29b	*Xylella fastidiosa subsp. fastidiosa*	XYLEFF	Bacteria	No	Yes (EFSA, 2023)	Not assessed	No
29c	*Xylella fastidiosa subsp. multiplex*	XYLEFM	Bacteria	No	Yes (EFSA, 2023)	Not assessed	No
Scolytinae spp. (non-European)							
30	*Ambrosiodmus lewisi* as Scolytinae spp. (non-European)	AMBDLE	Insects	No	Yes (Hoebeke, 1991; Wood & Bright, 1992)	Not assessed	No
31	*Ambrosiodmus tachygraphus* as Scolytinae spp. (non-European)	AMBDTA	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
32	*Ambrosiophilus atratus* as Scolytinae spp. (non-European)	XYLBAT	Insects	No	Yes (Bright, 2014; Wood & Bright, 1992)	Not assessed	No
33	*Anisandrus maiche* as Scolytinae spp. (non-European)	ANIDMA	Insects	Yes	Yes (Mandelshtam et al., 2018; Rabaglia et al., 2009; Wood & Bright, 1992)	No	No
34	*Anisandrus obesus* as Scolytinae spp. (non-European)	ANIDOB	Insects	Yes	Yes (Cognato et al., 2009; Wood & Bright, 1992)	Yes	Yes
35	*Anisandrus sayi* as Scolytinae spp. (non-European)	ANIDSA	Insects	Yes	Yes (Deyrup, 1981; Wood & Bright, 1992)	Yes	Yes
36	*Cnestus mutilatus* as Scolytinae spp. (non-European)	XYLSMU	Insects	No	Yes (Mandelshtam et al., 2018; Wood & Bright, 1992)	Not assessed	No
37	*Corthylus columbianus* as Scolytinae spp. (non-European)	CORHCL	Insects	Yes	Yes (Atkinson et al., 1991; Wood & Bright, 1992)	Yes	Yes
38	*Corthylus punctatissimus* as Scolytinae spp. (non-European)	CORHPU	Insects	Yes	Yes (Cognato et al., 2009; Wood & Bright, 1992)	No	No
39	*Cryptocarenus seriatus* as Scolytinae spp. (non-European)	CRPCSE	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
40	*Cyclorhipidion pelliculosum* as Scolytinae spp. (non-European)	XYLBPL	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
41	*Dryocoetes aceris* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
42	*Dryocoetes padi* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No

(Continues)

TABLE 4 (Continued)

No.	Pest name according to EU legislation[a]	EPPO code	Group	Pest present in Canada	*Acer* confirmed as a host (reference)	Pest can be associated with the commodity[b]	Pest relevant for the Opinion
43	*Dryocoetes picipennis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
44	*Dryocoetes ussuriensis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
45	*Dryoxylon onoharaense* as Scolytinae spp. (non-European)	DRYXON	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
46	*Euwallacea interjectus* as Scolytinae spp. (non-European)	XYLBIN	Insects	No	Yes (EPPO, 2020)	Not assessed	No
47	*Euwallacea validus* as Scolytinae spp. (non-European)	XYLBVA	Insects	Yes	Yes (EPPO, 2020; Wood & Bright, 1992)	Yes	Yes
48	*Euwallacea velatus* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
49	*Gnathotrichus retusus* as Scolytinae spp. (non-European)	GNAHRE	Insects	Yes	Yes (Peterson et al., 1999)	No	No
50	*Heteroborips seriatus* as Scolytinae spp. (non-European)	XYLBSE	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
51	*Hylocurus rudis* as Scolytinae spp. (non-European)	–	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
52	*Hyorrhynchus lewisi* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
53	*Hypothenemus atomus* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
54	*Hypothenemus birmanus* as Scolytinae spp. (non-European)	HYOTBI	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
55	*Hypothenemus brunneus* as Scolytinae spp. (non-European)	HYOTBR	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
56	*Hypothenemus californicus* as Scolytinae spp. (non-European)	HYOTCA	Insects	No	Yes (DiGirolomo et al., 2022)	Not assessed	No
57	*Hypothenemus dissimilis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
58	*Hypothenemus interstitialis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
59	*Hypothenemus javanus* as Scolytinae spp. (non-European)	HYOTJA	Insects	No	Yes (Atkinson, 2024)	Not assessed	No
60	*Hypothenemus piaparolinae* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Johnson et al., 2016)	Not assessed	No

TABLE 4 (Continued)

No.	Pest name according to EU legislation[a]	EPPO code	Group	Pest present in Canada	*Acer* confirmed as a host (reference)	Pest can be associated with the commodity[b]	Pest relevant for the Opinion
61	*Indocryphalus aceris* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
62	*Lymantor decipiens* as Scolytinae spp. (non-European)	–	Insects	Yes	Yes (Wood & Bright, 1992)	No	No
63	*Monarthrum fasciatum* as Scolytinae spp. (non-European)	MNTHFA	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
64	*Monarthrum mali* as Scolytinae spp. (non-European)	MNTHMA	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
65	*Neopteleobius scutulatus* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
66	*Pityophthorus lautus* as Scolytinae spp. (non-European)	PITOLA	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
67	*Procryphalus utahensis* as Scolytinae spp. (non-European)	–	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
68	*Scolytus tadzhikistanicus* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
69	*Taphrorychus lenkoranus* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
70	*Taphrorychus mikuniyamensis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
71	*Thysanoes fimbricornis* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
72	*Xyleborus aquilus* as Scolytinae spp. (non-European)	XYLBAQ	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
73	*Xyleborus ferrugineus* as Scolytinae spp. (non-European)	XYLBFE	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
74	*Xyleborus praevius* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
75	*Xylosandrus amputatus* as Scolytinae spp. (non-European)	XYLSAM	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No
76	*Xyloterinus politus* as Scolytinae spp. (non-European)	XYORPO	Insects	Yes	Yes (Wood & Bright, 1992)	Yes	Yes
77	*Xylosandrus zimmermanni* as Scolytinae spp. (non-European)	–	Insects	No	Yes (Wood & Bright, 1992)	Not assessed	No

[a]Commission Implementing Regulation (EU) 2019/2072.

[b]Only ambrosia and bark beetles associated with stems used for veneer production were retained.

4.2 | Selection of other relevant pests (non-regulated in the EU) associated with the commodity

The information provided by Canada, integrated with the search performed by EFSA, was evaluated in order to assess whether there are other relevant pests potentially associated with the commodity species present in the country of export. For these potential pests that are non-regulated in the EU, pest risk assessment information on the probability of entry, establishment, spread and impact is usually lacking. Therefore, these pests were also evaluated to determine their relevance for this Opinion based on evidence that:

a. the pest is present in Canada;
b. the pest is (i) absent or (ii) has a limited distribution in the EU;
c. commodity species is a host of the pest;
d. one or more life stages of the pest can be associated with logs to be used for veneer production;
e. the pest may have an impact in the EU.

For non-regulated species present in Canada and with a limited distribution in the EU (i.e. present in one or a few EU MSs) and fulfilling the other criteria (i.e. c, d and e), either one of the following conditions should be additionally fulfilled for the pest to be further evaluated:

- official phytosanitary measures have been adopted in at least one EU MS;
- any other reason justified by the panel (e.g. recent evidence of presence).

Pests that fulfilled the above listed criteria were selected for further evaluation.

Based on the information collected, 2108 non-regulated potential pests known to be associated with the commodity species were evaluated for their relevance to this Opinion. Species were excluded from further evaluation when at least one of the conditions listed above (a–e) was not met. Details can be found in Appendix H (Microsoft Excel® file). Of the evaluated EU non-quarantine pests, 34 pests (*Acarosporina microspora, Anelaphus pumilus, Annulohypoxylon truncatum, Anthophylax attenuatus, Armillaria calvescens, Armillaria gemina, Armillaria nabsnona, Armillaria sinapina, Astylopsis macula, Bellamira scalaris, Biscogniauxia atropunctata, Bondarzewia berkeleyi, Brachyleptura rubrica, Camillea tinctor, Catunica adiposa, Centrodera decolorata, Chrysobothris femorata, Chrysobothris mali, Clytus ruricola, Cylindrobasidium corrugum, Dicerca divaricata, Ecyrus dasycerus, Glycobius speciosus, Jamesreidia tenella, Meganotus everhartii, Parelaphidion incertum, Perenniporia fraxinophila, Pidonia ruficollis, Prionoxystus robiniae, Rigidonotus glomeratus, Sternidius misellus, Strangalepta abbreviata, Trigonarthris proxima, Typocerus deceptus*) were selected for further evaluation because it met all of the selection criteria. More information on these pests can be found in the pest datasheets (Appendix A).

4.3 | Summary of pests selected for further evaluation

Fifty-one pests satisfying all the relevant criteria listed above in Sections 4.1 and 4.2 are included in Table 5. The effectiveness of the different phases of the system approach as well as the system approach as a whole was evaluated for these selected pests.

TABLE 5 List of relevant pests selected for further evaluation.

Number	Current scientific name	EPPO code	Name used in the EU legislation	Taxonomic information	Group	Regulatory status
1	*Acarosporina microspora*	–	–	Ostropales Stictidaceae	Fungi	Not regulated in the EU
2	*Anelaphus pumilus*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
3	*Anisandrus obesus*	ANIDOB	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
4	*Anisandrus sayi*	ANIDSA	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
5	*Annulohypoxylon truncatum*	–	–	Xylariales Hypoxylaceae	Fungi	Not regulated in the EU

TABLE 5 (Continued)

Number	Current scientific name	EPPO code	Name used in the EU legislation	Taxonomic information	Group	Regulatory status
6	*Anthophylax attenuatus*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
7	*Armillaria calvescens*	–	–	Agaricales Physalacriaceae	Fungi	Not regulated in the EU
8	*Armillaria gemina*	–	–	Agaricales Physalacriaceae	Fungi	Not regulated in the EU
9	*Armillaria nabsnona*	–	–	Agaricales Physalacriaceae	Fungi	Not regulated in the EU
10	*Armillaria sinapina*	ARMLSI	–	Agaricales Physalacriaceae	Fungi	Not regulated in the EU
11	*Arrhenodes minutus*	ARRHMI	*Arrhenodes minutus* Drury	Coleoptera Brentidae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
12	*Astylopsis macula*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
13	*Bellamira scalaris*	STRLSC	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
14	*Biscogniauxia atropunctata*	HYPOAT	–	Xylariales Graphostromataceae	Fungi	Not regulated in the EU
15	*Bondarzewia berkeleyi*	–	–	Russulales Bondarzewiaceae	Fungi	Not regulated in the EU
16	*Brachyleptura rubrica*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
17	*Camillea tinctor*	–	–	Xylariales Graphostromataceae	Fungi	Not regulated in the EU
18	*Catunica adiposa*	CERAAD	–	Microascales Ceratocystidaceae	Fungi	Not regulated in the EU
19	*Centrodera decolorata*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
20	*Chrysobothris femorata*	CHRBFE	–	Coleoptera Buprestidae	Insects	Not regulated in the EU
21	*Chrysobothris mali*	CHRBMA	–	Coleoptera Buprestidae	Insects	Not regulated in the EU
22	*Clytus ruricola*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
23	*Corthylus columbianus*	CORHCL	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
24	*Cryphonectria parasitica*	ENDOPA	*Cryphonectria parasitica* (Murrill) Barr.	Diaporthales Cryphonectriaceae	Fungi	EU Protected Zone quarantine pest according to Commission Implementing Regulation (EU) 2019/2072
25	*Cylindrobasidium corrugum*	–	–	Agaricales Physalacriaceae	Fungi	Not regulated in the EU
26	*Davidsoniella virescens*	CERAVI	*Davidsoniella virescens* (R.W. Davidson) Z.W. de Beer, T.A. Duong & M.J. Wingfield	Microascales Ceratocystidaceae	Fungi	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
27	*Dicerca divaricata*	DICCDI	–	Coleoptera Buprestidae	Insects	Not regulated in the EU
28	*Ecyrus dasycerus*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU

(Continues)

TABLE 5 (Continued)

Number	Current scientific name	EPPO code	Name used in the EU legislation	Taxonomic information	Group	Regulatory status
29	*Entoleuca mammata*	HYPOMA	*Entoleuca mammata* (Wahlenb.) Rogers and Ju	Xylariales Xylariaceae	Fungi	EU Protected Zone quarantine pest according to Commission Implementing Regulation (EU) 2019/2072
30	*Euwallacea validus*	XYLBVA	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
31	*Glycobius speciosus*	GLYOSE	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
32	*Hylocurus rudis*	–	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
33	*Jamesreidia tenella*	–	–	Microascales Ceratocystidaceae	Fungi	Not regulated in the EU
34	*Meganotus everhartii*	–	–	Hymenochaetales Hymenochaetaceae	Fungi	Not regulated in the EU
35	*Monarthrum fasciatum*	MNTHFA	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
36	*Monarthrum mali*	MNTHMA	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
37	*Parelaphidion incertum*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
38	*Perenniporia fraxinophila*	–	–	Polyporales Polyporaceae	Fungi	Not regulated in the EU
39	*Phytophthora ramorum*	PHYTRA	*Phytophthora ramorum* (non-EU isolates)	Peronosporales Peronosporaceae	Oomycetes	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
40	*Pidonia ruficollis*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
41	*Pityophthorus lautus*	PITOLA	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
42	*Prionoxystus robiniae*	PRIXRO	–	Lepidoptera Cossidae	Insects	Not regulated in the EU
43	*Procryphalus utahensis*	–	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
44	*Rigidonotus glomeratus*	–	–	Hymenochaetales Hymenochaetaceae	Fungi	Not regulated in the EU
45	*Sternidius misellus*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
46	*Strangalepta abbreviata*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU

TABLE 5 (Continued)

Number	Current scientific name	EPPO code	Name used in the EU legislation	Taxonomic information	Group	Regulatory status
47	*Trigonarthris proxima*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
48	*Typocerus deceptus*	–	–	Coleoptera Cerambycidae	Insects	Not regulated in the EU
49	*Xyleborus ferrugineus*	XYLBFE	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
50	*Xylella fastidiosa*	XYLEFA	*Xylella fastidiosa* (Wells et al.)	Lysobacterales Lysobacteraceae	Bacteria	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072
51	*Xyloterinus politus*	XYORPO	Scolytinae spp. (non-European)	Coleoptera Curculionidae Scolytinae	Insects	EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072

5 | THE PESTS HIGHLIGHTED BY THE EUROPEAN COMMISSION

5.1 | *Davidsoniella virescens*

A pest categorisation opinion on *D. virescens* was published by EFSA (EFSA PLH Panel, 2017a).

5.1.1 | Taxonomy

Davidsoniella virescens is a fungus belonging to the phylum: Ascomycota; order: Microascales; and family: Ceratocystidaceae.

The synonyms are *Ceratocystis virescens*, *Endoconidiophora virescens* and *Ophiostoma virescens* (Index Fungorum, 2024).

Davidsoniella virescens was previously reported as *Ceratocystis coerulescens* (current name: *Endoconidiophora coerulescens*) by many authors including Hunt (1956), even though Davidson (1944) originally described the species and distinguished it from *C. coerulescens*. Now, *D. virescens* and *E. coerulescens* are accepted as distinct and separate species based on number of different characteristics (Webber, 2008): (a) morphological and molecular differences (Davidson, 1944; Witthuhn et al., 1998, 2000); (b) different host range – *E. coerulescens* infects conifers (Gibbs, 1993); (c) metabolite production (Davidson, 1944); and (d) isozyme variation (Harrington et al., 1996). The separateness of the two species was confirmed by Witthuhn et al. (1998).

The English common names of *D. virescens* are sapstreak disease of maple and sapstreak disease of sugar maple.

5.1.2 | Origin and distribution

The pathogen is native to North America and was reported for the first time in 1935 infecting *Acer saccharum* in North Carolina (Hepting, 1944; Kessler, 1972). It is present in the USA and Canada (EPPO, 2024b).

In the USA, the pathogen was reported in states of Michigan (Kessler Jr & Anderson, 1960; Kessler, 1972; Richter, 2012), New York (Beil & Kessler, 1979; Houston, 1994), North Carolina (Hepting, 1944; Roth et al., 1959; Kessler, 1972), Vermont (Kessler, 1972), Tennessee (Kessler, 1972; Roth et al., 1959) and Wisconsin (Kessler, 1972).

5.1.2.1 | *Presence, distribution and prevalence of the pathogen in Canada*

Davidsoniella virescens is reported from Canada (Ginns, 1986 citing Griffin, 1968; Griffin, 1968; CABI, 2024a, 2024b; EPPO, 2024b, 2024c), from provinces of Manitoba (Olchowecki, 1972; Olchowecki & Reid, 1974; Ginns, 1986 citing Olchowecki & Reid, 1974; CABI, 2024b) and Ontario (Griffin, 1968; Ginns, 1986; CABI, 2024a; EPPO, 2024b, 2024c).

Griffin (1968) states that there was only one record of the pathogen in Ontario, in the Forest District 18 on *Acer saccharum*.

According to Olchowecki (1972), *C. coerulescens* was found in Manitoba on *Picea mariana*, as a single record. This record most probably refers to the fungus with a current name of *Endoconidiophora coerulescens*, because it was found on a conifer tree.

The applicant confirmed after our request: 'There are no official pest free areas of *Davidsoniella virescens*, so logs of *Acer* can come from areas where *D. virescens* is present' (Dossier Section 2.1).

In addition, according to the Dossier Section 2.1, no surveys are conducted for *D. virescens*.

5.1.3 | Biology

There is a limited knowledge on the biology of *D. virescens*.

Davidsoniella virescens causes a vascular xylem disease (Houston, 1994). It has two types of spores: (1) endoconidia (asexual) and (2) ascospores (sexual) (Davidson, 1944). The fungus enters the tree mainly through wounds on the base of trunk or roots (Kessler, 1972), which could be caused by human activities such as logging, road building and sap hauling. The disease rarely occurs in non-wounded trees, by entering the tree through root-graft transmission. Moreover, there were no observed cases of infection through broken branches or other wounds of upper crowns or stems (Houston, 1994). The inoculum is believed to be brought to wounds by sap-feeding insects (Sinclair & Lyon, 2005). The fungus spreads rapidly in the sapwood, where it develops water-soaked lesions in the lower trunk and the roots (Kessler, 1972; Hepting, 1944; Houston, 1994). Sometimes it also extends to the cambium (Hepting, 1944; Ohman & Spike, 1966). *Acer saccharum* is most susceptible to infection during late spring to midsummer (Houston, 1994).

Maple trees dying from *D. virescens* were found associated with other fungal species such as *Armillaria mellea*, *Armillaria* sp., *Ustulina vulgaris* and *Xylaria* sp., which colonise roots (Hepting, 1944; Houston, 1994). Moreover, often also ambrosia beetles attacked the diseased trees near the buttress roots and lower bole, but occasionally, also higher up the stems (Houston, 1994).

5.1.3.1 | *Ability to create resting propagules*

There is no indication that the fungus can create resting propagules or chlamydospores.

5.1.3.2 | *Information on the temperature and humidity of survival*

There is no information regarding lethal temperatures and humidity for this pathogen.

Some information on the effect of different temperatures can be found on different *Ceratocystis* species which are phylogenetically related to *D. virescens*, see Appendix D.

5.1.4 | Host range and host status of *Acer*

Davidsoniella virescens was reported to be pathogenic and saprophytic on different plant species. Harrington et al. (1998) detected that these two groups are different based on fingerprint nuclear markers.

Davidsoniella virescens was found pathogenic on *Acer saccharum* (Hepting, 1944) and *Liriodendron tulipifera* (Kessler, 1972; Roth et al., 1959). There are two other reports on *Acer saccharinum* from state of New York (Langham, 1994) and *A. rubrum* from unknown location (Kehr et al., 2004; Sinclair & Lyon, 2005). However, there is no additional evidence of damage on these plant species.

According to Kessler (1972), the fungus often grows as saprophyte on cut logs and stumps. *Davidsoniella virescens* was found on green sapwood of hardwood logs and lumber of *Fagus grandifolia*, *Liquidambar styraciflua*, *Magnolia* sp., *Nyssa aquatica* and *Quercus* spp. (Davidson, 1944). It was also reported on *F. grandifolia* subsp. *grandifolia* (as *Fagus americana*), *Quercus robur* (Van Wyk et al., 2011), on logs of *Betula papyrifera* (Shigo, 1962) and on *Betula alleghaniensis* (Sinclair & Lyon, 2005).

5.1.5 | Symptoms

Symptoms on *Acer saccharum* are dwarfing of leaves in the crown (about half of the normal leaf size), paler leaves, dieback of branches, reddish or grey radial streaks and water-soaked areas in the wood of the lower stem and roots (Kessler, 1972; Hepting, 1944; Houston, 1994). Stained wood has wide radial streaks from the inner sapwood into the outer sapwood, sometimes to the cambium (Hepting, 1944; Ohman & Spike, 1966). Infected freshly cut wood has yellow-green stains which quickly change first into dark brown and eventually into light brown stains (Houston, 1986). No specific information on the presence of asymptomatic plants was found. However, foliar and branch symptoms may appear 1–6 years after infection (EFSA PLH Panel, 2017a; Sinclair & Lyon, 2005).

Different wood moisture content influences creation of stains by *D. virescens* (Campbell, 1959). The infected *Acer* tree usually dies after 2–8 years, in some cases even suddenly (Hepting, 1944; Houston, 1994; Kessler, 1972). It was observed by Houston (1994) that after experimental inoculation of *D. virescens*, only few saplings of *A. saccharum* had died after 2 months. Some diseased trees in state of New York recovered with no further disease progression. This could be explained by the absence of associated root disease pathogens such as *Armillaria* sp. and *Xylaria* sp. (Houston, 1994).

Healthy wood of *A. saccharum* has normally pH around 5.5. Instead, pH from an infected wood from a water-soaked area was 8.5 or higher (Hepting, 1944).

The fungus produces a distinctive musty odour on lumber and in culture (Davidson, 1944).

5.1.6 | Impact

Davidsoniella virescens causes a fatal disease to *Acer saccharum* in the USA, the infected trees in most cases do not recover and die within 2–8 years. Moreover, the strained wood has a low value for the wood industry (Kessler, 1972; Hepting, 1944; Houston, 1994). According to Ohman and Spike (1966), log/lumber value of infected logs that had heavy stain extending to the cambium was reduced by 32%–57% based on the 1966 prices.

5.1.7 | Pathway of entry with veneer sheets

Possible pathways of entry for *D. virescens* are susceptible wood (EFSA PLH Panel, 2017a; Webber, 2008) and wood products (Webber, 2008).

Experiments by Houston (1986) have shown that *D. virescens* can survive in infected wood for several months. The pathogen was occasionally isolated from air-dried felled wood (cut into boards) after 2 months (with moisture content of about 20%) from surface mycelium and after 5 months (with moisture content below 15%) from stained wood.

The pathogen can enter trees selected for veneer production through wounds on the base of trunk or roots caused by logging. The infected trees are then felled. The stains in the freshly cut tree may not be clearly visible particularly at early stage of infections and the infected log will be further processed for the veneer production. Potentially, *D. virescens* can survive the veneer production process and entry the EU with veneer sheets. However, there are no data on the survival of *D. virescens* in veneer sheets (in processed wood).

5.2 | *Phytophthora ramorum*

5.2.1 | Taxonomy

Phytophthora ramorum is an oomycete, belonging to the Phylum: Oomycota, Order: Peronosporales and Family: Peronosporaceae.

There are no synonyms of *P. ramorum* according to Index Fungorum (2024).

The English common names of *P. ramorum* are sudden oak death, Ramorum bleeding canker, Ramorum dieback and Ramorum blight.

5.2.2 | Origin and distribution

Phytophthora ramorum was described for the first time by Werres et al. (2001) from infected plants of *Rhododendron* and *Viburnum* coming from Germany and the Netherlands between years 1993 and 1999.

The pathogen is reported from Asia (Japan, Vietnam), Europe (Belgium, Croatia, Denmark, Finland, France, Germany, Guernsey, Ireland, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovenia, Switzerland and the UK), North America (Canada, the USA) and South America (Argentina) (EPPO, 2024d) and it is most probably native to East Asia (Poimala & Lilja, 2013; Jung et al., 2021).

5.2.2.1 | *Presence, distribution and prevalence of the pathogen in Canada*

Phytophthora ramorum is a quarantine pest of Canada (CFIA, 2024a; EPPO, 2024e). Host plant species are regulated based on their susceptibility to *P. ramorum* (CFIA, 2024b).

The presence of *P. ramorom* in Canada was first confirmed on *Rhododendron* plants in a nursery in British Columbia in June 2003 (Sabaratnam, 2021). Since then, annual surveys have taken place each year for different provinces (mainly British Columbia, Ontario and Quebec). The pathogen was detected in a number of nurseries/sites in British Columbia (south mainland, Vancouver Island). When *P. ramorum* was detected, the nurseries/sites were placed under quarantine and all infected plant material was destroyed. Trace forward and trace back investigations were conducted to eliminate the organism from the plants for planting pathway (CFIA, 2024c; Shamoun et al., 2018). It is worth noted that *P. ramorum* has never been found in forests or wildland in Canada (Sansford et al., 2009; Shamoun et al., 2018).

During the last survey carried out in 2022–2023, 36 provinces (23 in British Columbia, 12 in Ontario and 1 in Quebec) were examined for *P. ramorum* by visual inspections followed by laboratory analyses. *P. ramorum* was detected in one nursery in British Columbia. Regulatory measures have been implemented at the infested nursery and eradication protocols were initiated (CFIA, 2024d). Summary of other surveys conducted in Canada throughout the years can be found in Table 6.

According to EPPO (2024f), the pathogen is present in Canada with few occurrences in British Columbia. Applicant country states that '*Phytophtora ramorum* is occasionally detected in nurseries in British Columbia only but is absent in the wild. Immediate eradication is carried out following each detection' (Dossier Section 2.1).

Phytophtora ramorum isolated from Canadian nurseries was mainly of NA2 clonal lineage (75%), followed by EU1 lineage and NA1 lineage (Goss et al., 2011).

TABLE 6 Results of surveys for *P. ramorum* in Canadian provinces from 2006 till 2023.

Survey year	Provinces surveyed (number of sites)	Results for *P. ramorum*	Source
2006	BC (40), NB (7), NS (9), ON (86), PE (12), QC (26)	BC: found in 3 retail garden centres, on plants: *Rhododendron* 'Catawbiense Boursault', 2 *Rhododendron* spp., *Hamamelis* 'Diane' and *Viburnum bodnantense* 'Dawn'	CFIA (2024e)
2007	BC (213), NB (6), NL (3), NS (9), ON (90), PE (12), QC (33)	BC: found in 9 retail and wholesale nurseries, on plants: *Kalmia latifolia* 'Ostbo Red', *Magnolia grandiflora* 'TeddyBear', *Rhododendron* spp., *Gaultheria shallon*, *Dryopteris* spp., *Physocarpus* spp., *Syringa vulgaris* 'MichaelBuchner', *Vaccinium parviflorum* and *Viburnum tinus*	CFIA (2024e)
2008	BC (60), NB (19), NL (5), NS (8), ON (96), PE (12), QC (34)	BC: found in 9 retail nurseries and 12 landscape sites (no additional information provided about landscape sites)	CFIA (2024e)
2009	BC (57 + 73), NB (13), NL (3), NS (14), ON (95), PE (10), QC (37)	BC: found in 3 nurseries	CFIA (2024f)
2010–2011	BC (77), NB (16), NL (1), NS (5), ON (78), PE (7), QC (38)	BC: found in 4 nurseries (Vancouver Island and in lower mainland)	CFIA (2024f)
2011–2012	BC (24), ON (37), QC (5)	No detection	CFIA (2024f)
2012–2013	BC (25), NS (1), ON (45), QC (3)	BC: found in 1 nursery (Vancouver Island)	CFIA (2024f)
2013–2014	BC (23), NS (1), ON (35), QC (3)	No detection	CFIA (2024f)
2014–2015	BC (136), NS (1), ON (41), QC (3)	BC: found in 9 nurseries (Vancouver Island and in lower mainland)	CFIA (2024f)
2015–2016	BC (41), NS (1), ON (29), QC (3)	BC: found in 1 nursery (Abbotsford)	CFIA (2024f)
2016–2017	BC (20), NS (1), ON (28), QC (3)	BC: found in 1 nursery (Richmond)	CFIA (2024f)
2018–2019	BC (?), NS (?), ON (?), QC (?)	BC: found in Abbotsford	CFIA (2024g)
2019–2020	BC (?), ON (?), QC (?)	BC: found in Aldergrove, Chilliwack and Saanichton	CFIA (2024g)
2020–2021	BC (?), ON (?)	No detection	CFIA (2024g)
2021–2022	BC (28), ON (23), QC (2)	BC: found in 1 nursery	CFIA (2024g)
2022–2023	BC (23), ON (12), QC (1)	BC: found in 1 nursery	CFIA (2024g)

Abbreviations: (?), no information provided; BC, British Columbia; NB, New Brunswick; NL, Newfoundland and Labrador; NS, Nova Scotia; ON, Ontario; PE, Prince Edward Island; QC, Quebec.

5.2.3 | Biology

Phytophthora ramorum has 12 known lineages: NA1 and NA2 from North America, EU1 from Europe (including the UK) and North America (Grünwald et al., 2009), EU2 from Northern Ireland and western Scotland (Van Poucke et al., 2012), IC1 to IC5 from Vietnam and NP1 to NP3 from Japan (Jung et al., 2021).

Phytophthora ramorum is heterothallic oomycete species belonging to clade 8c (Blair et al., 2008) with two mating types: A1 and A2 (Boutet et al., 2010).

Phytophthora species generally reproduce through a) dormant (resting) spores which can be either sexual (oospores) or asexual (chlamydospores); and b) fruiting structures (sporangia) which contain zoospores (Erwin & Ribeiro, 1996).

Phytophthora ramorum produces sporangia on the surfaces of infected leaves and twigs of host plants. These sporangia can be splash-dispersed a short distance or carried by wind and rain over longer distances. The sporangia germinate to produce zoospores that penetrate and initiate an infection on new hosts. In infected plant material, the chlamydospores are produced and can serve as resting structures (Davidson et al., 2005; Grünwald et al., 2008). Trunk cankers (e.g. on *Quercus*) are not known to support sporulation and therefore do not transmit the pathogen (DEFRA, 2008). The pathogen is also able to survive in soil (Shishkoff, 2007). In the west of Scotland, it persisted in soil for at least 2 years after its hosts were removed (Elliot et al., 2013). Oospores were only observed in pairing tests under controlled laboratory conditions (Brasier & Kirk, 2004). Optimal temperatures under laboratory conditions were 16–26°C for growth, 14–26°C for chlamydospore production and 16–22°C for sporangia production (Englander et al., 2006).

Phytophthora ramorum is mainly a foliar pathogen; however, it was also reported to infect shoots, stems and occasionally roots of various host plants (Grünwald et al., 2008; Parke & Lewis, 2007). According to Brown and Brasier (2007), *P. ramorum* commonly occupies xylem beneath phloem lesions and may spread within xylem and possibly recolonise the phloem from the xylem. *Phytophthora ramorum* can remain viable within xylem for two or more years after the overlying phloem had been excised.

Phytophthora ramorum can disperse by aerial dissemination, water, movement of infested plant material and soil containing propagules on footwear, tires of trucks and mountain bikes or the feet of animals (Brasier, 2008; Davidson et al., 2002).

Infected foliar hosts can be a major source of inoculum, which can lead to secondary infections on nearby host plants. Important foliar hosts in Europe are *Rhododendron* spp. and *Larix kaempferi* (Brasier & Webber, 2010; Grünwald et al., 2008). In North America, the key foliar hosts are *Umbellularia californica* and *Lithocarpus densiflorus* (Grünwald et al., 2008).

5.2.3.1 | *Ability to create resting propagules*

Oospores and chlamydospores can serve as resting spores (Davidson et al., 2005). However, oospores of *P. ramorum* were only observed under laboratory conditions (Brasier & Kirk, 2004).

5.2.3.2 | *Information on the temperature and humidity of survival*

All the evidence for survival/mortality of *P. ramorum* based on exposure to different temperatures can be found in Appendix D.

5.2.4 | Host range

Phytophthora ramorum has a very wide host range, which is expanding.

Main host plants include *Kalmia* spp., *Larix decidua*, *L. kaempferi*, *Pieris* spp., *Rhododendron* spp., *Syringa vulgaris*, *Viburnum* spp. and the North American trees species, *Notholithocarpus densiflorus* (=*Lithocarpus densiflorus*) and *Quercus agrifolia* (EPPO, 2024g).

Proven hosts of *P. ramorum* based on Koch's postulates are *Abies grandis*, *A. magnifica*, *Acer circinatum*, *A. macrophyllum*, *A. pseudoplatanus*, *Adiantum aleuticum*, *Adiantum jordanii*, *Aesculus californica*, *A. hippocastanum*, *Arbutus menziesii*, *A. unedo*, *Arctostaphylos columbiana*, *A. glauca*, *A. hooveri*, *A. manzanita*, *A. montereyensis*, *A. morroensis*, *A. pilosula*, *A. pumila*, *A. silvicola*, *A. viridissima*, *Berberis aquifolium* (≡*Mahonia aquifolium*), *Calluna vulgaris*, *Camellia* spp., *Castanea sativa*, *Ceanothus thyrsiflorus*, *Chamaecyparis lawsoniana*, *Chrysolepis chrysophylla*, *Cinnamomum camphora*, *Corylus cornuta*, *Fagus sylvatica*, *Frangula californica* (=*Rhamnus californica*), *F. purshiana* (=*Rhamnus purshiana*), *Fraxinus excelsior*, *Gaultheria procumbens*, *G. shallon*, *Griselinia littoralis*, *Hamamelis virginiana*, *Heteromeles arbutifolia*, *Larix × eurolepis*, *Laurus nobilis*, *Lonicera hispidula*, *Lophostemon confertus*, *Loropetalum chinense*, *Magnolia × loebneri*, *M. doltsopa* (≡*Michelia doltsopa*), *M. stellata*, *Maianthemum racemosum* (=*Smilacina racemosa*), *Parrotia persica*, *Phoradendron serotinum* subsp. *macrophyllum*, *Photinia × fraseri*, *Prunus laurocerasus*, *Pseudotsuga menziesii* var. *menziesii*, *Quercus cerris*, *Q. chrysolepis*, *Q. falcata*, *Q. ilex*, *Q. kelloggii*, *Q. parvula* var. *shrevei*, *Rosa gymnocarpa*, *Salix caprea*, *Sequoia sempervirens*,*Taxus baccata*, *Trientalis latifolia*, *Umbellularia californica*, *Vaccinium myrtillus*, *Vaccinium parvifolium*, *Vaccinium ovatum*, *Vinca minor* (APHIS USDA, 2022; Cave et al., 2008) and *Cornus capitata* (Belisle et al., 2024).

There are many other plants associated with *P. ramorum* which are found to be naturally infected (APHIS USDA, 2022; Cave et al., 2008).

5.2.4.1 | *Host status of Acer*

Proven maple hosts of *P. ramorum* are *Acer circinatum* (DiLeo et al., 2008), *A. macrophyllum* (Garbelotto et al., 2003), and *A. pseudoplatanus* (COMTF, 2006a).

Other maple species found associated with *P. ramorum* are *A. davidii* (COMTF, 2006b) and *A. laevigatum* (Cave et al., 2008).

5.2.5 | Symptoms

Phytophthora ramorum causes different types of symptoms depending on the host species and the plant tissue infected. According to DEFRA (2008) *P. ramorum* causes three different types of disease:

a. 'Ramorum bleeding canker' – cankers on trunks of trees, which emit a dark ooze. As they increase in size they can lead to tree death.
b. 'Ramorum leaf blight' – infection of the foliage, leading to discoloured lesions on the leaves.
c. 'Ramorum dieback' – shoot and bud infections which result in wilting, discolouration and dying back of affected parts.

Plants can be without above-ground symptoms for months (if roots are infected by *P. ramorum*) until developmental or environmental factors trigger disease expression (Roubtsova & Bostock, 2009; Thompson et al., 2021).

Acer macrophyllum is affected by discoloration of leaves ranging from orange to brown colour, which normally starts from the leaf edges (Davidson et al., 2003). According to Garbelotto et al. (2003), *P. ramorum* appears to be primarily a leaf pathogen with very limited stem infection on *A. macrophyllum*. Moreover, petiole necrosis was observed on *A. macrophyllum* (DiLeo et al., 2008).

On *Acer pseudoplatanus*, *P. ramorum* has been isolated from bleeding bark lesions (Brown & Brasier, 2007). In an inoculation experiment with *P. ramorum*, low levels of necrosis on leaves were observed on this host species (Denman et al., 2005).

Observed symptoms on *A. circinatum* were dark necrotic lesions and water-soaked patches along leaf margins and petiole necrosis (DiLeo et al., 2008).

5.2.6 | Impact

Phytophthora ramorum caused rapid decline of *Notholithocarpus densiflorus* (=*Lithocarpus densiflorus*) and *Quercus agrifolia* in forests of California and Oregon (Rizzo et al., 2005) and *Larix kaempferi* in plantations of south-west England (Brasier & Webber, 2010).

5.2.7 | Pathway of entry with veneer sheets

One possible pathway of entry for *P. ramorum* according to Sundheim et al. (2009), EFSA PLH Panel (2011) and Thomsen et al. (2023) is susceptible wood.

Bark infections by *P. ramorum* have been reported on *Acer* spp. and infected logs originating from areas where the pathogen is present could enter the veneer production process. *P. ramorum* is able to colonise the xylem that underlies infected bark. Both hyphae and chlamydospores can be found in such tissue (Brown & Brasier, 2007; Parke et al., 2008). Debarking and rounding would therefore not be sufficient to eliminate the pathogen. No specific information on the survival of *P. ramorum* during the veneer production is available. Although very unlikely, survival of some inoculum cannot be excluded, and the pathogen could potentially enter the EU with veneer sheets.

6 | EVALUATION OF THE SYSTEMS APPROACH PROPOSED BY THE APPLICANT

The applicant proposed to combine different measures during the production process to be combined in a systems approach (see Sections 2.2.2 and 3). The different phases in the production of veneer sheets are evaluated below with regard to their potential to mitigate the pest risk. A combination of the measures is considered in the EKE as a systems approach.

6.1 | Risk mitigation of different steps in the production of veneer sheets

6.1.1 | Selection of trees in the forest

Trees are selected based on the highest quality criteria (straight, free of major defects, free from pest damage, no rot). Selective harvesting is preformed and receiving inspection is performed at site to validate veneer log criteria such as freedom from defects and rot. Further details on the selection of trees is provided in Section 3.3.1.

The selection of trees without visible symptoms will reduce the likelihood that infected/infested trees are entering the veneer production process. However, low levels of infections may be overlooked and some pests, such as wood rot fungi, may be present asymptomatically. Similarly, low levels of infestations by ambrosia and bark beetles as well as other wood-boring insects may be difficult to detect.

6.1.2 | Water bath

The logs are heated for prolonged time in a water bath until the core temperature reaches 50°C (for details, see Section 3.3.2). The temperature range inside the logs was estimated as 50°C and above for at least 22 min up to 26 h. The temperature range in the outer wood (5 cm from the surface) was estimated as 50°C and above for at least 22 min up to 60 h and up to 60°C for at least 5 h (for details, see Appendix E).

This heat treatment of logs is expected to be fully effective against all the pests, which are known to be killed by temperatures of 50°C and below (e.g. *Xylella fastidiosa*). To reach a core temperature of 50°C, the temperature of the water bath depends on the season and on the size of the logs (see Section 3.3.2). As a result, pests associated with the bark and outer sapwood are exposed to higher temperature and are more likely to be killed than those that may be present deeper inside the logs (e.g. wood rot fungi, ambrosia beetles).

6.1.3 | Debarking and rounding

The debarking and rounding of logs remove fully the bark and 3–10 mm of the outer sapwood.

This phase will be effective against canker-causing fungi as it removes all bark infections. It will only be partially effective against fungi present in the sapwood as only the outer sapwood is removed. Debarking and rounding most likely will remove all larvae and eggs of wood boring insects. This phase will not be effective against fungi and insects, which are located deeper inside the logs (e.g. wood rot fungi, ambrosia beetles).

6.1.4 | Cutting of veneer

Rotary cutting of round wood sections result in thin veneer sheets. In the current opinion, cutting of logs into veneer sheets of 0.7 mm and 6 mm thickness is evaluated.

This phase is highly effective against insect pests, none of which are expected to survive the cutting into veneer sheets of 0.7 mm thickness. However, smaller insects, such as ambrosia beetles, could survive the cutting into 6 mm thin veneer sheets. Cutting of veneer does not affect the survival of fungal pathogens. This step may only remove some heart rot as the central part of the log is not used for veneer production.

6.1.5 | High heat drying of veneer sheets

The veneer sheets are dried to a moisture content of 8%–12% at temperatures of 90–125°C for 90–120 s (for details, see Section 3.3.2). The temperature reached inside veneer sheets of a thickness of 0.7 mm and 6 mm was estimated to be in the range of 90–110°C and 70–92°C, respectively (details see Appendix E).

This phase is expected to be highly effective against most pests. However, some surviving pests cannot be excluded as detailed information on thermotolerance are not available for most pests under evaluation. Fungi are more likely to survive this step than insects or bacteria, as some wood inhabiting fungi in particular have been reported to be highly thermotolerant. Heat drying might be a less effective in killing pests for 6 mm thin veneer sheets as the temperature inside the sheets is lower than for 0.7 mm thin sheets.

6.1.6 | Overall evaluation of the combination of all measures in a systems approach

The combination of all phases of the system approach is expected to largely reduce the probability that any pest is present in the final veneer sheets. *Xylella fastidiosa*, the only bacterium under evaluation, is heat sensitive and is not expected to survive the heat treatments during the veneer production process. Heating the logs in a water bath followed by debarking and rounding will be effective on insects and fungi associated with bark and outer sapwood. These measures will be less effective for insects and fungi that may be present deeper inside the logs. Overall, the measures are more effective for 0.7 mm thin veneer sheets than for veneer sheets up to 6 mm because of the slicing effect on insects and the fact that the thinner sheets are exposed to higher temperature during the final heat drying step.

An evaluation of the efficacy of the different phases of the system approach on the pest risk is included in Appendix F for the different pests considered relevant for further investigation.

6.2 | Effects of temperature on the survival of relevant pests

6.2.1 | Effects of temperature and wood moisture on survival of pests

All organisms have thermotolerance limits. Most eucaryotic organisms are not able to survive temperatures above 56–60°C (Tansey & Brock, 1972). High temperatures have a long tradition for preserving stored products against insect pests with temperatures above 62°C being lethal to insect storage pests (Fields & White, 2002).

A low moisture content of wood may prevent fungi from growing but does not necessarily kill the fungi. The same is observed for some insect species. A low moisture content by itself is not sufficient to meet phytosanitary goals (Allen, 2014) and it is therefore not further investigated in the current opinion.

Heat treatments are suggested as a phytosanitary measure in international standards such as ISPM 15 and national import requirements e.g. from Australia (DAFF BICON - Import Conditions (agriculture.gov.au) and New Zealand https://www.mpi.govt.nz/dmsdocument/1225/direct

ISPM 15 requires heating of wood packaging material to a core temperature of 56°C for 30 min. This is sufficient to kill most wood pests; however, it may not be sufficient for some pests (e.g. see below for instance Ramsfield et al., 2010) and some countries have developed specific and stricter import requirements for wood (Allen, 2014). The results of the review of Allen (2014) suggest that some thermophilic wood inhabiting fungal species may be able to tolerate higher temperatures compared to insects and bacteria. Lethal temperatures of > 82°C for short-term exposure were found in several studies with fungal species e.g. Tansey (1971) and Schmidt (2007).

TABLE 7 Requirements for heat treatment of wood in terms of core temperature and duration in ISPM 15 and national requirements of New Zealand and Australia.

ISPM 15	New Zealand (NZ MPI 2018)[1]	Australia (DAFF-BIOCON)[2]
Wood packaging material	Sawn wood	Timber from Myrtaceae and pathogen risk species (many genera grown in NZ, US, Europe, among which *Acer* is listed)*
Core temp.: 56°C Duration: 0.5 h	Core temp.: 70, 80, 90, 100, 110, 120°C Duration: 4h, 2 h, 1h, 0.5h, 20 min, 15 min	Core temp.: 74°C Duration: 4 h (≤ 25 mm thickness) 18 h (> 200 mm thickness) Duration depends on thickness of logs (longer duration with increasing thickness)

*Timber from Canada is accepted when certified under the Canadian HT program which requires treatment with 56°C core temperature for 30 min.[1]https://www.mpi.govt.nz/dmsdocument/1225/direct.

[2]BICON - Import Conditions (agriculture.gov.au).

6.2.1.1 | *Temperature limits of survival for P. ramorum*

The data collected in the literature review suggest that the temperature limit of survival of *P. ramorum* is between 50°C and 60°C for short exposure times (30–60 min) to dry heat in soil (Schweigkofler, Kosta, Huffman, Sharma, et al., 2014). Similar, or lower lethal temperatures were observed in other studies (Funahashi & Parke, 2018; Linderman & Davis, 2008; Noble et al., 2009; Swain et al., 2006). In some studies, even short-term exposure to temperatures below 50°C was lethal (Browning et al., 2008). Differences in thermotolerance were observed in *P. ramorum* mating types European A1 and North American A2 with lethal temperatures (30-min exposure) of 45°C and 50°C, respectively.

For longer exposure times of 3–14 days, the temperature limit of survival was observed to be between 30°C and 55°C (Browning et al., 2008; Harnik et al., 2004; Tooley et al., 2008; Yakabe & MacDonald, 2010). However, there were two exceptions where higher temperature limits were observed. One active *P. ramorum* isolate was recovered from wood after treatment with 56°C for 30 min in a preliminary study conducted by Tubajika et al. (2007) and *P. ramorum* mycelium was not killed by exposure to a temperature of 60°C for 1 h (Chimento et al., 2012). The heat treatment in this study has led only to a delay in growth by 1 week. This observation adds some uncertainty on whether the reported lethal temperatures in other studies have indeed always caused mortality or have only inactivated the microbe without being lethal. However, it is noted that the study was not performed to investigate the thermotolerance of *P. ramorum* and it was rather an observation in an attempt to obtain dead mycelium.

Overall, it is concluded that a temperature of 50–60°C for 30 min will most likely be sufficient to eliminate *P. ramorum*. However, there is some uncertainty as this temperature may lead only to inactivation without killing the pathogen.

6.2.1.2 | *Temperature limits of survival of D. virescens*

No information was retrieved on the thermotolerance of *D. virescens*. Extrapolation may be possible from information available for other fungal species. Given its biology and life-history traits, it is not expected that *D. virescens* is exceptionally thermotolerant. Temperatures of 56°C for 30 min (Juzwik et al., 2019) and 49°C (Jones, 1973) were lethal for phylogenetically related *Ceratocystis* species. Therefore, it is concluded that *D. virescens* would be covered by the temperature ranges observed and summarised below for other fungal species.

6.2.1.3 | *Temperature limits of survival of other fungal species and oomycetes*

The survival limits for short-term exposure (15 min) were between > 95°C and 50°C (mycelium grown in wood, exposure duration 4 h) and between 80°C and 55°C (grown on Agar medium, exposure duration 1–24 h) for 17 indoor wood destroying fungi (Schmidt, 2007; Schmidt & Huckfeldt, 2005). Similar or lower temperature limits were observed in other studies and with other fungal species for short-term exposure of 30–60 min (Linderman & Davis, 2008; Ramsfield et al., 2010).

Based on experimental data, Ramsfield et al. (2010) investigated the eradication temperature needed for 11 different wood colonising fungal species. The fungi were grown in wood blocks and exposed to temperatures (inside wood blocks) ranging from 41°C to 76°C for 1–120 min. For six of the tested species, a temperature below 61°C for 1 min was sufficient to kill them. For one species, the 1-min eradication temperature was 76°C. The estimated eradication temperature (99.99% mortality) for an exposure duration of 30 min was 41.6–69.6°C for the 11 investigated fungal species.

For longer exposure times of 1–7 days, the limits of survival reported in the review by Noble et al. (2009) were between 64°C and 40°C. In one study (Noble et al., 2011), a temperature of 32.8°C and an exposure time of 5 days were lethal to *P. kernoviae*.

There are some reports suggesting that fungal structures such as sclerotia, chlamydospores and ascospores have a greater thermotolerance than other fungal cell types (cited in Allen, 2014: Dijksterhuis, 2007; Seifert et al., 2004; Suryanarayanan et al., 2011). However, the information retrieved in the current literature review was not sufficient to draw conclusions on the most thermotolerant life stages. For example, the observed lethal temperature of 40°C in a study with chlamydospores of *P. ramorum* (Tooley et al., 2008) was well within the range observed for other life stages.

Overall, it is concluded that a temperature of 76°C (for 1 min) is required to kill most plant pathogenic fungi for which information was retrieved. For longer exposure times of 1–7 days 64°C are sufficient to eradicate the investigated fungal species. However, there is some uncertainty as there are observations on six indoor wood decay fungi that they can survive temperatures of > 80°C and > 95°C (for 4 h).

6.2.1.4 | *Temperature limits of survival of plant pathogenic bacteria*

The information retrieved in the review of Noble et al. (2009) suggests temperature limits of survival of plant pathogenic bacteria of 60–45°C for exposure times ranging from 30 to 120 min. Martins et al. (2007) observed that *Xylella fastidiosa* and *Xanthomonas citri* were killed by a temperature of 42°C after 180 min, but this temperature did not completely kill the bacteria when the exposure time was only 45 min. Similar temperatures for thermal inactivation of plant pathogenic bacteria are reported in Allen (2014) e.g. 50°C (30 min) for *E. amylovora* (Keck et al., 1995), 60°C (15 min) for *Xanthomonas translucens* pv. *pistaciae* (Vu Thanh et al., 2012), 35–40°C for *Pseudomonas syringae* pv. *aesculi* (Mullett & Webber, 2013). Long-term exposure (3 days) to 37°C was lethal for *X. fastidiosa* (Feil & Purcell, 2001).

Overall, a temperature of 60°C maintained for 60 min is sufficient to kill plant pathogenic bacteria for which information was retrieved in the current review. Lethal temperatures of 42°C (for 3 h) and 37°C (for 3 days) were observed for *Xylella fastidiosa*, which was the only plant pathogenic bacterium relevant in the current assessment.

6.2.1.5 | *Temperature limits of survival of wood boring insects*

A temperature of 60°C (bolt core temperature) for 30 min was required to kill larvae of *Agrilus bilineatus* and *A. sulcicollis* and some bark (*Ips* sp.) and longhorn beetle species (Cerambycidae) while 56°C for 30 min was sufficient to kill larvae of *A. anxius* and *A. planipennis* and weevil species (*Pissodes* sp.) (Haack & Petrice, 2022). Similar temperatures were reported in the review of Allen (2014) for *A. planipennis*. Higher temperature limits were only found for powder post beetles (*Lyctus* spp.) requiring treatment at 82°C for 30 min (Snyder, 1923 cited in Allen, 2014). Zhao et al. (2018) found that 2 min at 50°C are sufficient to kill the bark beetle *Dendroctonus armandi*.

Overall, it can be concluded that exposure to 60°C for 30 min is sufficient to kill all wood boring insects for which information was retrieved, except powder post beetles where a lethal temperature of 82°C was reported. But since powder post beetles are not associated with *Acer* trees grown in Canada, their higher temperature tolerance was not considered in the assessment.

7 | QUANTITATIVE ASSESSMENT OF THE PEST FREEDOM OF MAPLE VENEER

The EKE for pest freedom of maple veneers of a thickness of 0.7 mm and 6 mm was conducted for *P. ramorum*, *D. virescens*, canker fungi and other fungi associated with sapwood, and for wood decay fungi.

Wood-dwelling insects are considered to be killed during slicing of logs to thin veneer sheets of 0.7 mm thickness, and therefore, the EKE was conducted for insect groups only for veneers of a thickness of 6 mm.

Based on the available information on the thermotolerance of the plant pathogenic bacterium *X. fastidiosa*, it was concluded that it will not survive the heat treatments during veneer production (i.e. water bath phase), and hence, no EKE was conducted for *X. fastidiosa*.

The temperature during the final drying phase of thin veneer sheets (0.7 mm) exceeds the thermotolerance of *P. ramorum,* and therefore, the EKE was conducted only for veneer sheets with a thickness of 6 mm.

The outcome of the EKE on pest freedom of maple veneer sheets at the end of the veneer production is presented in Table 8 and Figures 1 and 2. A detailed description of the scenarios and considerations for the estimates are provided in Appendix G.

TABLE 8 Conclusion on the likelihood of pest freedom of maple veneer sheets at the end of the veneer production process.

Number	Pest species	Sometimes pest free	More often than not pest free	Frequently pest free	Very frequently pest free	Extremely frequently pest free	Pest free with some exceptional cases	Pest free with few exceptional cases	Almost always pest free
1	*Davidsoniella virescens*/0.7 mm veneer						**L**		**MU**
2	Wood decay fungi/0.7 mm veneer						**LM**		**U**
3	Canker fungi and other fungi associated with sapwood/0.7 mm veneer						**L**	**M**	**U**
4	*Davidsoniella virescens*/6 mm veneer						**LM**		**U**
5	*Phytophthora ramorum* / 6 mm veneer						**L**		**MU**
6	Wood decay fungi/6 mm veneer					**L**	**M**		**U**
7	Canker fungi and other fungi associated with sapwood/6 mm veneer					**L**	**M**		**U**
8	Ambrosia beetles/6 mm veneer						**L**	**M**	**U**
9	Other insect species/6 mm veneer								**LMU**

Insects will not survive slicing of veneer sheets with a thickness of 0.7 mm and *P. ramorum* will not survive temperatures during high heat drying of thin veneer sheets. Therefore, no EKE was conducted for insects and *P. ramorum* for veneer sheets of 0.7 mm thickness

	Pest freedom category	Pest-free plants out of 10,000
	Sometimes pest free	≤ 5000
	More often than not pest free	5000 to ≤ 9000
	Frequently pest free	9000 to ≤ 9500
	Very frequently pest free	9500 to ≤ 9900
	Extremely frequently pest free	9900 to ≤ 9950
	Pest free with some exceptional cases	9950 to ≤ 9990
	Pest free with few exceptional cases	9990 to ≤ 9995
	Almost always pest free	9995 to ≤ 10,000

Legend of pest freedom categories	
L	Pest freedom category includes the elicited lower bound of the 90% uncertainty range
M	Pest freedom category includes the elicited median
U	Pest freedom category includes the elicited upper bound of the 90% uncertainty range

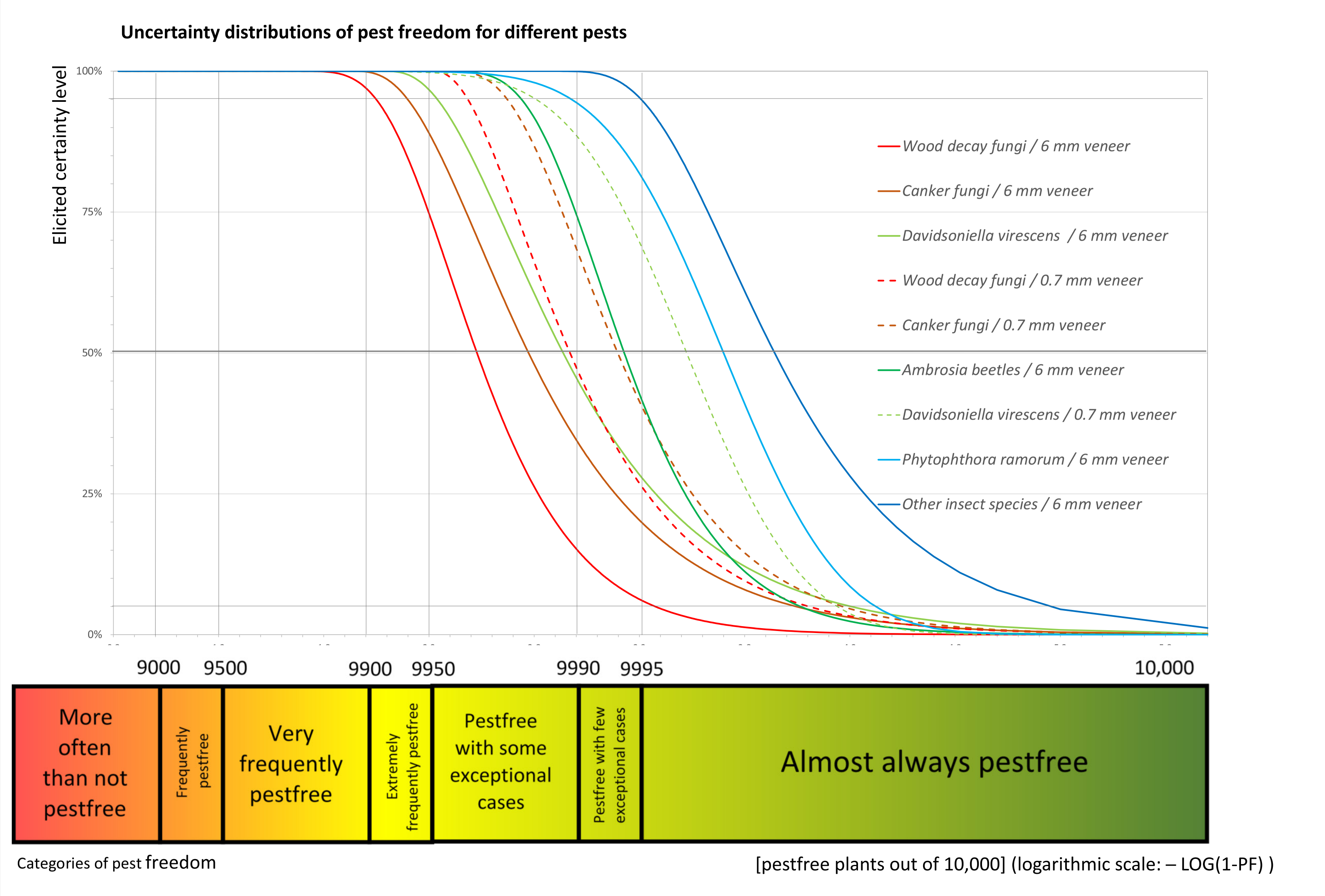


FIGURE 1 The likelihood of pest freedom of maple veneer sheets of 0.7 and 6 mm thickness at the end of the production process.

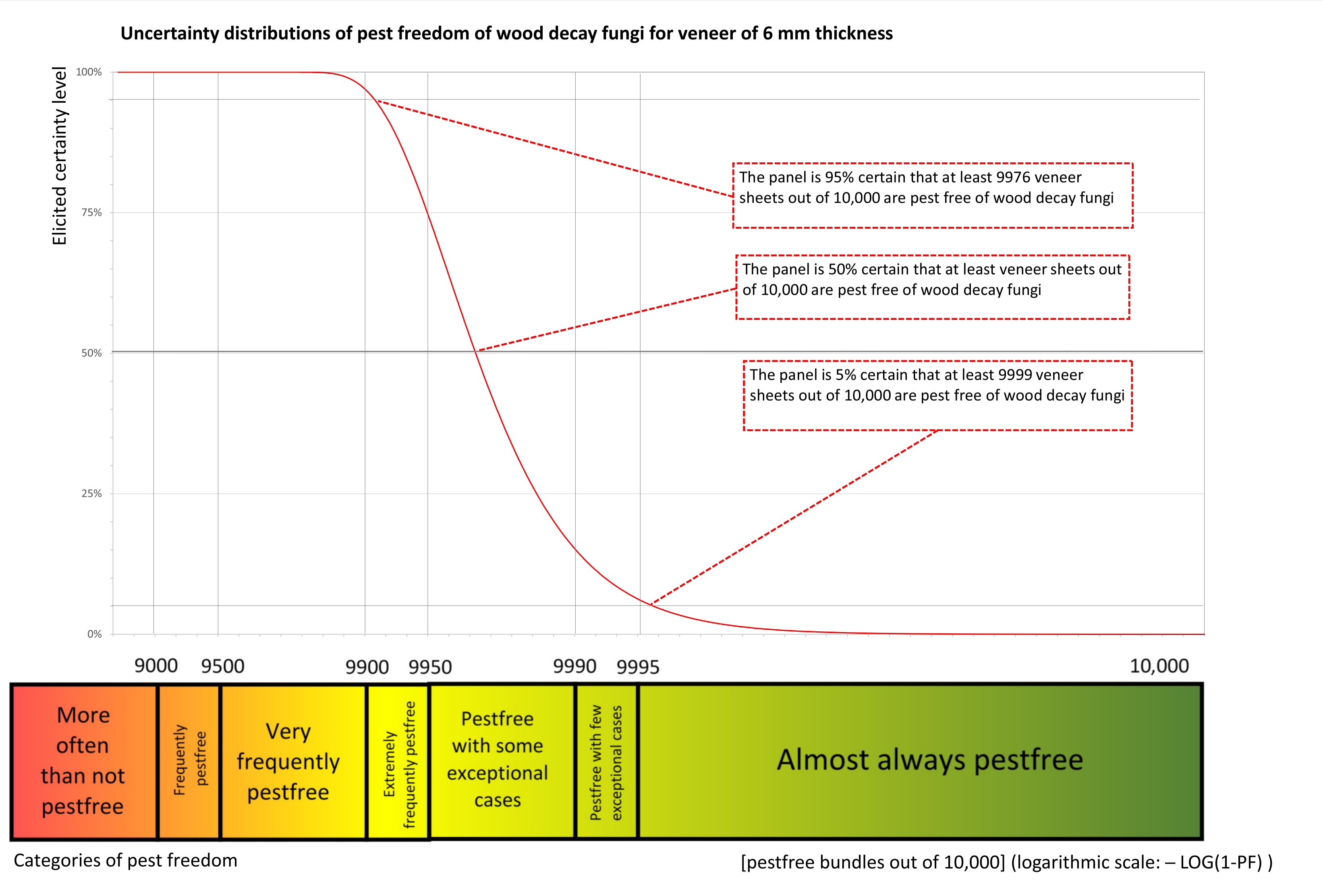


FIGURE 2 Explanation of the descending distribution function describing the likelihood of pest freedom for wood decay fungi of veneers of 6 mm thickness.

8 | CONCLUSIONS

The pest freedom of maple veneer sheets of a thickness of 0.7 mm and 6 mm was evaluated for *Phytophthora ramorum*, *Davidsoniella virescens* and other relevant pest species present in Canada and potentially infesting maple wood. In total 51 relevant pest species were identified and evaluated grouped as canker fungi and other fungi associated with sapwood, wood decay fungi, bacteria, ambrosia beetles and all other wood boring insects. The assessment took into account the different phases in the veneer production in a systems approach for the reduction of the risk of harmful pests being associated with maple veneers. Some of the phases of the systems approach taken alone including the heat treatment of logs in the water bath, the cutting into thin veneer sheets and final high heat drying of veneer sheets are expected to be effective against some of the pests, without uncertainties, making the systems approach fully effective for those pests. For example, insects are considered not to survive slicing of logs into thin veneer sheets of 0.7 mm and the heat treatment of logs in the water bath exceed the thermotolerance of the plant pathogenic bacterium *Xylella fastidiosa*. Similarly, *P. ramorum* is not expected to survive the final high heat drying phase of veneer sheets of 0.7 mm. Some uncertainty remained for the majority of pests. Therefore, the pest freedom and the uncertainty were quantitatively assessed in the EKE.

For maple veneer sheets 0.7 mm thick, the systems approach will be fully effective against the following pests because those pests will be killed/removed, without uncertainties, during at least one of the production phases: *X. fastidiosa*, *P. ramorum*, some canker fungi and other fungi associated with sapwood (i.e. *C. parasitica*), some wood decay fungi (i.e. *Armillaria* spp.), and all insects.

For *D. virescens*, the likelihood of pest freedom of 0.7 mm veneer sheets was estimated as 'almost always pest free' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9984 and 10,000 veneer sheets per 10,000 will be free from living *D. virescens*.

For the remaining canker fungi and other fungi associated with sapwood (*Acarosporina microspore, Annulohypoxylon truncatum, Biscogniauxia atropunctata, Camillea tinctor, Catunica adiposa, Cryphonectria parasitica, Entoleuca mammata, Jamesreidia tenella*), the likelihood of pest freedom of 0.7 mm veneer sheets was estimated as 'pest free with few exceptional cases' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9979 and 10,000 veneer sheets per 10,000 will be free from living canker fungi and other fungi associated with sapwood.

For the remaining wood decay fungi (*Bondarzewia berkeleyi, Cylindrobasidium corrugum, Rigidonotus glomeratus, Perenniporia fraxinophila, Meganotus everhartii*), the likelihood of pest freedom of 0.7 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9967 and 10,000 veneer sheets per 10,000 will be free from living wood decay fungi.

For maple veneer sheets 6 mm thick, the systems approach will be fully effective against the following pests because those pests will be killed/removed, without uncertainties, during at least one of the production phases: *Xylella fastidiosa*, some wood decay fungi (i.e. *Armillaria* spp.) and some wood boring insects (i.e. *Pityophthorus lautus*, *Procryphalus utahensis*).

For *P. ramorum*, the likelihood of pest freedom of 6 mm veneer sheets was estimated as 'almost always pest free' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9989 and 10,000 veneer sheets per 10,000 will be free from living *P. ramorum*.

For *D. virescens*, pest freedom of 6 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9954 and 10,000 veneer sheets per 10,000 will be free from living *D. virescens*.

For canker fungi and other fungi associated with sapwood (*Acarosporina microspore, Annulohypoxylon truncatum, Biscogniauxia atropunctata, Camillea tinctor, Catunica adiposa, Cryphonectria parasitica, Entoleuca mammata, Jamesreidia tenella*), pest freedom of 6 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9937 and 10,000 veneer sheets per 10,000 will be free from living canker fungi and other fungi associated with sapwood.

For the remaining wood decay fungi (*Bondarzewia berkeleyi, Cylindrobasidium corrugum, Rigidonotus glomeratus, Perenniporia fraxinophila, Meganotus everhartii*), pest freedom of 6 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9911 and 10,000 veneer sheets per 10,000 will be free from living wood decay fungi.

For ambrosia beetles (*Anisandrus obesus, Anisandrus sayi, Corthylus columbianus, Euwallacea validus, Monarthrum fasciatum, Monarthrum mali, Xyleborus ferrugineus, Xyloterinus politus*), the likelihood of pest freedom of 6 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9982 and 10,000 veneer sheets per 10,000 will be free from living ambrosia beetles.

For all other wood boring insects (full list see Section A.4 in Appendix A), the likelihood of pest freedom of 6 mm veneer sheets was estimated as 'pest free with some exceptional cases' with 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9995 and 10,000 veneer sheets per 10,000 will be free from living wood boring insects other than ambrosia beetles. Although the different phases of the veneer production are very effective in reducing the risk of living pests associated with veneer sheets, it cannot be excluded that some pests, in particular fungal pathogens, may survive the veneer production procedure. The risk could be further mitigated by very strict quality control sorting out infested logs before starting the production and infested veneers at the end of the production, as well as by increasing temperatures during the water bath and the final veneer sheet drying phases, provided that these last measures would not affect the quality of the commodity.

GLOSSARY

Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2024a, 2024b).
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2024b).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2024b).
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units.
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2024b).
Measures	Control (of a pest) is defined in ISPM 5 (FAO, 2024b) as 'Suppression, containment or eradication of a pest population' (FAO, 2024a). Control measures are measures that have a direct effect on pest abundance. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk mitigation measures that do not directly affect pest abundance.
Pathway	Any means that allows the entry or spread of a pest (FAO, 2024b).
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2024b).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2024b).
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2024b).

ABBREVIATIONS

CFIA-ACIA	Canadian Food Inspection Agency-Agence Canadienne d'Inspection des Aliments
EKE	Expert Knowledge Elicitation
EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organisation
ISPM	International Standards for Phytosanitary Measures
PLH	Plant Health

ACKNOWLEDGEMENTS

EFSA wishes to acknowledge the contribution of the hearing expert Wolfgang Gindl-Altmutter on the temperature estimates inside logs and veneer sheets and the EFSA colleagues Alex Gobbi and Irene Munoz Guajardo for their advice and support with the literature review. The Scientific Opinion was prepared in cooperation with the Universita degli studi di Padova, Dipartimento Agronomia, Animali, Alimenti, Risorse Naturali e Ambiente (Italy) under the EFSA Art. 36 Framework Partnership Agreement 'GP/EFSA/PLANTS/2022/11' commodity risk assessment for forestry plants.

CONFLICT OF INTEREST

If you wish to access the declaration of interests of any expert contributing to an EFSA scientific assessment, please contact interestmanagement@efsa.europa.eu.

REQUESTOR

European Commission

QUESTION NUMBER

EFSA-Q-2023-00206

COPYRIGHT FOR NON-EFSA CONTENT

PANEL MEMBERS

Claude Bragard, Paula Baptista, Elisavet Chatzivassiliou, Francesco Di Serio, Paolo Gonthier, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A. Navas-Cortes, Stephen Parnell, Roel Potting, Philippe L. Reignault, Emilio Stefani, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen, and Lucia Zappalà.

REFERENCES

Abe, Y. (1989). Effect of moisture on the colonization by *Lentinus edodes* and *Hypoxylon truncatum* in wood. *Forest Pathology*, *19*(7), 423–434. https://doi.org/10.1111/j.1439-0329.1989.tb00280.x

Adams, K. B. (2017). *The bionomics of a monophagous, native woodborer, Glycobius speciosus (say) (Coleoptera: Cerambycidae)*. (Publication No. 10288047) [Doctoral dissertation, State University of New York College of Environmental Science and Forestry]. ProQuest Dissertations & Theses Global.

Adams, K. B., Allen, D. C., & Stehman, S. V. (2023). Life history and bionomics of *Glycobius speciosus* (Coleoptera: Cerambycidae: Cerambycinae: Clytini). *Environmental Entomology*, *52*(4), 692–708. https://doi.org/10.1093/ee/nvad045

Agarwal, K., Kathuria, S., Sundar, G., Singh, P., Khanna, G., & Chowdhary, A. (2014). A case of allergic fungal rhinosinusitis due to *Ceratocystis adiposa*. *Diagnostic Microbiology and Infectious Disease*, *78*(2), 196–198. https://doi.org/10.1016/j.diagmicrobio.2013.10.018

Allen. (2014). ST 05: Review of heat treatment of wood and wood packaging Draft. NAPPO,Science and Technology Documents, 35 pp. https://assets.ippc.int/static/media/uploads/resources/review_of_heat_treatment_of_wood_and_wood_packaging_english.pdf

Anderson, N. A., Ostry, M. E., & Anderson, G. W. (1979). Insect wounds as infection sites for *Hypoxylon mammatum* on trembling aspen. *Phytopathology*, *69*, 476–479. https://doi.org/10.1094/phyto-69-476

Anderson, P. J., & Babcock, D. C. (1913). Field studies on the dissemination and growth of the chestnut blight fungus. *Pennsylvania Chestnut Tree Blight Commission*, *3*, 46.

Androw, R. A., & Keeney, G. D. (1999). New records of Ohio long-horned beetles (Coleoptera: Cerambycidae). *The Great Lakes Entomologist*, *32*(1), 7.

Anonymous. (1960). *Index of Plant Diseases in the United States*. Agriculture Handbook no 165, USDA-ARS (US), 531 pp.

Aoki, T., Kasson, M. T., Berger, M. C., Freeman, S., Geiser, D. M., & O'Donnell, K. (2018). *Fusarium oligoseptatum* sp. nov., a mycosymbiont of the ambrosia beetle *Euwallacea validus* in the eastern US and typification of *F. ambrosium*. *Fungal Systematics and Evolution*, *1*(1), 23–39. https://doi.org/10.3114/fuse.2018.01.03

APHIS USDA (Animal and Plant Health Inspection Service U.S. Department of Agriculture). (2022). APHIS lists of proven hosts of and plants associated with *Phytophthora ramorum*. September 2022. 12. https://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/usdaprlist.pdf

Ashok, D., & Prasher, I. B. (2014). Wood rotting nongilled Agaricomycetes new to India. *Journal on New Biological Reports*, *3*(1), 4–8.

Atkinson, T. H. (2024). Bark and Ambrosia Beetles of the Americas. https://www.barkbeetles.info/index.php (accessed 2024-03-07).

Atkinson, T. H., Rabaglia, R. J., Peck, S. J., & Foltz, J. L. (1991). New records of Scolytidae and Platypodidae from the United States and Bahamas. *The Coleopterists Bulletin*, *45*(2), 152–164.

Baker, J. M., & Norris, D. M. (1968). A complex of fungi mutualistically involved in the nutrition of the ambrosia beetle *Xyleborus ferrugineus*. *Journal of Invertebrate Pathology*, *11*(2), 246–250. https://doi.org/10.1016/0022-2011(68)90157-2

Baker, W. L. (1972). *Eastern forest insects*. *USDA Forest Service, Miscellaneous Publication*, *1175*, 658.

Banik, M. T., Volk, T. J., & Burdsall, H. H., Jr. (1996). *Armillaria* species of the Olympic Peninsula of Washington state, including confirmation of North American biological species XI. *Mycologia*, *88*(3), 492–496. https://doi.org/10.2307/3760889

Barringer, L., & Ciafré, C. M. (2020). Worldwide feeding host plants of spotted lanternfly, with significant additions from North America. *Environmental Entomology*, *49*(5), 999–1011. https://doi.org/10.1093/ee/nvaa093

Bassett, E. N., & Fenn, P. (1984). Latent colonization and pathogenicity of *Hypoxylon atropunctatum* on oaks. *Plant Disease*, *68*(4), 317–319. https://doi.org/10.1094/pd-68-317

Baxter, D. V. (1925). The biology and pathology of some of the hardwood heart-rotting fungi. Part I. *American Journal of Botany*, *12*(8), 522–552.

Beeman, S. L., & Norris, D. M. (1977). Embryogenesis of *Xyleborus ferrugineus* (Fabr.) (Coleoptera, Scolytidae). I. External morphogenesis of male and female embryos. *Journal of Morphology*, *152*(2), 177–219. https://doi.org/10.1002/jmor.1051520205

Beil, J. A., & Kessler, K. J. (1979). Sapstreak disease of sugar maple found in New York state. *Plant Disease Reported*, *63*(5), 436.

Belisle, W. H., Rooney-Latham, S., Soriano, M. C., Grünwald, N., & Blomquist, C. L. (2024). First report of *Phytophthora ramorum* causing leaf spots on *Cornus capitata* (Evergreen dogwood) in United States. *Plant Disease*, 3. https://doi.org/10.1094/PDIS-12-23-2638-PDN

Berger, M. C. (2017). *Interactions between Euwallacea ambrosia beetles, their fungal symbionts and the native trees they attack in the eastern United States*. (Publication No. 5186) [Master Thesis, West Virginia University]. Graduate Theses, Dissertations, and Problem Reports. https://doi.org/10.33915/etd.5186

Berry, F. H. (1973). Heart rots of central region hardwoods. US Department of Agriculture, Forest Service. *Forest Pest Leaflet*, *140*, 8.

Bérubé, J. A., & Dessureault, M. (1989). Morphological studies of the *Armillaria mellea* complex: Two new species. *A. gemina and A. calvescens*. *Mycologia*, *81*(2), 216–225. https://doi.org/10.2307/3759703

Bessette, A. E., Smith, D., & Bessette, A. R. (2021). *Polypores and similar fungi of eastern and central North America* (p. 429). University of Texas Press. https://doi.org/10.7560/322727

Bishop, S., & McGrath, W. T. (1978). *Key to the wood-decaying Polyporaceae of the East Texas region*. *eBooks*, *8*, 107. https://scholarworks.sfasu.edu/ebooks/8

Bissegger, M., & Sieber, T. N. (1994). Assemblages of endophytic fungi in coppice shoots of *Castanea sativa*. *Mycologia*, *86*, 648–655. https://doi.org/10.2307/3760535

Blair, J. E., Coffey, M. D., Park, S. Y., Geiser, D. M., & Kang, S. (2008). A multi-locus phylogeny for *Phytophthora* utilizing markers derived from complete genome sequences. *Fungal Genetics and Biology*, *45*(3), 266–277. https://doi.org/10.1016/j.fgb.2007.10.010

Böckh, P., & Wetzel, T. (2017). *Wärmeübertragung. Grundlagen und Praxis*. Textbook. Springer-Verlag Ed. 7, 363 pp.

Boutet, X., Vercauteren, A., Heungens, C., & Kurt, A. (2010). Mating of *Phytophthora ramorum*: Functionality and consequences. In S. J. Frankel, J. T. Kliejunas, & K. M. Palmieri (Eds.), *Proceedings of the sudden oak death fourth science symposium* (pp. 97–100). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Brar, G. S., Capinera, J. L., Kendra, P. E., McLean, S., & Peña, J. E. (2013). Life cycle, development, and culture of *Xyleborus glabratus* (Coleoptera: Curculionidae: Scolytinae). *Florida Entomologist*, *96*(3), 1158–1167. https://doi.org/10.1653/024.096.0357

Brasier, C. (2008). *Phytophthora ramorum* + *P. kernoviae* = international biosecurity failure. In S. J. Frankel, J. T. Kliejunas, & K. M. Palmieri (Eds.), *Proceedings of the sudden oak death third science symposium* (pp. 133–139). USDA Forest Service, Pacific Southwest Research Station, US Department of Agriculture.

Brasier, C., & Kirk, S. (2004). Production of gametangia by *Phytophthora ramorum* in vitro. *Mycological Research*, *108*(7), 823–827. https://doi.org/10.1017/s0953756204000565

Brasier, C., & Webber, J. (2010). Sudden larch death. *Nature*, *466*, 824–825. https://doi.org/10.1038/466824a

Brazee, N. J., Hulvey, J. P., & Wick, R. L. (2011). Evaluation of partial tef1, rpb2, and nLSU sequences for identification of isolates representing *Armillaria calvescens* and *Armillaria gallica* from northeastern North America. *Fungal Biology*, *115*(8), 741–749. https://doi.org/10.1016/j.funbio.2011.05.008

Bright, D. E. (1993). *The insects and arachnids of Canada, part 21. The weevils of Canada and Alaska: Volume 1. Coleoptera: Curculionidea, excluding Scolytidae and Curculionidae*. Agriculture Canada Publication, 1882, 217 pp.

Bright, D. E. (2014). *A catalog of Scolytidae and Platypodidae (Coleoptera), supplement 3 (2000–2010), with notes on subfamily and tribal reclassifications*. Insecta Mundi, 0356, 336 pp.

Brown, A. V., & Brasier, C. M. (2007). Colonization of tree xylem by *Phytophthora ramorum*, *P. kernoviae* and other *Phytophthora* species. *Plant Pathology*, *56*, 227–241. https://doi.org/10.1111/j.1365-3059.2006.01511.x

Browning, M., Englander, L., Tooley, P. W., & Berner, D. (2008). Survival of *Phytophthora ramorum* hyphae after exposure to temperature extremes and various humidities. *Mycologia*, *100*(2), 236–245. https://doi.org/10.3852/mycologia.100.2.236

Buchanan, W. D. (1960). Biology of the oak Timberworm, *Arrhenodes minutus*. *Journal of Economic Entomology*, *53*(4), 510–513. https://doi.org/10.1093/jee/53.4.510

Burke, H. E., & Böving, A. G. (1929). The pacific flatheaded borer. In *Technical bulletin, 83* (p. 36). USDA.

Butler, E. J. (1906). Fungus diseases of sugar-cane in Bengal. *Memoirs of the Department of Agriculture in India*, *1*(3), 1–53.

CABI (Centre for Agriculture and Bioscience International). (2024a). *Ceratocystis virescens*. [Distribution map]. 2 pp. https://doi.org/10.1079/DMPD/20056500704 (accessed 2024-04-03).

CABI (Centre for Agriculture and Bioscience International). (2024b). *Ceratocystis virescens* (sapstreak disease of maple). https://doi.org/10.1079/cabicompendium.12169 (accessed 2024-04-03).

Calkins, W. W. (1886). Notes on Florida Fungi. No. 9. *The Journal of Mycology*, *2*(11), 126–128.

Callan, B. E. (1998). *Diseases of Populus in British Columbia: A diagnostic manual* (p. 157). Natural Resources Canada.

Campbell, J. M., Sarazin, M. J., & Lyons, D. B. (1989). *Canadian beetles (Coleoptera) injurious to crops, ornamentals, stored products, and buildings* (p. 491). Research Branch Agriculture Canada. Canadian Government publishing Centre, Supply and Services Canada.

Campbell, R. N. (1959). Fungus sap-stains of hardwoods. *Southern Lumberman*, 115–120.

Campbell, W. A., & Davidson, R. W. (1939a). *Poria andersonii* and *Polyporus glomeratus*, two distinct heart-rotting fungi. *Mycologia*, *31*(2), 161–168.

Campbell, W. A., & Davidson, R. W. (1939b). Sterile conks of *Polyporus glomeratus* and associated cankers on beech and red maple. *Mycologia*, *31*(5), 606–611.

Canada's National Forest Inventory. (2023). Tree Species. https://nfi.nfis.org/en/general (accessed 2023-07-19).

Capizzi, J., Miller, J., & Green, J. (1982). Flatheaded apple tree borer and Pacific flatheaded borer: Live larvae - dead trees. *Ornamentals Northwest Archives*, *6*(1), 3–5.

Cassar, S., Roeper, R., Beck, R., Pomeroy, T., & Bunce, M. (2016). Gallery characteristics and life history of the ambrosia beetle *Anisandrus obesus* (Coleoptera: Curculionidae: Scolytinae) in big tooth aspen. *Great Lakes Entomologist*, *49*(3–4), 169–172.

Cave, G. L., Randall-Schadel, B., & Redlin, S. C. (2008). *Risk analysis for Phytophthora ramorum Werres, de Cock & Man in't Veld, causal agent of sudden oak death, ramorum leaf blight, and ramorum dieback* (p. 88). US Department of Agriculture, Animal and Plant Health Inspection Service.

CFIA (Canadian Food Inspection Agency). (2024a). List of Pests Regulated by Canada. https://inspection.canada.ca/plant-health/invasive-species/regulated-pests/eng/1363317115207/1363317187811 (accessed 2024-03-04).

CFIA (Canadian Food Inspection Agency). (2024b). Appendix 1- Plants Regulated for *Phytophthora ramorum* (Sudden Oak Death). https://inspection.canada.ca/plant-health/invasive-species/directives/horticulture/d-01-01/appendix-1/eng/1363039571899/1363039666772

CFIA (Canadian Food Inspection Agency). (2024c). Sudden oak death – *Phytophthora ramorum*. https://inspection.canada.ca/plant-health/invasive-species/plant-diseases/sudden-oak-death/eng/1327587864375/1327587972647

CFIA (Canadian Food Inspection Agency). (2024d). Plant health survey report for 2022–2023. https://inspection.canada.ca/en/plant-health/invasive-species/plant-pest-surveillance/survey-report-2022-2023

CFIA (Canadian Food Inspection Agency). (2024e). Plant Health Surveillance Unit, Summary of Plant Quarantine Pest and Disease Situations in Canada, 2006, 2007 and 2008. https://epe.lac-bac.gc.ca/100/206/301/cfia-acia/2011-09-21/inspection.gc.ca/english/plaveg/pestrava/surv/obje.shtml

CFIA (Canadian Food Inspection Agency). (2024f). Plant protection survey report, 2009–2017. https://publications.gc.ca/site/eng/9.831610/publication.html

CFIA (Canadian Food Inspection Agency). (2024g). Plant pest surveillance. https://inspection.canada.ca/plant-health/invasive-species/plant-pest-surveillance/eng/1344466499681/1344466638872

Cha, B. H., Soo, J. A., Gang, G., Chung, G. P., & Kwak, Y.-S. (2012). Morphological and molecular characteristics of the oak tree canker pathogen. *Annulohypoxylon truncatum*. *Mycobiology*, *40*(1), 79–81. https://doi.org/10.5941/MYCO.2012.40.1.079

Chen, J., Cui, B., He, S., Cooper, J. A., Barrett, M. D., Chen, J., Song, J., & Dai, Y. (2016). Molecular phylogeny and global diversity of the remarkable genus *Bondarzewia* (Basidiomycota, Russulales). *Mycologia*, *108*(4), 697–708. https://doi.org/10.3852/14-216

Chimento, B. A., Cacciola, S. O., & Garbelotto, M. (2012). Detection of mRNA by reverse-transcription PCR as an indicator of viability in *Phytophthora ramorum*. *Forest Pathology*, *42*, 14–21. https://doi.org/10.1111/j.1439-0329.2011.00717.x

Clark, S. M., LeDoux, D. G., Seeno, T. N., Riley, E. G., Gilbert, A. J., & Sullivan, J. M. (2004). *Host plants of leaf beetle species occurring in the United States and Canada (Coleoptera: Megalopodidae, Orsodacnidae, Chrysomelidae, excluding Bruchinae)*. *Coleopterists Society, Special Publication*, *2*, 1–476.

Cognato, A. I., Barc, N., Philip, M., Mech, R., Smith, A. D., Galbraith, E., Storer, A. J., & Kirkendall, L. R. (2009). The native and introduced bark and ambrosia beetles of Michigan (Coleoptera: Curculionidae, Scolytinae). *The Great Lakes Entomologist*, *42*(3–4), 101–120.

COMTF (California Oak Mortality Task Force). (2006a). California Oak Mortality Task Force Report October 2006. 8 pp. https://www.suddenoakdeath.org/library/newsletter-archive/ (accessed 2024-03-05).

COMTF (California Oak Mortality Task Force). (2006b). 2006 Sudden Oak Death & *Phytophthora ramorum* Summary Report, A Compendium of COMTF Monthly Newsletters. 35 pp. https://www.suddenoakdeath.org/library/newsletter-archive/ (accessed 2024-03-05).

Conners, I. L. (1967). *An annotated index of plant diseases in Canada and fungi recorded on plants in Alaska, Canada and Greenland*. Publ. Research branch Canada Department of Agriculture, 1251, 381 pp.

Craighead, F. C. (1923). *North American cerambycid larvae. A classification and the biology of north American cerambycid larvae*. *Dominion of Canada, Department of Agriculture*, *27*, 268.

Cunnington, J. H., & Pascoe, I. G. (2003). Post entry quarantine interception of chestnut blight in Victoria. *Australasian Plant Pathology*, *32*, 569–570. https://doi.org/10.1071/AP03067

Dai, Y. C., Cui, B. K., Yuan, H. S., & Li, B. D. (2007). Pathogenic wood-decaying fungi in China. *Forest Pathology*, *37*(2), 105–120. https://doi.org/10.1111/j.1439-0329.2007.00485.x

Dajoz, R. (2005). Les Coléoptères corticoles d'un érable rouge (*Acer rubrum*) en Caroline du Nord (Etats-Unis). Liste des espèces et étude biométrique du Brentidae *Arrenodes minutus* (Drury, 1770). *L'entomologiste*, *61*, 193–199.

Davidson, J. M., Rizzo, D. M., Garbelotto, M., Tjosvold, S., & Slaughter, G. W. (2002). *Phytophthora ramorum* and sudden oak death in California: II. Transmission and survival. In R. B. Standiford, D. McCreary, & K. L. Purcell (Eds.), *Proceedings of the fifth symposium on oak woodlands: Oaks in California's challenging landscape* (pp. 741–749). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Davidson, J. M., Werres, S., Garbelotto, M., Hansen, E. M., & Rizzo, D. M. (2003). Sudden oak death and associated diseases caused by *Phytophthora ramorum*. *Plant Health Progress*, *4*(1), 23. https://doi.org/10.1094/php-2003-0707-01-dg

Davidson, J. M., Wickland, A. C., Patterson, H. A., Falk, K. R., & Rizzo, D. M. (2005). Transmission of *Phytophthora ramorum* in mixed-evergreen forest in California. *Phytopathology*, *95*, 587–596. https://doi.org/10.1094/phyto-95-0587

Davidson, R. W. (1944). Two American hardwood species of *Endoconidiophora* described as new. *Mycologia*, *36*(3), 300–306.

Davidson, R. W. (1958). Additional species of Ophiostomataceae from Colorado. *Mycologia*, *50*(5), 661–670.

Davidson, R. W., & Lorenz, R. C. (1938). Species of *Eutypella* and *Schizoxylon* associated with cankers of maple. *Phytopathology*, *28*, 733–745.
De Beer, Z. W., Procter, M., Wingfield, M. J., Marincowitz, S., & Duong, T. A. (2022). Generic boundaries in the Ophiostomatales reconsidered and revised. *Studies in Mycology*, *101*(1), 57–120. https://doi.org/10.3114/sim.2022.101.02
DEFRA (Department for Environment, Food and Rural Affairs). (2008). *Consultation on future management of risks from Phytophthora ramorum and Phytophthora kernoviae* (p. 22). Department for Environment, Food and Rural Affairs.
den Nijs, L. J. M. F., Brinkman, H., & van der Sommen, A. T. C. (2004). A Dutch contribution to knowledge on phytosanitary risk and host status of various crops for *Meloidogyne chitwoodi* Golden et al., 1980 and *M. fallax* Karssen, 1996: An overview. *Nematology*, *6*(3), 303–312. https://doi.org/10.1163/1568541042360492
Denman, S., Kirk, S. A., Brasier, C. M., & Webber, J. F. (2005). In vitro leaf inoculation studies as an indication of tree foliage susceptibility to *Phytophthora ramorum* in the UK. *Plant Pathology*, *54*(4), 512–521. https://doi.org/10.1111/j.1365-3059.2005.01243.x
Desprez-Loustau, M.-L., Balci, Y., Cornara, D., Gonthier, P., Robin, C., & Jacques, M.-A. (2021). Is *Xylella fastidiosa* a serious threat to European forests? *Forestry*, *94*, 1–17.
Deyrup, M. A. (1981). Annotated list of Indiana Scolytidae (Coleoptera). *The Great Lakes Entomologist*, *14*, 1–9.
DiGirolomo, M. F., Bohne, M. J., Dodds, K. J., Gapinski, A. T., DelRosso, J. S., Charap, J. G., & Evans, S. C. (2022). Utilizing urban arboreta for detection of native and non-native wood-inhabiting beetles. *Agricultural and Forest Entomology*, *24*(1), 72–96. https://doi.org/10.1111/afe.12470
Dijksterhuis, J. (2007). Heat-resistant ascospores. In J. Dijksterhuis & R. A. Samson (Eds.), *Food mycology: A multifaceted approach to fungi and food* (Vol. *25*, pp. 115–132). CRC.
DiLeo, M. V., Bienapfl, J. C., & Rizzo, D. M. (2008). *Phytophthora ramorum* infects hazelnut, vine maple, blue blossom, and manzanita species in California. *Plant Health Progress*, *9*(1), 3. https://doi.org/10.1094/php-2008-0118-02-br
Dodge, H. R. (1938). *The bark beetles of Minnesota (Coleoptera: Scolytidae)* (Vol. *132*, p. 60). University of Minnesota Agricultural Experiment Station, *Technical Bulletin*.
Dutta, G., & Singh, R. K. (2023). Five new records of *Annulohypoxylon* spp. (Hypoxylaceae) from India. *New Zealand Journal of Botany*, 1–12. https://doi.org/10.1080/0028825X.2023.2248933
EFSA (European Food Safety Authority), Gibin, D., Gutierrez Linares, A., Fasanelli, E., Pasinato, L., & Delbianco, A. (2023a). Update of the *Xylella* spp. host plant database – Systematic literature search up to 30 June 2023. *EFSA Journal*, *21*(12), e8477. https://doi.org/10.2903/j.efsa.2023.8477
EFSA (European Food Safety Authority), Ipekdal, K., Rassati, D., & Graziosi, I. (2023b). Pest survey card on *Arrhenodes minutus*. *EFSA Supporting Publication*, EN-8219. https://doi.org/10.2903/sp.efsa.2023.EN-8219
EFSA PLH Panel (EFSA Panel on Plant Health). (2011). Scientific opinion on the Pest risk analysis on *Phytophthora ramorum* prepared by the FP6 project RAPRA. *EFSA Journal*, *9*(6), 2186. https://doi.org/10.2903/j.efsa.2011.2186
EFSA PLH Panel (EFSA Panel on Plant Health), Jeger, M., Bragard, C., Chatzivassiliou, E., Dehnen-Schmutz, K., Gilioli, G., Jaques Miret, J. A., MacLeod, A., Navajas Navarro, M., Niere, B., Parnell, S., Potting, R., Rafoss, T., Urek, G., Van Bruggen, A., Van der Werf, W., West, J., Winter, S., Maresi, G., … Rossi, V. (2016). Risk assessment and reduction options for *Cryphonectria parasitica* in the EU. *EFSA Journal*, *14*(12), 4641. https://doi.org/10.2903/j.efsa.2016.4641
EFSA PLH Panel (EFSA Panel on Plant Health), Jeger, M., Bragard, C., Caffier, D., Candresse, T., Chatzivassiliou, E., Dehnen-Schmutz, K., Gilioli, G., Gregoire, J.-C., Jaques Miret, J. A., MacLeod, A., Navajas Navarro, M., Niere, B., Parnell, S., Potting, R., Rafoss, T., Rossi, V., Urek, G., Van Bruggen, A., … Pautasso, M. (2017a). Scientific Opinion on the pest categorisation of *Davidsoniella virescens*. *EFSA Journal*, *15*(12), 5104. https://doi.org/10.2903/j.efsa.2017.5104
EFSA PLH Panel (EFSA Panel on Plant Health), Jeger, M., Bragard, C., Caffier, D., Candresse, T., Chatzivassiliou, E., Dehnen Schmutz, K., Gilioli, G., Gregoire, J.-C., Jaques Miret, J. A., MacLeod, A., Navajas Navarro, M., Niere, B., Parnell, S., Potting, R., Rafoss, T., Rossi, V., Urek, G., Van Bruggen, A., … Pautasso, M. (2017b). Scientific opinion on the pest categorisation of *Entoleuca mammata*. *EFSA Journal*, *15*(7), 4925. https://doi.org/10.2903/j.efsa.2017.4925
EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Dehnen-Schmutz, K., Di Serio, F., Gonthier, P., Jacques, M.-A., Jaques Miret, J. A., Fejer Justesen, A., MacLeod, A., Magnusson, C. S., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., Zappalà, L., … Milonas, P. (2019). Scientific opinion on the pest categorisation of *Arrhenodes minutus*. *EFSA Journal*, *17*(2), 5617. https://doi.org/10.2903/j.efsa.2019.5617
Elliot, M., Meagher, T. R., Harris, C., Searle, K., Purse, B. V., & Schlenzig, A. (2013). The epidemiology of *Phytophthora ramorum* and *P. kernoviae* at two historic gardens in Scotland. In S. J. Frankel, J. T. Kliejunas, K. M. Palmieri, & J. M. Alexander (Eds.), *Sudden oak death fifth science symposium* (pp. 23–32). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.
Ellis, J. B., & Everhart, B. M. (1888). Synopsis of the north American species of *Hypoxylon* and *Nummularia* (continued). *The Journal of Mycology*, *4*(9), 85–95.
Englander, L., Browning, M., & Tooley, P. W. (2006). Growth and sporulation of *Phytophthora ramorum* in vitro in response to temperature and light. *Mycologia*, *98*(3), 365–373. https://doi.org/10.3852/mycologia.98.3.365
EPPO (European and Mediterranean Plant Protection Organization). (2021). *EPPO Pest risk analysis for Chrysobothris femorata and C. mali. Technical document, 1083* (p. 114). EPPO. https://gd.eppo.int/taxon/CHRBFE/documents
EPPO (European and Mediterranean Plant Protection Organization). (2024a). EPPO Global Database. https://gd.eppo.int/ (accessed 2024-03-07).
EPPO (European and Mediterranean Plant Protection Organization). (2024b). *Davidsoniella virescens* (CERAVI), Distribution. https://gd.eppo.int/taxon/CERAVI/distribution (accessed 2024-03-07).
EPPO (European and Mediterranean Plant Protection Organization). (2024c). *Davidsoniella virescens* (CERAVI), Distribution details in Canada (Ontario). https://gd.eppo.int/taxon/CERAVI/distribution/CA_ot (accessed 2024-03-07).
EPPO (European and Mediterranean Plant Protection Organization). (2024d). *Phytophthora ramorum* (PHYTRA), Distribution. https://gd.eppo.int/taxon/PHYTRA/distribution (accessed 2024-03-04).
EPPO (European and Mediterranean Plant Protection Organization). (2024e). *Phytophthora ramorum* (PHYTRA), Categorization. https://gd.eppo.int/taxon/PHYTRA/categorization (accessed 2024-03-04).
EPPO (European and Mediterranean Plant Protection Organization). (2024f). *Phytophthora ramorum* (PHYTRA), Distribution details in Canada (British Columbia). https://gd.eppo.int/taxon/PHYTRA/distribution/CA_bc (accessed 2024-03-04).
EPPO (European and Mediterranean Plant Protection Organization). (2024g). *Phytophthora ramorum* (PHYTRA), Host plants. https://gd.eppo.int/taxon/PHYTRA/hosts (accessed 2024-03-05).
EPPO (European and Mediterranean Plant Protection Organization). (2024h). *Cryphonectria parasitica* (ENDOPA), Categorization. https://gd.eppo.int/taxon/ENDOPA/categorization (accessed 2024-04-30).
EPPO (European and Mediterranean Plant Protection Organization). (2024i). *Cryphonectria parasitica* (ENDOPA), Distribution. https://gd.eppo.int/taxon/ENDOPA/distribution (accessed 2024-04-30).
EPPO (European and Mediterranean Plant Protection Organization). (2024j). *Entoleuca mammata* (HYPOMA), Categorization. https://gd.eppo.int/taxon/HYPOMA/categorization (accessed 2024-04-12).
EPPO (European and Mediterranean Plant Protection Organization). (2024k). *Entoleuca mammata* (HYPOMA), Distribution. https://gd.eppo.int/taxon/HYPOMA/distribution (accessed 2024-04-12).

EPPO (European and Mediterranean Plant Protection Organization). (2024l). *Entoleuca mammata* (HYPOMA), Datasheet. https://gd.eppo.int/taxon/HYPOMA/datasheet (accessed 2024-04-12).
EPPO (European and Mediterranean Plant Protection Organization). (2024m). *Xyleborus ferrugineus* (XYLBFE), Categorization. https://gd.eppo.int/taxon/XYLBFE/categorization (accessed 2024-04-22).
EPPO (European and Mediterranean Plant Protection Organization). (2024n). *Xyloterinus politus* (XYORPO), Reporting. https://gd.eppo.int/taxon/XYORPO/reporting (accessed 2024-04-22).
EPPO (European and Mediterranean Plant Protection Organization). (2024o). *Euwallacea fornicatus sensu stricto* (EUWAWH), Datasheet. https://gd.eppo.int/taxon/EUWAWH/datasheet (accessed 2024-04-14).
EPPO (European and Mediterranean Plant Protection Organization). (2024p). *Arrhenodes minutus* (ARRHMI), Categorization. https://gd.eppo.int/taxon/ARRHMI/categorization (accessed 2024-04-20).
EPPO (European and Mediterranean Plant Protection Organization). (2024q). *Arrhenodes minutus* (ARRHMI), Distribution. https://gd.eppo.int/taxon/ARRHMI/distribution (accessed 2024-04-20).
EPPO (European and Mediterranean Plant Protection Organization). (2024r). *Arrhenodes minutus*, Datasheet. https://gd.eppo.int/taxon/ARRHMI/datasheet (accessed 2024-04-20).
EPPO (European and Mediterranean Plant Protection Organization). (2024s). *Chrysobothris femorata* (CHRFBE), Categorization. https://gd.eppo.int/taxon/CHRBFE/categorization (accessed 2024-04-12).
EPPO (European and Mediterranean Plant Protection Organization). (2024t). *Chrysobothris mali* (CHRBMA). https://gd.eppo.int/taxon/CHRBMA/categorization (accessed 2024-04-19).
EPPO (European and Mediterranean Plant Protection Organization). (2024u). *Chrysobothris femorata* (CHRFBE), Hosts. https://gd.eppo.int/taxon/CHRBFE/hosts (accessed 2024-04-20).
EPPO (European and Mediterranean Plant Protection Organization). (2024v). *Chrysobothris mali* (CHRBMA), Hosts. https://gd.eppo.int/taxon/CHRBMA/hosts (accessed 2024-04-19).
EPPO (European and Mediterranean Plant Protection Organization). (2024w). *Prionoxystus robiniae* (PRIXRO), Categorization. https://gd.eppo.int/taxon/PRIXRO/categorization (accessed 2024-04-18).
EPPO (European and Mediterranean Plant Protection Organization). (2005). PM 7/45 (1) *Cryphonectria parasitica*. *Bulletin OEPP/EPPO Bulletin*, *35*, 271–273.
EPPO (European and Mediterranean Plant Protection Organization). (2020). *EPPO technical document No. 1081, EPPO study on the risk of bark and ambrosia beetles associated with imported non-coniferous wood*. EPPO. https://www.eppo.int/RESOURCES/eppo_publications
Erwin, D. C., & Ribeiro, O. K. (1996). *Phytophthora diseases worldwide* (p. 562). APS Press, American Phytopathological Society.
Eskalen, A., Stouthamer, R., Lynch, S. C., Twizeyimana, M., Gonzalez, A., & Thibault, T. (2013). Host range of *Fusarium* dieback and its ambrosia beetle (Coleoptera: Scolytinae) vector in southern California. *Plant Disease*, *97*, 938–951. https://doi.org/10.1094/pdis-11-12-1026-re
EUROPHYT. (2024). European Union Notification System for Plant Health Interceptions. https://ec.europa.eu/food/plants/plant-health-and-biosecurity/European-union-notification-system-plant-health-interceptionsen (accessed 2024-05-15).
Eyre, F. H., & Zillgitt, W. M. (1953). *Partial cuttings in northern hardwoods of the Lake States: Twenty-year experimental results*. USDA, United States Department of Agriculture, 1076, 52 pp.
FAO (Food and Agriculture Organization of the United Nations). (2024a). *ISPM (International standards for phytosanitary measures) No 4. Requirements for the establishment of pest free areas*. FAO. Available online: https://www.ippc.int/en/publications/614/
FAO (Food and Agriculture Organization of the United Nations). (2024b). *ISPM (International standards for phytosanitary measures) No. 5. Glossary of phytosanitary terms*. FAO. Available online: https://www.ippc.int/en/publications/622/
Farr, D. F., & Rossman, A. Y. (2024). Fungal Databases, U.S. National Fungus Collections, ARS, USDA. https://fungi.ars.usda.gov/ (accessed 2024-04-18).
Feil, H., & Purcell, A. H. (2001). Temperature-dependent growth and survival of *Xylella fastidiosa* in vitro and in potted grapevines. *Plant Disease*, *85*, 1230–1234. https://doi.org/10.1094/pdis.2001.85.12.1230
Felt, E. P. (1905). *Insects affecting park and woodland trees*. In *New York state museum memoir 8(1)* (p. 459). New York State Education Department.
Fenton, F. (1942). The flatheaded apple tree borer (*Chrysobothris femorata* (Oliver)). *Experimental Station Bulletin, B-259*, 32.
Fernando, A., Ring, F., Lowe, D., & Callan, B. (1999). *Index of plant pathogens, plant-associated microorganisms, and forest fungi of British Columbia* (p. 459). Pacific Forestry Centre.
Fields, P., Subramanyam, B., & Hulasare, R. (2012). 15 Extreme temperatures. In D. W. Hogstrum, T. W. Phillips, & G. Cuperus (Eds.), *Stored product protection* (pp. 179–190). Kansas state University.
Fields, P. G., & White, N. D. (2002). Alternatives to methyl bromide treatments for stored-product and quarantine insects. *Annual Review of Entomology*, *47*(1), 331–359. https://doi.org/10.1146/annurev.ento.47.091201.145217
Fleming, W. E. (1972). *Biology of the Japanese beetle. Technical Bulletin, Agricultural Research Service, USDA*, *no 1449*, 129.
Flott, J. J., & Gilbertson, R. L. (1991). Cultural studies of four north American species of *Perenniporia* (Aphyllophorales: Polyporaceae). *Mycological Research*, *95*(9), 1113–1122. https://doi.org/10.1016/s0953-7562(09)80557-1
Funahashi, F., & Parke, J. L. (2018). Thermal inactivation of inoculum of two *Phytophthora* species by intermittent versus constant heat. *Phytopathology*, *108*(7), 829–836. https://doi.org/10.1094/phyto-06-17-0205-r
Garbelotto, M., Davidson, J., Ivors, K., Maloney, P., Hüberli, D., Koike, S. T., & Rizzo, D. (2003). Non-oak native plants are main hosts for sudden oak death pathogen in California. *California Agriculture*, *57*(1), 18–23. https://doi.org/10.3733/ca.v057n01p18
GBIF (Global Biodiversity Information Facility) Secretariat. (2024). GBIF BackBone Taxonomy. https://www.gbif.org/ (accessed 2024-04-26).
Gibbs, J. N. (1993). Biology of Ophiostomatiod fungi causing sapstain in trees and freshly cut logs. In M. J. Wingfield, K. Seifert, & J. F. Webber (Eds.), *Ophiostoma and Ceratocystis: Taxonomy, biology and pathogenicity* (pp. 153–160). American Phytopathological Society: Minnesota.
Gilbertson, R. L. (1973). Notes on some corticioid lignicolous fungi associated with snowbanks in southern Arizona. *Persoonia*, *7*(2), 171–182.
Gilbertson, R. L., & Bigelow, D. M. (1998). Annotated checklist of wood-rotting basidiomycetes of the Sky Islands in southeastern Arizona. *Journal of the Arizona-Nevada Academy of Science*, *31*(1), 13–36.
Gilbertson, R. L., Burdsall, H. H., Jr., & Larsen, M. J. (1975). Notes on wood-rotting hymenomycetes in New Mexico, Southw. *Naturalist*, *19*(4), 347–360.
Ginns, J. (1998). Genera of the north American Corticiaceae sensu lato. *Mycologia*, *90*(1), 1–35.
Ginns, J. H. (1986). *Compendium of plant disease and decay fungi in Canada, 1960–1980* (p. 440). Canadian Government Publishing Centre.
Glaeser, J. A., & Smith, K. T. (2013). Decay fungi of riparian trees in the southwestern US. *Western Arborist (Fall 2013)*, 40–51.
Good, H. M., & Nelson, C. D. (1951). A histological study of sugar maple decayed by *Polyporus glomeratus* Peck. *Canadian Journal of Botany*, *29*(3), 215–223.
Gosling, D. C. L. (1984). Cerambycid host plants in a southwestern Michigan woodland (Coleoptera: Cerambycidae). *The Great Lakes Entomologist*, *17*(2), 69–78.
Goss, E. M., Larsen, M., Vercauteren, A., Werres, S., Heungens, K., & Grünwald, N. J. (2011). *Phytophthora ramorum* in Canada: Evidence for migration within North America and from Europe. *Phytopathology*, *101*(1), 166–171. https://doi.org/10.1094/phyto-05-10-0133
Griffin, H. D. (1968). The genus *Ceratocystis* in Ontario. *Canadian Journal of Botany*, *46*(5), 689–718. https://cdnsciencepub.com/doi/abs/10.1139/b68-094?journalCode=cjb1

Grünwald, N. J., Goss, E. M., Ivors, K., Garbelotto, M., Martin, F. N., Prospero, S., Hansen, E., Bonants, P. J. M., Hamelin, R. C., Chastagner, G., Werres, S., Rizzo, D. M., Abad, G., Beales, P., Bilodeau, G. J., Blomquist, C. L., Brasier, C., Brière, S. C., Chandelier, A., … Widmer, T. L. (2009). Standardizing the nomenclature for clonal lineages of the sudden oak death pathogen, *Phytophthora ramorum*. *Phytopathology*, *99*(7), 792–795.

Grünwald, N. J., Goss, E. M., & Press, C. M. (2008). *Phytophthora ramorum*: A pathogen with a remarkably wide host range causing sudden oak death on oaks and ramorum blight on woody ornamentals. *Molecular Plant Pathology*, *9*(6), 729–740. https://doi.org/10.1111/j.1364-3703.2008.00500.x

Guzmàn, G., & Varela, L. (1979). Observaciones sobre el hongo *Bondarzewia berkeleyi* en Mexico. *Boletin de la Sociedad Mexicana de Micologia*, *13*, 55–62.

Haack, R. A., & Petrice, T. R. (2022). Mortality of bark- and wood-boring beetles (Coleoptera: Buprestidae, Cerambycidae, and Curculionidae) in naturally infested heat-treated ash, birch, oak, and pine bolts. *Journal of Economic Entomology*, *115*(6), 1964–1975. https://doi.org/10.1093/jee/toac138

Halik, S., & Bergdahl, D. R. (2002). Potential beetle vectors of *Sirococcus clavigignenti-juglandacearum* on butternut. *Plant Disease*, *86*(5), 521–526.

Hallinen, M. J., Steffens, W. P., Schultz, J. L., Wittman, J. T., & Aukema, B. H. (2021). *The Jewel beetles of Minnesota* (p. 121). University of Minnesota, Department of Entomology.

Hanlin, R. T. (1963). A revision of the ascomycetes of Georgia, Mimeograph Series. *University of Georgia Agricultural Experiment Station*, *175*, 68.

Hannon, E. R., & Beers, E. H. (2024). *Carpenterworm, Prionoxystus robiniae Peck (Lepidoptera: Cossidae)*. Washington State University. https://treefruit.wsu.edu/crop-protection/opm/carpenterworm/ (accessed 2024-04-26).

Hannon, E. R., Rodstrom, R. A., Chong, J. M., & Brown, J. J. (2017). Carpenterworm moth. *Insect Pest Management in Hybrid Poplars Series*, 7.

Hara, A. H., & Beardsley, J. W. (1979). The biology of the black twig borer, *Xylosandrus compactus* (Eichhoff), in Hawaii. *Proceedings of the Hawaiian Entomological Society*, *23*, 55–70.

Harnik, T. Y., Mejia-Chang, M., Lewis, J., & Garbelotto, M. (2004). Efficacy of heat-based treatments in eliminating the recovery of the sudden oak death pathogen (*Phytophthora ramorum*) from infected California bay laurel leaves. *HortScience*, *39*(7), 1677–1680. https://doi.org/10.21273/hortsci.39.7.1677

Harrington, T. C., Steimel, J., & Kile, G. (1998). Genetic variation in three *Ceratocystis* species with outcrossing, selfing and asexual reproductive strategies. *Forest Pathology*, *28*, 217–226. https://doi.org/10.1111/j.1439-0329.1998.tb01176.x

Harrington, T. C., Steimel, J. P., Wingfield, M. J., & Kile, G. A. (1996). Isozyme variation and species delimitation in the *Ceratocystis coerulescens* complex. *Mycologia*, *88*(1), 104–113. https://doi.org/10.2307/3760789

Hawes, C. R., & Beckett, A. (1977). Conidium ontogeny in the Chalara state of *Ceratocystis adiposa*: I. Light microscopy. *Transactions of the British Mycological Society*, *68*(2), 259–265.

Hazen, C. R., & Roeper, R. A. (1980). Observations of the ambrosia beetle *Xyleborus sayi* (Coleoptera Scolytidae) infesting subcanopy maples in Michigan. *Great Lakes Entomologist*, *13*, 145–147.

Heinzelmann, R., Dutech, C., Tsykun, T., Labbé, F., Soularue, J. P., & Prospero, S. (2019). Latest advances and future perspectives in *Armillaria* research. *Canadian Journal of Plant Pathology*, *41*(1), 1–23. https://doi.org/10.1080/07060661.2018.1558284

Heppner, J. B., & Habeck, D. H. (1976). Insects associated with *Polygonum* (Polygonaceae) in North Central Florida I. Introduction and Lepidoptera. *Florida Entomologist*, *59*(3), 231–239.

Hepting, G. H. (1944). Sapstreak, a new killing disease of sugar maple. *Phytopathology*, *34*, 2069–2076.

Hepting, G. H. (1971). *Diseases of forest and shade trees of the United States*. USDA, United States Department of Agriculture, Forest Service. *Agriculture Handbook*, *386*, 658.

Herrick, G. W. (1935). *Insect enemies of shade-trees* (p. 417). Comstock.

Hirt, R. R. (1930). *Fomes everhartii* associated with the production of sterile rimose bodies on *Fagus grandifolia*. *Mycologia*, *22*(6), 310–311.

Hoddle, M. S., Triapitsyn, S. V., & Morgan, D. J. W. (2003). Distribution and plant association records for *Homalodisca coagulata* (Hemiptera: Cicadellidae) in Florida. *Florida Entomologist*, *86*(1), 89–91.

Hodges, G., Edwards, G. B., & Dixon, W. (2005). Chilli thrips *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) a new pest thrips for Florida. Florida Department of Agriculture and Consumer Service, department of primary industries. *Pest Alert*, 3. https://ccmedia.fdacs.gov/content/download/68187/file/Pest_Alert_-_Scirtothrips_dorsalis,_Chilli_Thrips.pdf

Hoebeke, E. R. (1991). An Asian ambrosia beetle, *Ambrosiodmus lewisi*, new to North America (Coleoptera: Scolytidae). *Proceedings of the Entomological Society of Washington*, *93*(2), 420–424.

Houston, D. H. (1986). Sap streak of sugar maple: Appearance of lumber from diseased trees and longevity of *Ceratocystis coerulescens* in air-dried lumber. *Phytopathology*, *76*, 653.

Houston, D. R. (1994). *Sapstreak disease of sugar maple: Development over time and space*. US Department of Agriculture, Forest Service. *Northeastern Forest Experiment Station*, *687*, 24. https://doi.org/10.2737/ne-rp-687

Hunt, J. (1956). Taxonomy of the genus *Ceratocystis*. *Loydia*, *19*(1), 1–58.

Index Fungorum. (2024). https://www.indexfungorum.org/ (accessed 2024-05-17).

Jaynes, R. A., & DePalma, N. D. (1984). Natural infection of nuts of *Castanea dentata* by *Endothia paratitica*. *Phytopathology*, *74*, 296–299. https://doi.org/10.1094/phyto-74-296

Johnson, A. J., Atkinson, T. H., & Hulcr, J. (2016). Two remarkable new species of *Hypothenemus* Westwood (Curculionidae: Scolytinae) from southeastern USA. *Zootaxa*, *4200*(3), 417–425.

Jones, T. W. (1973). Killing the oak wilt fungus in logs. *Forest Products Journal*, *23*(11), 52–54.

Jung, T., Horta Jung, M., Webber, J. F., Kageyama, K., Hieno, A., Masuya, H., Uematsu, S., Pérez-Sierra, A., Harris, A. R., Forster, J., & Rees, H. (2021). The destructive tree pathogen *Phytophthora ramorum* originates from the laurosilva forests of East Asia. *Journal of Fungi*, *7*(3), 226. https://doi.org/10.3390/jof7030226

Juzwik, J., Yang, A., Chen, Z., White, M. S., Shugrue, S., & Mack, R. (2019). Vacuum steam treatment eradicates viable *Bretziella fagacearum* from logs cut from wilted *Quercus rubra*. *Plant Disease*, *103*(2), 276–283. https://doi.org/10.1094/pdis-07-18-1252-re

Karren, J. B., & Roe, A. H. (2019). *Utah pests, fact sheet, Carpenterworm (Prionoxystus robiniae)* (p. 3). Utah State University Extension and Utah Plant Pest Diagnostic Laboratory.

Keck, M., Reich, H., Chartier, R., & Paulin, J. P. (1995). First record of fire blight (*Erwinia amylovora*) in Austria preliminary experiments on the survival on fruit boxes. *In VII International Workshop on Fire Blight*, *411*, 9–12.

Kehr, R., Pehl, L., Wulf, A., Schröder, T., & Kaminski, K. (2004). Zur Gefährdung von Bäumen und Waldökosystemen durch eingeschleppte Krankheiten und Schädlinge. *Nachrichtenblatt Des Deutschen Pflanzenschutzdienstes*, *56*(10), 217–238.

Kessler, K. J., Jr., & Anderson, R. L. (1960). *Ceratocystis coerulescens* on sugar maple in the Lake states. *Plant Disease Reporter*, *44*(5), 348–350.

Kessler, K. J. (1972). Sapstreak disease of sugar maple. Department of Agriculture, Forest Service. *Forest Pest Leaflet*, *128*, 1–4.

Kim, M. S., Klopfenstein, N. B., Hanna, J. W., & McDonald, G. I. (2006). Characterization of North American *Armillaria* species: Genetic relationships determined by ribosomal DNA sequences and AFLP markers. *Forest Pathology*, *36*(3), 145–164. https://doi.org/10.1111/j.1439-0329.2006.00441.x

King, K. M., Harris, A. R., & Webber, J. F. (2015). In planta detection used to define the distribution of the European lineages of *Phytophthora ramorum* on larch (*Larix*) in the UK. *Plant Pathology*, *64*, 1168–1175. https://doi.org/10.1111/ppa.12345

Kirkendall, L. R., Biedermann, P. H., & Jordal, B. H. (2015). Evolution and diversity of bark and ambrosia beetles. In F. E. Vega & R. W. Hofstetter (Eds.), *Bark beetles: Biology and ecology of native and invasive species* (pp. 85–156). Academic Press.

Kosztarab, M. (1962). *The armored scale insects of Ohio (Homoptera: Coccoidea: Diaspididae)*. [Doctoral dissertation, The Ohio State University, Department of Zoology and Entomology].

Kuhnert, E., Sir, E. B., Lambert, C., Kevin, D., Hyde, K. D., Hladk, A. I., Romero, A. I., Rohde, M., & Stadler, M. (2016). Phylogenetic and chemotaxonomic resolution of the genus *Annulohypoxylon* (Xylariaceae) including four new species. *Fungal Diversity*, *85*, 1–43. https://doi.org/10.1007/s13225-016-0377-6

Kuschel, G. (1990). *Beetles in a suburban environment: A New Zealand case study. DSIR Plant Protection Report*, *3*, 1–120. https://doi.org/10.1080/00288233.1993.10427498

Langham, R.J. (1994). A biosystematic study of three plant pathogenic fungi. [master thesis, eastern Illinois university, Charleston, Illinois].

Leininger, T. D. (1999). A guide to major insects, diseases, air pollution injury, and chemical injury of sycamore. *Southern Research Station*, General Technical Report SRS-28, 44.

Lesica, P., Atthowe, H. E., & Dugan, F. M. (2003). Incidence of *Perenniporia fraxinophila* and its effects on green ash (*Fraxinus pennsylvanica*) woodlands in eastern Montana, USA. *Forest Ecology and Management*, *182*(1–3), 153–159. https://doi.org/10.1016/s0378-1127(03)00011-2

Li, S.-J., Xue, X., Ahmed, M. Z., Ren, S.-X., Du, Y.-Z., Wu, J.-H., Cuthbertson, A. G. S., & Qiu, B.-L. (2011). Host plants and natural enemies of *Bemisia tabaci* (Hemiptera: Aleyrodidae) in China. *Insect Science*, *18*, 101–120. https://doi.org/10.1111/j.1744-7917.2010.01395.x

Lin, Y. C., Wei, C. L., Chen, C. Y., Chen, C. C., & Wu, S. H. (2021). Three new species of *Cylindrobasidium* (Physalacriaceae, Agaricales) from East Asia. *Mycological Progress*, *20*(10), 1297–1308.

Linderman, R. G., & Davis, E. A. (2008). Eradication of *Phytophthora ramorum* and other pathogens from potting medium or soil by treatment with aerated steam or fumigation with metam sodium. *HortTechnology*, *18*(1), 106–110. https://doi.org/10.21273/horttech.18.1.106

Lorenz, R. C., & Davidson, R. W. (1939). Observations on several disease of hardwoods in the Lake states. *Plant Disease Reporter*, *23*, 384–385.

Lowe, D. P. (1969). *Check list and host index of bacteria, fungi and mistletoes of British Columbia* (p. 392). Forest branch department of fisheries and forestry. Forest research laboratory Victoria.

Lowe, J. L. (1952). Perennial polypores of North America. Fomes with Colored Spores. *Mycologia*, *44*(2), 228–238.

Lutter, R., Drenkhan, R., Tullus, A., Jürimaa, K., Tullus, T., & Tullus, H. (2019). First record of *Entoleuca mammata* in hybrid aspen plantations in hemiboreal Estonia and stand-environmental factors affecting its prevalence. *European Journal of Forest Research*, *138*(2), 263–274. https://doi.org/10.1007/s10342-019-01165-7

MacLean, D., & Giese, R. (1967). The life history of the ambrosia beetle *Xyloterinus politus* (Coleoptera: Scolytidae). *The Canadian Entomologist*, *99*, 285–299. https://doi.org/10.4039/ent99285-3

MacRae, T. C., & Rice, M. E. (2007). Biological and distributional observations on north American Cerambycidae (Coleoptera). *The Coleopterists Bulletin*, *61*(2), 227–263. https://doi.org/10.1649/0010-065x(2007)61[227:badoon]2.0.co;2

Maekawa, N., Tsuneda, A., & Arita, I. (1987). *Ceratocystis* species occurring on the *Lentinus edodes* bedlogs. *Reports of the Tottori Mycological Institute*, *25*, 6–14.

Majka, C. G., Anderson, R. S., & McCorquodale, D. B. (2007). The weevils (Coleoptera: Curculionoidea) of the maritime provinces of Canada, II: New records from Nova Scotia and Prince Edward Island and regional zoogeography. *The Canadian Entomologist*, *139*(3), 397–442.

Mandelshtam, M. Y., Yakushkin, E. A., & Petrov, A. V. (2018). Oriental ambrosia beetles (Coleoptera: Curculionidae: Scolytinae): New inhabitants of Primorsky krai in Russia. *Russian Journal of Biological Invasions*, *9*(4), 355–365. https://doi.org/10.1134/s2075111718040082

Manion, P. D., & Griffin, D. H. (1986). Sixty-five years of research on Hypoxylon canker of aspen. *Plant Disease*, *70*(8), 803–808. https://doi.org/10.1094/pd-70-803

Martinez-Valdez, F. J., Carrillo-Sancen, G., & Loera, O. (2022). Heat stress on *Fomes* culture reduces proteases and improves laccases thermostability. *Revisita Mexicana de. Ingenieria Quimica*, *21*(3), Bio2860. https://doi.org/10.24275/rmiq/bio2860

Martins, D., Astua-Monge, G., Coletta-Filho, H. D., Winck, F. V., Baldasso, P. A., De Oliveira, B. M., Marangoni, S., Machado, M. A., Novello, J. C., & Smolka, M. B. (2007). Absence of classical heat shock response in the citrus pathogen *Xylella fastidiosa*. *Current Microbiology*, *54*, 119–123. https://doi.org/10.1007/s00284-006-0215-2

Mathiassen, G. (1993). Corticolous and lignicolous Pyrenomycetes s. lat. (Ascomycetes) on along a mid-Scandinavian transect. *Sommerfeltia*, *20*(1), 1–185.

Maxwell, M. J. (1937). Studies on *Chrysobothris femorata* fab. in Oklahoma. [bachelor thesis, Oklahoma agricultural and mechanical college].

Mayers, C., McNew, D. L., Harrington, T. C., Roeper, R. A., Fraedrich, S. W., Biedermann, P. H., Castrillo, L. A., & Reed, S. E. (2015). Three genera in the Ceratocystidaceae are the respective symbionts of three independent lineages of ambrosia beetles with large, complex mycangia. *Fungal Biology*, *119*(11), 1075–1092. https://doi.org/10.1016/j.funbio.2015.08.002

Mayers, C. G. (2018). *Co-adaptations between Ceratocystidaceae ambrosia fungi and the mycangia of their associated ambrosia beetles. Doctoral disertation*. Iowa State University.

Mayers, C. G., Harrington, T. C., Masuya, H., Jordal, B. H., McNew, D. L., Shih, H. H., Roets, F., & Kietzka, G. J. (2020). Patterns of coevolution between ambrosia beetle mycangia and the Ceratocystidaceae, with five new fungal genera and seven new species. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, *44*(1), 41–66. https://doi.org/10.3767/persoonia.2020.44.02

McAlpine, R. G. (1961). *Hypoxylon tinctor* associated with a canker on American sycamore [*Platanus occidentalis*] trees in Georgia. *Plant Disease Reporter*, *45*(3), 196–198.

McCorquodale, D. B., Brown, J. M., & Marshall, S. A. (2007). A decline in the number of long-horned wood boring beetle (Coleoptera: Cerambycidae) species in Ontario during the 20th century. *Journal of the Entomological Society of Ontario*, *138*, 107–135.

McKenzie, E. H. C., Buchanan, P. K., & Johnston, P. R. (2002). Checklist of fungi on kauri (*Agathis australis*) in New Zealand. *New Zealand Journal of Botany*, *40*(2), 269–296. https://doi.org/10.1080/0028825X.2002.9512788

McLaughlin, J. A. (2001). Distribution, hosts, and site relationships of *Armillaria* spp. in central and southern Ontario. *Canadian Journal of Forest Research*, *31*(9), 1481–1490. https://doi.org/10.1139/x01-084

McLaughlin, J. A., & Hsiang, T. (2010). Identification protocol for six *Armillaria* species from northeastern North America. *Canadian Journal of Forest Research*, *40*(3), 536–548. https://doi.org/10.1139/x10-015

McLean, K. L., Swaminathan, J., & Stewart, A. (2001). Increasing soil temperature to reduce sclerotial viability of *Sclerotium cepivorum* in New Zealand soils. *Soil Biology & Biochemistry*, *33*, 137–143. https://doi.org/10.1016/s0038-0717(00)00119-x

McNamara, J. (1991). Family Cerambycidae (longhorn beetles). *Checklist of Beetles of Canada and Alaska*, 277–300.

Mendel, Z., Protasov, A., Maoz, Y., Maymon, M., Miller, G., Elazar, M., & Freeman, S. (2017). The role of *Euwallacea* nr. *fornicatus* (Coleoptera: Scolytinae) in the wilt syndrome of avocado trees in Israel. *Phytoparasitica*, *45*(3), 341–359. https://doi.org/10.1007/s12600-017-0598-6

Miller, J. H. (1945). Fungi of The Dominican Republic—Xylariacea. *The Journal of Agriculture of the University of Puerto Rico*, *29*(2), 57–68. https://doi.org/10.46429/jaupr.v29i2.12873

Miller, S. L., Larsson, E., Larsson, K. H., Verbeken, A., & Nuytinck, J. (2006). Perspectives in the new Russulales. *Mycologia*, *98*, 960–970. https://doi.org/10.3852/mycologia.98.6.960

Monné, M. A., & Nearns, E. H. (2023). Catalogue of the Cerambycidae (Coleoptera) of Canada and United States of America. Part IV. Subfamily Lamiinae. https://cerambycids.com/catalog/

Moore, M., Juzwik, J., Miller, F., Roberts, L., & Ginzel, M. D. (2019). Detection of *Geosmithia morbida* on numerous insect species in four eastern states. *Plant Health Progress*, *20*, 133–139. https://doi.org/10.1094/php-02-19-0016-rs

Mullett, M. S., & Webber, J. F. (2013). *Pseudomonas syringae* pv. *aesculi*: Foliar infection of *aesculus* species and temperature–growth relationships. *Forest Pathology*, *43*(5), 371–378. https://doi.org/10.1111/efp.12040

Munnecke, D. E., Wilbur, W., & Darley, E. F. (1976). Effect of heating or drying on *Armillaria mellea* or *Trichoderma viride* and the relation to survival of *A. mellea* in soil. *Phytopathology*, *66*(11), 1363–1368.

MyCoPortal (Mycology Collections data Portal). (2024). Search collections. https://www.mycoportal.org/portal/collections/harvestparams.php

Nag Raj, T. R., & Kendrick, B. (1975). *A monograph of Chalara and allied genera* (p. 200). Wilfrid Laurier University Press.

Nelson, G. H. (1975). A revision of the genus *Dicerca* in North America Coleoptera Buprestidae. *Entomologische Arbeiten aus dem museum G. Frey Tutzing Bei München*, *26*, 87–180.

Newton, W. G., & Allen, D. C. (1982). Characteristics of trees damaged by sugar maple borer, *Glycobius speciosus* (say). *Canadian Journal of Forest Research*, *12*(4), 738–744. https://doi.org/10.1139/x82-112

Noble, R., Blackburn, J., Thorp, G., Dobrovin-Pennington, A., Pietravalle, S., Kerins, G., Allnutt, T. R., & Henry, C. M. (2011). Potential for eradication of the exotic plant pathogens *Phytophthora kernoviae* and *Phytophthora ramorum* during composting. *Plant Pathology*, *60*(6), 1077–1085. https://doi.org/10.1111/j.1365-3059.2011.02476.x

Noble, R., Elphinstone, J. G., Sansford, C. E., Budge, G. E., & Henry, C. M. (2009). Management of plant health risks associated with processing of plant-based wastes: A review. *Bioresource Technology*, *100*(14), 3431–3446. https://doi.org/10.1016/j.biortech.2009.01.052

Nord, J. C., & McManus, M. L. (1972). The columbian timber beetle. *USDA Forest Service, Forest Pest Leaflet*, *132*, 6.

Ohman, J. H., & Spike, A. B. (1966). Effect of staining caused by sapstreak disease on sugar maple log and lumber values. *North Central Forest Experiment Station, Research Notes, NC-12*, 2.

Olchowecki, A. (1972). *Taxonomy of the genus Ceratocystis in Manitoba. Doctoral Thesis*. The University of Manitoba, Departments of Botany.

Olchowecki, A., & Reid, J. (1974). Taxonomy of the genus *Ceratocystis* in Manitoba. *Canadian Journal of Botany*, *52*(7), 1675–1711. https://doi.org/10.1139/b74-222

Oliver, J. B., Fare, D. C., Youssef, N., Scholl, S. S., Reding, M. E., Ranger, C. M., Moyseenko, J. J., & Halcomb, M. A. (2010). Evaluation of a single application of neonicotinoid and multi-application contact insecticides for flatheaded borer management in field grown red maple cultivars. *Journal of Environmental Horticulture*, *28*(3), 135–149. https://doi.org/10.24266/0738-2898-28.3.135

Olson, J. (2013). *Biscogniauxia* (Hypoxylon) canker and dieback of trees. In *Oklahoma cooperative extension service, EPP-7620* (p. 2). Oklahoma State University.

O'Mara, J., & Opbroek, N. (2016). 15. *Biscogniauxia* canker of oak. In A. D. Bergdahl & A. Hill (Eds.), *Diseases of trees in the Great Plains* (pp. 58–60). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

O'Neal, C. E. (1914). Some species of *Nummularia* common in Indiana. *Proceedings of the Indiana Academy of Science*, *24*, 235–250.

Osborn, R. K., Castro, J., Duong, T. A., Hulcr, J., Li, Y., Martínez, M., & Cognato, A. I. (2023). Symbiotic fungi associated with xyleborine ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) and the imperative of global collaboration. *Annals of the Entomological Society of America*, *116*(1), 51–71. https://doi.org/10.1093/aesa/saac024

Ostry, M. E. (2013). *Hypoxylon* canker. In P. Gonthier & G. Nicolotti (Eds.), *Infectious Forest diseases* (pp. 407–419). CABI International.

Ostry, M. E., & Anderson, N. A. (1983). Infection of trembling aspen by *Hypoxylon mammatum* through cicada oviposition wounds. *Phytopathology*, *73*, 1092–1096. https://doi.org/10.1094/phyto-73-1092

Ostry, M. E., & Anderson, N. A. (2009). Genetics and ecology of the *Entoleuca mammata–Populus* pathosystem: Implications for aspen improvement and management. *Forest Ecology and Management*, *257*, 390–400. https://doi.org/10.1016/j.foreco.2008.09.053

Ostry, M. E., O'Brien, J. G., & Anderson, N. A. (2011). *Field guide to common macrofungi in eastern forests and their ecosystem functions*. *Government Printing Office*, *84*.

Overholts, L. O. (1917). The structure of *Polyporus glomeratus* Peck. *Torreya*, *17*(11), 202–206.

Parke, J., Oh, E., Voelker, S., Hansen, E., Buckles, G., & Lachenbruch, B. (2008). *Phytophthora ramorum* infects tanoak sapwood and is associated with reduced sap flux and specific conductivity of xylem. In *Proceedings of the sudden oak death third science symposium* (pp. 5–9).

Parke, J. L., & Lewis, C. (2007). Root and stem infection of *Rhododendron* from potting medium infested with *Phytophthora ramorum*. *Plant Disease*, *91*, 1265–1270. https://doi.org/10.1094/pdis-91-10-1265

Petch, C. E., & Maltais, J. B. (1932). The Carpenter Worm, *Prionoxystus robiniae* Peck, and its Control. 23rd–24th Annual report of the Quebec Society for the Protection of Plants 1930–32. 131–136.

Peterson, E. B., Peterson, N. M., Comeau, P., & Thomas, K. D. (1999). *Bigleaf maple Managers' handbook for British Columbia*. In *B.C. Ministry of Forests, forestry division services branch, production resources, 595 Pandora avenue* (Vol. *V8W 3E7*, p. 62).

Pilotti, M., Di Lernia, G., Modesti, V., Lumia, V., & Brunetti, A. (2016). Outcome of *Ceratocystis platani* inoculations in *Platanus× acerifolia* in relation to season and inoculum dose. *Forest-Biogeosciences and Forestry*, *9*(4), 608–617. https://doi.org/10.3832/ifor1594-008

Pohl, G. R., Landry, J. F., Schmidt, B. C., Lafontaine, J. D., Troubridge, J. T., Macaulay, A. D., van Nieukerken, E., DeWaard, J. R., Dombroskie, J. J., Klymko, J., & Nazari, V. (2018). *Annotated checklist of the moths and butterflies (Lepidoptera) of Canada and Alaska* (p. 583). PENSOFT Publishers.

Poimala, A., & Lilja, A. (2013). NOBANIS – Invasive alien species fact sheet – *Phytophthora ramorum*. Online Database of the European Network on Invasive Alien Species. 14 pp.

Potter, D. A., Timmons, G. M., & Gordon, F. C. (1988). Flatheaded apple tree borer (Coleoptera: Buprestidae) in nursery-grown red maples: Phenology of emergence, treatment timing, and response to stressed trees. *Journal of Environmental Horticulture*, *6*(1), 18–22. https://doi.org/10.24266/0738-2898-6.1.18

Rabaglia, R. J., Vandenberg, N. J., & Acciavatti, R. E. (2009). First records of *Anisandrus maiche* stark (Coleoptera: Curculionidae: Scolytinae) from North America. *Zootaxa*, *2137*, 23–28. https://doi.org/10.11646/zootaxa.2137.1.2

Ramsfield, T. D., Ball, R. D., Gardner, J. F., & Dick, M. A. (2010). Temperature and time combinations required to cause mortality of a range of fungi colonizing wood. *Canadian Journal of Plant Pathology*, *32*(3), 368–375. https://doi.org/10.1080/07060661.2010.499269

Ranger, C. M., Reding, M. E., Schultz, P. B., Oliver, J. B., Frank, S. D., Addesso, K. M., Chong, J. H., Sampson, B., Werle, C., Gill, S., & Krause, C. (2016). Biology, ecology, and management of nonnative ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) in ornamental plant nurseries. *Journal of Integrated Pest Management*, *7*(1), 1–23. https://doi.org/10.1093/jipm/pmw005

Redhead, S. A. (1997). Macrofungi of British Columbia: Requirements for inventory British Columbia, Ministry of Forests. *Research Program*, *28*, 119.

Richter, D. L. (2012). The sugar maple sapstreak fungus (*Ceratocystis virescens* Davidson) Moreau, Ascomycota in the Huron Mountains, Marquette County, Michigan. *The Michigan Botanist*, *51*, 73–82.

Riffle, J. W., & Conway, K. E. (1986). 38. Phellinus stem decays of hardwoods. In J. W. Riffle & G. W. Peterson (Eds.), *Diseases of trees in the Great Plains* (pp. 83–85). USDA Forest Service. General Technical Report RM-129.

Riffle, J. W., & Walla, J. A. (1986). 37. Perennial Woodrotting fungi that cause stem decays of hardwoods. In J. W. Riffle & G. W. Peterson (Eds.), *Diseases of trees in the Great Plains* (pp. 80–82). USDA Forest Service. General Technical Report RM-129.

Rigling, D., & Prospero, S. (2018). *Cryphonectria parasitica*, the causal agent of chestnut blight: Invasion history, population biology and disease control: *Cryphonectria parasitica*. *Molecular Plant Pathology*, *19*(1), 7–20. https://doi.org/10.1111/mpp.12542

Rizzo, D. M., Garbelotto, M., & Hansen, E. M. (2005). *Phytophthora ramorum*: Integrative research and management of an emerging pathogen in California and Oregon forests. *Annual Review of Phytopathology*, *43*, 13.1–13.27. https://doi.org/10.1146/annurev.phyto.42.040803.140418

Rizzo, D. M., & Harrington, T. C. (1993). Delineation and biology of clones of *Armillaria ostoyae, A. gemina* and *A. calvescens*. *Mycologia*, *85*(2), 164–174. https://doi.org/10.2307/3760452

Robinson, G. S., Ackery, P. R., Kitching, I. J., Beccaloni, G. W., & Hernández, L. M. (2024). *HOSTS – A database of the world's lepidopteran hostplants*. Natural History Museum. https://data.nhm.ac.uk/dataset/hosts (accessed 2024-03-07).

Roth, E. R., Hepting, G. H., & Toole, E. R. (1959). Sapstreak disease of sugar maple and yellow poplar in North Carolina. *Phytopathology*, *49*, 549.

Roubtsova, T. V., & Bostock, R. M. (2009). Episodic abiotic stress as a potential contributing factor to onset and severity of disease caused by *Phytophthora ramorum* in *Rhododendron* and *Viburnum*. *Plant Disease*, *93*(9), 912–918. https://doi.org/10.1094/pdis-93-9-0912

Rudolph, E. (2022). *Exploring the biology and monitoring techniques of two economically impactful Chrysobothris species in Oregon hazelnuts. Thesis* (p. 120). Oregon State University.

Rudolph, E. A., & Wiman, N. G. (2023). Insights from specimen data for two economic *Chrysobothris* species (Coleoptera: Buprestidae) in the western United States. *Annals of the Entomological Society of America*, *116*(4), 195–206. https://doi.org/10.1093/aesa/saad009

Ryvarden, L. (2005). *The genus Inonotus: A synopsis* (p. 150). Fungiflora.

Sabaratnam, S. (2021). Ramorum blight and dieback (Sudden Oak Death). Abbotsford Agriculture Centre, British Columbia Ministry of Agriculture, Food and Fisheries Abbotsford, B.C., Canada. 5 pp.

Saint-Germain, M. (2007). *Host-selection behaviour and host-use patterns of saproxylic beetles in snags of aspen (Populus tremuloides Michaux) and black spruce (Picea mariana (Miller)) in the province of Québec*, Canada. Thesis. (p. 244). Department of Natural Resource Sciences, McGill University, Montreal.

Sangvichien, N. S. C. P. E., Nutthaporn, P. S., Yi-Jian, R. M. A. W., & Whalley, Y. A. J. (2013). Biogeography of selected Xylariaceae. *Mycosystema*, *32*, 15.

Sansford, C., Inman, A. J., Baker, R., Frankel, S., de Gruyter, J., Husson, C., Kehlenbeck, H., Kessel, G., Moralejo, E., Steeghs, M., & Webber, J. (2009). *Risk analysis for Phytophthora ramorum, a newly recognised pathogen threat to Europe and the cause of sudden oak death in the USA (acronym-RAPRA).* Priority 8.1.b.1, policy-oriented research specific targetted research project – (p. 310). RAPRA.

Sasaki, C., & Yamanaka, S. (2020). Novel sterilization method combining food preservative use and low temperature steaming for treatment of lignocellulosic biomass with white rot fungi. *Industrial Crops and Products*, *155*, 112765. https://doi.org/10.1016/j.indcrop.2020.112765

Schmidt, O. (2007). Indoor wood-decay basidiomycetes: Damage, causal fungi, physiology, identification and characterization, prevention and control. *Mycological Progress*, *6*, 261–279. https://doi.org/10.1007/s11557-007-0545-x

Schmidt, O., & Huckfeldt, T. (2005). Gebäudepilze. In J. Müller (Ed.), *Holzschutz im Hochbau* (pp. 44–72). Fraunhofer IRB.

Schweigkofler, W., Kosta, K., Huffman, V., Sharma, S., Suslow, K., & Ghosh, S. (2014). Steaming inactivates *Phytophthora ramorum*, causal agent of sudden oak death and ramorum blight, from infested nursery soils in California. *Plant Health Progress*, *15*(1), 43–47. https://doi.org/10.1094/php-rs-13-0111

Schweigkofler, W., Kosta, K., Huffman, V., & Suslow, K. (2014). Thermal inactivation of *Phytophthora ramorum* is a management option to treat infested plants, nursery equipment and soil. *Phytopathology*, *104*, 105.

Seifert, K. A., Nickerson, N. L., Corlett, M., Jackson, E. D., Louis-Seize, G., & Davies, R. J. (2004). *Devriesia*, a new hyphomycete genus to accommodate heat-resistant, cladosporium-like fungi. *Canadian Journal of Botany*, *82*(7), 914–926.

Shamoun, S. F., Rioux, D., Callan, B., James, D., Hamelin, R. C., Bilodeau, G. J., Elliott, M., Lévesque, C. A., Becker, E., McKenney, D., & Pedlar, J. (2018). An overview of Canadian research activities on diseases caused by *Phytophthora ramorum*: Results, progress, and challenges. *Plant Disease*, *102*(7), 1218–1233. https://doi.org/10.1094/PDIS-11-17-1730-FE

Shaw, C. G., & Kile, G. A. (1991). *Armillaria root disease* (Vol. *No. 691*, p. 233). Forest Service, US Department of Agriculture.

Shear, C. L., Stevens, N. E., & Tiller, R. J. (1917). *Endothia parasitica* and related species. *Bulletin of the United States department of. Agriculture*, *380*, 1–82. https://doi.org/10.5962/bhl.title.64538

Shigo, A. L. (1962). Observations on the succession of fungi on hardwood pulpwood bolts. *Plant Disease Reporter*, *46*, 379–380.

Shigo, A. L. (1969). How *Poria obliqua* and *Polyporus glomeratus* incite cankers. *Phytopathology*, *59*(8), 1164–1165.

Shishkoff, N. (2007). Persistence of *Phytophthora ramorum* in soil mix and roots of nursery ornamentals. *Plant Disease*, *91*(10), 1245–1249. https://doi.org/10.1094/pdis-91-10-1245

Simmons, E. G. (1946). Studies in the stromatic Sphaeriales of Indiana. *Proceedings of the Indiana Academy of Science*, *56*, 338–374.

Sinclair, W. A., & Lyon, H. H. (2005). *Diseases of trees and shrubs, 2nd edition* (p. 660). Comstock publishing associates, a division of Cornell University Press.

Sjöman, H., Östberg, J., & Nilsson, J. (2014). Review of host trees for the wood-boring pests *Anoplophora glabripennis* and *Anoplophora chinensis*: An urban forest perspective. *Arboriculture & Urban Forestry*, *40*(3), 143–164. https://doi.org/10.48044/jauf.2014.016

Smith, S. M., & Hulcr, J. (2015). *Scolytus* and other economically important bark and ambrosia beetles. In F. E. Vega & R. W. Hofstetter (Eds.), *Bark beetles: Biology and ecology of native and invasive species* (pp. 495–531). Academic Press.

Snyder, T. E. (1923). High temperatures as a remedy for *Lyctus* powder-post beetles. *Journal of Forestry*, *21*(8), 810–814.

Solomon, J. D. (1988). Influence of host on larval survival, feeding habits, and adult fecundity of the carpenter worm (Lepidoptera: Cossidae). *Journal of Economic Entomology*, *81*(3), 834–839.

Solomon, J. D. (1995). Guide to insect borers in North American broadleaf trees and shrubs. Agricultural Handbook, 706. US Department of Agriculture, Forest Service. 748 pp.

Solomon, J. D., & Hay, C. J. (1974). *Annotated bibliography of the Carpenterworm: Prionoxystus robiniae*. Southern Forest Experiment Station, Forest Service, US Department of Agriculture (p. 14).

Solomon, J. D., Leininger, T. D., Wilson, A. D., Anderson, R. L., Thompson, L. C., & McCracken, F. I. (1993). *Ash pests, a guide to major insects, diseases, air pollution injury, and chemical injury* (p. 45). United States Department of Agriculture, Forest Service.

Spaulding, P. (1961). *Foreign diseases of Forest trees of the world*. U.S.D.A. *Agriculture Handbook*, *197*, 1–361.

Steed, B. E., & Burton, D. A. (2015). *Field guide to diseases and insects of quaking aspen in the West. Part 1: Wood and bark boring insects* (p. 115). USDA Forest Service, Forest Health Protection.

Suh, S. J. (2020). Host plant list of the scale insects (Hemiptera: Coccomorpha) in South Korea. *Insecta Mundi*, *0757*, 1–26.

Suh, S. O., & Zhou, J. (2010). Yeasts associated with the curculionid beetle *Xyloterinus politus: Candida xyloterini* sp. nov., *Candida palmyrensis* sp. nov. and three common ambrosia yeasts. *International Journal of Systematic and Evolutionary Microbiology*, *60*(7), 1702–1708. https://doi.org/10.1099/ijs.0.016907-0

Sundheim, L., Herrero, M. L., Rafoss, T., & Toppe, B. (2009). Pest risk assessment of *Phytophthora ramorum* in Norway. Opinion of the Panel on Plant Health of the Norwegian Scientific Committee for Food Safety.

Suryanarayanan, T. S., Govindarajulu, M. B., Thirumalai, E., Reddy, M. S., & Money, N. P. (2011). Agni's fungi: Heat-resistant spores from the Western Ghats, southern India. *Fungal Biology*, *115*(9), 833–838.

Swain, S., Harnik, T., Mejia-Chang, M., Hayden, K., Bakx, W., Creque, J., & Garbelotto, M. (2006). Composting is an effective treatment option for sanitization of *Phytophthora ramorum*-infected plant material. *Journal of Applied Microbiology*, *101*(4), 815–827. https://doi.org/10.1111/j.1365-2672.2006.03008.x

Tansey, M. R. (1971). Isolation of thermophilic fungi from self-heated, industrial wood chip piles. *Mycologia*, *63*(3), 537–547. https://doi.org/10.1080/00275514.1971.12019133

Tansey, M. R., & Brock, T. D. (1972). The upper temperature limit for eukaryotic organisms. *Proceedings of the National Academy of Sciences*, *69*(9), 2426–2428.

Tavakilian, G., & Chevillotte, H. (2024). Titan: base de données internationales sur les Cerambycidae ou Longicornes. Version 4.0. http://titan.gbif.fr/ (accessed 2024-04-20).

Temreshev, I. I. (2023). New records of *Aeolesthes sarta* (Solsky, 1871) (Coleoptera, Cerambycidae) in Kazakhstan. *Acta Biologica Sibirica*, *9*, 831–843.

Thiyagaraja, V., Lücking, R., Ertz, D., Karunarathna, S. C., Wanasinghe, D. N., Lumyong, S., & Hyde, K. D. (2021). The evolution of life modes in Stictidaceae, with three novel taxa. *Journal of Fungi*, *7*, 105. https://doi.org/10.3390/jof7020105

Thompson, C. H., McCartney, M. M., Roubtsova, T. V., Kasuga, T., Ebeler, S. E., Davis, C. E., & Bostock, R. M. (2021). Analysis of volatile profiles for tracking asymptomatic infections of *Phytophthora ramorum* and other pathogens in *Rhododendron*. *Phytopathology*, *111*, 1818–1827. https://doi.org/10.1094/phyto-10-20-0472-r

Thomsen, I. M., Alsenius, B., Flø, D., Krokene, P., Wendell, P. H. M., Wright, S., Sæthre, M. G., Børve, J., Magnusson, C., Nicolaisen, M., Nybakken, L., & Stenberg, J. A. (2023). Updated pest risk assessment of *Phytophthora ramorum* in Norway. In *Scientific opinion of the panel on plant health of the Norwegian scientific Committee for Food and Environment. Norwegian scientific Committee for Food and Environment (VKM)* (p. 88). https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/3098330

Tooley, P. W., Browning, M., & Berner, D. (2008). Recovery of *Phytophthora ramorum* following exposure to temperature extremes. *Plant Disease*, *92*(3), 431–437. https://doi.org/10.1094/pdis-92-3-0431

TRACES-NT. (online). TRAde Control and Expert System. https://webgate.ec.europa.eu/tracesnt [Accessed: 15 May 2024] (accessed 2024-05-15).

Tubajika, K. M., Singh, R., & Shelly, J. R. (2007). Preliminary observations of heat treatment to control *Phytophthora ramorum* in infected wood species: An extended abstract. *Proceedings of the Sudden Oak Death Third Science Symposium*, 477–480.

USDA (United States Department of Agriculture). (1985). Insects of eastern forests. USDA Forest Service, 1426, 621 pp.

USDA (United States Department of Agriculture). (2024). Checklist of Organisms Causing Tree Diseases. https://www.srs.fs.usda.gov/pubs/misc/ag_654/volume_1/checklist_of/organisms_causing_tree_diseases.htm

Van Poucke, K., Franceschini, S., Webber, J., Vercauteren, A., Turner, J. A., Mccracken, A. R., Heungens, K., & Brasier, C. (2012). Discovery of a fourth evolutionary lineage of *Phytophthora ramorum*: EU2. *Fungal Biology*, *116*, 1178–1191. https://doi.org/10.1016/j.funbio.2012.09.003

Van Wyk, M., Wingfield, B. D., Al-Adawi, A. O., Rossetto, C. J., Ito, M. F., & Wingfield, M. J. (2011). Two new *Ceratocystis* species associated with mango disease in Brazil. *Mycotaxon*, *117*(1), 381–404. https://doi.org/10.5248/117.381

Vance, C. C., Kirby, K. R., Malcolm, J. R., & Smith, S. M. (2003). Community composition of longhorned beetles (Coleoptera: Cerambycidae) in the canopy and understorey of sugar maple and white pine stands in south-central Ontario. *Environmental Entomology*, *32*(5), 1066–1074.

Vasilyeva, L. N., Rogers, J. D., & Miller, A. N. (2007). Pyrenomycetes of the Great Smoky Mountains National Park. V. *Annulohypoxylon* and *Hypoxylon* (*Xylariaceae*). *Fungal Diversity*, *27*, 231–245.

Vasilyeva, L. N., Stephenson, S. L., Hyde, K. D., & Bahkali, A. H. (2012). Some stromatic pyrenomycetous fungi from northern Thailand-1. *Biscogniuxia*, *Camillea* and *Hypoxylon* (Xylariaceae). *Fungal Diversity*, *55*, 65–76.

Vasilyeva, L. N., Stephenson, S. L., & Miller, A. N. (2007). Pyrenomycetes of the Great Smoky Mountains National Park. IV. *Biscogniauxia*, *Camaropella*, *Camarops*, *Camillea, Peridoxylon* and *Whalleya*. *Fungal Diversity*, *25*, 219–231.

Vernia, C. S. (1999). *Polypores of a North Carolina Piedmont forest. Thesis* (p. 128). North Carolina State University.

Villarreal, M., Ruelo, V., De Tov, A. M. T., & Arenal, E. (2005). A new Ophiostoma species isolated from *Pinus pinaster* in the Iberian Peninsula. *Mycotaxon*, *92*, 259–268.

Vlasak, J., & Vlasakova, K. (2021). New larval host plants and ecological observations on north American Cerambycidae (Coleoptera). *Insecta Mundi*, *0901*, 23.

Volk, T. J., Burdsall, H. H., Jr., & Banik, M. T. (1996). *Armillaria nabsnona*, a new species from western North America. *Mycologia*, *88*(3), 484–491. https://doi.org/10.2307/3760888

Von Schrenk, H., & Spaulding, P. (1909). Diseases of deciduous forest trees. US Government Printing Office, 149, 85 pp.

Vu Thanh, T. A., Sosnowski, M. R., Giblot-Ducray, D., Taylor, C., & Scott, E. S. (2012). Effect of burning and high temperature on survival of *Xanthomonas translucens* pv. *pistaciae* in infected pistachio branches and twigs. *Plant Pathology*, *61*(6), 1082–1092. https://doi.org/10.1111/j.1365-3059.2012.02596.x

Walters, R. S., & Yawney, H. W. (1990). *Acer rubrum* L., red maple. In R. M. Burns & B. H. Honkala (Eds.), *Silvics of North America* (pp. 60–69). Volume 2. Hardwoods. Agriculture Handbook, 654, Forest Service, United States Department of Agriculture.

Webber, J. (2008). *Abbreviated Pest risk analysis for Ceratocystis virescens* (p. 8). Forest Research.

Webster, R., McCoqrquodale, D., & Majka, C. (2009). New records of Cerambycidae (Coleoptera) for New Brunswick, Nova Scotia, and Prince Edward Island, Canada. *ZooKeys*, *22*, 285–308. https://doi.org/10.3897/zookeys.22.122

Wendt, L., Sir, E. B., Kuhnert, E., Heitkämper, S., Lambert, C., Hladki, A. I., Romero, A. I., Luangsa-ard, J. J., Srikitikulchai, P., Peršoh, D., & Stadler, M. (2018). Resurrection and emendation of the *Hypoxylaceae*, recognised from a multi-gene genealogy of the *Xylariales*. *Mycological Progress*, *17*, 115–154. https://doi.org/10.1007/s11557-017-1311-3

Werres, S., Marwitz, R., In't Veld, W. A. M., De Cock, A. W., Bonants, P. J., De Weerdt, M., Themann, K., Ilieva, E., & Baayen, R. P. (2001). *Phytophthora ramorum* sp. nov., a new pathogen on *Rhododendron* and *Viburnum*. *Mycological Research*, *105*(10), 1155–1165. https://doi.org/10.1016/s0953-7562(08)61986-3

Whalley, M. A., Whalley, A. J. S., Thienhirun, S., & Sihanonth, P. (1999). *Camillea malaysianensis* sp. nov. and the distribution of *Camillea* in Southeast Asia. *Kew Bulletin*, *54*, 715–722.

White, K. R., Jergensen, J. A., & Lam, A. (2021). *Bondarzewia berkeleyi*. *Mycological herbarium of macrofungi from the east Brook Valley*, 23. https://orb.binghamton.edu/macrofungi_eastbrookvalley/23 (accessed 2024-04-19).

Williamson, Z. V. (2022). *Exploring the role and impact of flatheaded borers (Coleoptera: Buprestidae) and ambrosia beetles (Coleoptera: Curculionidae) in Georgia specialty tree crop systems and urban landscapes. Doctoral dissertation*. University of Georgia.

Witthuhn, R. C., Harrington, T. C., Steimel, J. P., Wingfield, B. D., & Wingfield, M. J. (2000). Comparison of isozymes, rDNA spacer regions and MAT-2 DNA sequences as phylogenetic characters in the analysis of the *Ceratocystis coerulescens* complex. *Mycologia*, *92*(3), 447–452. https://doi.org/10.2307/3761503

Witthuhn, R. C., Wingfield, B. D., Wingfield, M. J., Wolfaardt, M., & Harrington, T. C. (1998). Monophyly of the conifer species in the *Ceratocystis coerulescens* complex based on DNA sequence data. *Mycologia*, *90*(1), 96–101. https://doi.org/10.2307/3761017

Wong, B., Leal, I., Feau, N., Dale, A., Uzunovic, A., & Hamelin, R. C. (2020). Molecular assays to detect the presence and viability of *Phytophthora ramorum* and *Grosmannia clavigera*. *Plos One*, *15*(2), e0221742.

Wood, S. L. (1982). The bark and ambrosia beetles of north and Central America (Coleoptera: Scolytidae), a taxonomic monograph. *Great Basin Natural Memoirs*, *6*, 1–1359.

Wood, S. L., & Bright, D. E. (1992). *A catalog of Scolytidae and Platypodidae (Coleoptera)*. Part 2: Taxonomic index. *Great Basin Naturalist Memoirs*, *13*, 1–1553.

Worrall, J. J. (2016). 30. Stem decays. In A. D. Bergdahl & A. Hill (Eds.), *Diseases of trees in the Great Plains* (pp. 105–117). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Xu, Y. M., & Zhao, Z. Q. (2019). Longidoridae and Trichodoridae (Nematoda: Dorylaimida and Triplonchida). *Fauna of New Zealand*, *79*, 149.

Yakabe, L. E., & MacDonald, J. D. (2010). Soil treatments for the potential elimination of *Phytophthora ramorum* in ornamental nursery beds. *Plant Disease*, *94*(3), 320–324. https://doi.org/10.1094/pdis-94-3-0320

Yanega, D. (1996). Field guide to northeastern longhorned beetles (Coleoptera: Cerambycidae). *Illinois Natural History Survey Manual*, *6*, 184.

Yassin, M. A., & Bendixen, L. E. (1982). *Weed hosts of the cotton whitefly (Bemisia tabaci (Genn.)) Homoptera Aleyrodidae* (p. 10). The Ohio State University, Research Bulletin 1144, June 1982.

Ye, W., Szalanski, A. L., & Robbins, R. T. (2004). Phylogenetic relationships and genetic variation in *Longidorus* and *Xiphinema* species (Nematoda: Longidoridae) using ITS1 sequences of nuclear ribosomal DNA. *Journal of Nematology*, *36*, 14–19.

Yuan, Y., Bian, L.-S., Wu, Y.-D., Chen, J.-J., Wu, F., Liu, H.-G., Zeng, G.-Y., & Dai, Y.-C. (2023). Species diversity of pathogenic wood-rotting fungi (Agaricomycetes, Basidiomycota) in China. *Mycology*, *14*(3), 204–226. https://doi.org/10.1080/21501203.2023.2238779

Zeps, M., Adamovics, A., Smilga, J., & Sisenis, L. (2016). Productivity and quality of hybrid aspen at the age of 18 years. *Research for Rural Development*, *2*, 55–61.

Zhao, L., Ramaswamy, H., & Wang, S. (2018). Thermal-death kinetics of the bark beetle (*Dendroctonus armandi*; Coleoptera: Scolytidae). *Scandinavian Journal of Forest Research*, *33*, 735–740. https://doi.org/10.1080/02827581.2018.1530370

Zhou, L.-W., Hao, Z.-Q., Wang, Z., Wang, B., & Dai, Y.-C. (2011). Comparison of ecological patterns of polypores in three forest zones in China. *Mycology*, *2*(4), 260–275. https://doi.org/10.1080/21501203.2011.602726

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Gonthier, P. (2024). Commodity risk assessment of maple veneer sheets from Canada. *EFSA Journal*, *22*(7), e8892. https://doi.org/10.2903/j.efsa.2024.8892

APPENDIX A

Pest datasheet

A.1 | CANKER FUNGI AND OTHER FUNGI ASSOCIATED WITH SAPWOOD (*ACAROSPORINA MICROSPORA, ANNULOHYPOXYLON TRUNCATUM, BISCOGNIAUXIA ATROPUNCTATA, CAMILLEA TINCTOR, CATUNICA ADIPOSA, CRYPHONECTRIA PARASITICA, ENTOLEUCA MAMMATA, JAMESREIDIA TENELLA*)

A.1.1 | Organism information

A.1.1.1 | *Acarosporina microspora*

Taxonomic information	Current valid scientific name: *Acarosporina microspora* Synonyms: *Schizoxylon microsporum* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Ostropales Family: Stictidaceae Common name: Schizoxylon canker Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Acarosporina microspora* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Acarosporina microspora* is present in Canada only in Quebec (Ginns, 1986)
Pest status in the EU	*Acarosporina microspora* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)
Host status on *Acer*	*Acer rubrum* and *A. saccharum* are hosts of *Acarosporina microspora* according to Davidson and Lorenz (1938)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found
Association with wood	Stictidaceae are mostly known for saprophytic and lichenicolous lifestyle; however, several species of the saprophytic *Acarosporina* have been also recorded as parasitic, causing cankers on *Quercus* and *Fagus* in North America (Thiyagaraja et al., 2021). Cankers on suppressed *Ulmus americana* were also observed by Lorenz and Davidson (1939). On both red and sugar maple, *A. microspora* causes *Nectria*-like cankers, but limited to 3 inches (7.62 cm) in diameter stems, and only on suppressed trees (Davidson & Lorenz, 1938). Cankers are irregular shape, with outer callus rings bark-covered and white mycelium developing beneath the bark at the margins; they are often extended to the entire diameter, exposing the wood and causing the distortion of the stem (Davidson & Lorenz, 1938; Hepting, 1971). Pycnidia are usually present on both exposed wood and in the bark near the margins of cankers; apothecia are only rarely seen (Davidson & Lorenz, 1938). *Acarosporina microspora* is generally rare on sugar maple (Eyre & Zillgitt, 1953); it can cause large numbers of cankers in some localities in the Lake States of the USA, where it is considered of minor importance as only occurring on suppressed *Acer* trees (Hepting, 1971)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *A. microspora* can produce resting propagules or chlamydospores *Acarasporina microspora* only produces ascospores and pycnidiospores (Davidson & Lorenz, 1938)

A.1.1.2 | *Annulohypoxylon truncatum*

Taxonomic information	Current valid scientific name: *Annulohypoxylon truncatum* Synonyms: *Cryptovalsa depressa, Engizostoma depressum, Hypoxylon annulatum* var. *depressum, Hypoxylon annulatum* var. *truncatum, Hypoxylon truncatum, Sphaeria annulata, Sphaeria depressa, Sphaeria truncata, Sphaeria truncatula* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Xylariales Family: Hypoxylaceae Common name: – Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Annulohypoxylon truncatum* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Annulohypoxylon truncatum* was found in Canada only in Newfoundland on *Picea* sp., as *Hypoxylon truncatum* (MyCoPortal, 2024)
Pest status in the EU	*Annulohypoxylon truncatum* was reported from France (MyCoPortal, 2024)
Host status on *Acer*	*Acer rubrum* is a host of *Annulohypoxylon truncatum* according to Farr and Rossman (2024)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found

(Continues)

(Continued)

Association with wood	*Annulohypoxylon* fungi are largely distributed in all forested areas of the world as endophytic and saprophytic species (Kuhnert et al., 2016). Members of the genus mostly grow on bark, twigs and dead logs of many woody hosts in tropical, subtropical and temperate forests (Dutta & Singh, 2023). *Annulohypoxylon truncatum* is one of the more common species; it is present in Asia, North America and Africa. *Quercus* sp. are common hosts of *Annulohypoxylon truncatum* in Asia and North America, but also *Fagus, Castanea, Magnolia, Ulmus, Zelkova* are recorded. In the literature and databases, only one record of *A. truncatum* for *Acer rubrum* in Georgia (the USA) (Farr & Rossman, 2024; Hanlin, 1963) was found. Despite its wide distribution, very poor information is available on biology and damage of *A. truncatum*. Severe cankers have been observed in Korea on *Quercus acutissima* and *Q. variabilis*, causing dark brown discoloration of the sap in affected trees; dark brown glomerate stromata with spherical perithecia are associated with the cankers (Cha et al., 2012). In North America, the fungus was only found on dead branches of *Quercus* spp. (Vasilyeva, Rogers, & Miller, 2007). In Japan, *A. truncatum* is one of the most common Ascomycotina species occurring on oak bed logs used in the cultivation of Shii-take (*Lentinus edodes*), to which it causes serious damage for antagonistic growth (Abe, 1989)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *Annulohypoxylon truncatum* can produce resting propagules or chlamydospores. *Annulohypoxylon truncatum* produces stromata, asci and ascospores, perithecia and conidia (Vasilyeva, Rogers, & Miller, 2007; Wendt et al., 2018)

A.1.1.3 | *Biscogniauxia atropunctata*

Taxonomic information	Current valid scientific name: *Biscogniauxia atropunctata* Synonyms: *Albocrustum atropunctatum*, *Anthostoma atropunctatum*, *Biscogniauxia atropunctata* var. *intermedia*, *Biscogniauxia atropunctata* var. *maritima*, *Biscogniauxia maritima*, *Diatrype atropunctata*, *Hypoxylon atropunctatum*, *Nummularia atropunctata*, *Nummularia cinerea*, *Numulariola atropunctata*, *Sphaeria atropunctata* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Xylariales Family: Graphostromataceae Common name: Hypoxylon Canker of Oak, Biscogniauxia Canker and Dieback disease Name used in the Dossier: –
Group	Fungi
EPPO code	HYPOAT
Regulated status	*Biscogniauxia atropunctata* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Biscogniauxia atropunctata* was recorded in Canada (GBIF, 2024; MyCoPortal, 2024) in provinces of Ontario and Quebec (MyCoPortal, 2024)
Pest status in the EU	*Biscogniauxia atropunctata* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)
Host status on *Acer*	*Biscogniauxia atropunctata* is primarily pathogen of oaks, but it also affects other hardwood species including *Acer* spp. (O'Mara & Opbroek, 2016). It was recorded on *Acer rubrum* (Hanlin, 1963) and on *Acer saccharinum/ rubrum* in Illinois, the USA, (MyCoPortal, 2024 – Catalogue number: 72123858)
Asymptomatic plants	*Biscogniauxia atropunctata* can persist for many years within the sapwood and bark of healthy trees without causing disease symptoms. The disease is usually triggered by stress events (drought, fire, root injury, chemical damage, compacted soil, improper pruning, storm damage) (Bassett & Fenn, 1984; O'Mara & Opbroek, 2016)
Association with wood	*Biscogniauxia atropunctata* can infect trees of any age (O'Mara & Opbroek, 2016). The disease is associated with tree decline and death (Bassett & Fenn, 1984). *Biscogniauxia atropunctata* has sexual (ascospores) and asexual stage (conidia). Ascospores are either wind-blown, rain splashed or carried by animals, and they enter the tree through natural openings and/or wounds. After infection, a stroma (cushion-like mat/ a mass of fungal tissue) is formed underneath the bark in the cambium. The pressure from this mass causes the bark to pop off, exposing a crusty stroma. As the outer layer of the stroma wears off, the canker turns white/silver/brown and then black and crusty (resembling asphalt). The cancers can range from a few inches up to several yards along the length of the tree (Olson, 2013; O'Mara & Opbroek, 2016). *Biscogniauxia atropunctata* decays the phloem and sapwood (Bassett & Fenn, 1984). It causes a brown discoloration of the sapwood. Later on, yellow decay with black zone lines will develop (Olson, 2013)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *B. atropunctata* can produce resting propagules or chlamydospores. *Biscogniauxia atropunctata* produces asci, ascospores, stroma, conidia and perithecia (Ellis & Everhart, 1888; O'Mara & Opbroek, 2016; Vasilyeva, Stephenson, & Miller, 2007)

A.1.1.4 | *Camillea tinctor*

Taxonomic information	Current valid scientific name: *Camillea tinctor* Synonyms: *Sphaeria tinctor, Diatrype tinctor, Hypoxylon tinctor, Nummularia tinctor, Valsa tinctor, Numulariola tinctor* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Xylariales Family: Graphostromataceae Common name: – Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Camillea tinctor* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Camillea tinctor* is recorded from Canada (GBIF, 2024; MyCoPortal, 2024), in provinces of British Columbia and Quebec. The records are from 1896 (on elm bark), 1915 (on dead *Crataegus* bark) and 1962 (on wind-thrown hardwood tree) (MyCoPortal, 2024)
Pest status in the EU	*Camillea tinctor* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024; MyCoPortal, 2024)
Host status on *Acer*	*Camillea tinctor* (as *Hypoxylon tinctor*) was recorded on *Acer* spp. (O'Neal, 1914; Simmons, 1946), *Acer floridanum*, *A. leucoderme*, *A. negundo* and *A. rubrum* in the USA (Hanlin, 1963; Farr & Rossman, 2024)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found
Association with wood	*Camillea tinctor* is recorded from Africa (Congo-Kinshasa, Ghana, Sierra Leone, Uganda), tropical America (Brazil, Cuba, French Guiana, Mexico, Nicaragua, Peru, Puerto Rico, St Croix), Australasia (Papua New Guinea), Asia (Malaysia, Singapore, Thailand) (Whalley et al., 1999) and North America (Calkins, 1886; Ellis & Everhart, 1888; Farr & Rossman, 2024; GBIF, 2024; MyCoPortal, 2024; O'Neal, 1914; Vasilyeva, Stephenson, & Miller, 2007). According to Vasilyeva et al. (2012) *Camillea tinctor* reported in Asia might be a different species. *Camillea tinctor* is a common saprophyte on dead trunks and limbs of different deciduous trees (Ellis & Everhart, 1888; Leininger, 1999; Vasilyeva, Stephenson, & Miller, 2007), including *Acer*, *Cercis*, *Fagus*, *Platanus*, *Ulmus* (O'Neal, 1914), *Betula*, *Quercus* (Simmons, 1946), *Magnolia* (Calkins, 1886) and *Ficus nitida* (Miller, 1945). It occasionally produces cankers on living trees of *Platanus*, on main stems and larger branches (Leininger, 1999). The canker was found on a main stem of living tree of *Platanus occidentalis* in Georgia (McAlpine, 1961). Wind-blown or rain-splashed ascospores enter the tree through wounds in the bark (Leininger, 1999) Stroma of *C. tinctor* are thick, black with smooth surface (O'Neal, 1914), they can be found on bark or partially concealed by bark (Leininger, 1999). Stroma stain the wood with orange (Calkins, 1886; Miller, 1945; Sangvichien et al., 2013) to reddish-orange colour (O'Neal, 1914)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *C. tinctor* can produce resting propagules or chlamydospores. *Camillea tinctor* produces stromata, asci, ascospores and perithecia (Ellis & Everhart, 1888; Whalley et al., 1999; Vasilyeva, Stephenson, & Miller, 2007)

A.1.1.5 | *Catunica adiposa*

Taxonomic information	Current valid scientific name: *Catunica adiposa* Synonyms: *Sphaeronaema adiposum, Ceratostomella adiposa, Ophiostoma adiposum, Endoconidiophora adiposa, Ceratocystis adiposa, Ophiostoma majus, Ceratostomella major, Ceratocystis major* Name used in the EU legislation: – Order: Microascales Family: Ceratocystidaceae Common name: black rot of sugarcane Name used in the Dossier: –
Group	Fungi
EPPO code	CERAAD
Regulated status	*Catunica adiposa* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Catunica adiposa* (or as *Ceratocystis adiposa*) is reported in Canada (Farr & Rossman, 2024; GBIF, 2024; MyCoPortal, 2024), in provinces of Ontario and Quebec (Ginns, 1986; MyCoPortal, 2024).
Pest status in the EU	*Catunica adiposa* was reported from France (1953) and the Netherlands (1934) (Mayers et al., 2020)
Host status on *Acer*	*Catunica adiposa* (as *Ceratocystis major*) was reported on *Acer saccharum* in Ontario, in Forest District 18, without any additional details (Ginns, 1986; Griffin, 1968)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found

(Continues)

(Continued)

Association with wood	*Catunica adiposa* was first described as *Sphaeronaema adiposum*, the causal organism of black rot of sugar cane (*Saccharum officinarum*) by Butler (1906). The fungus was also recorded on *Acer saccharum*, *Ananas sativus*, *Eleocharis plantaginea* var. *tuberosa*, *Eleocharis tuberosa*, *Pinus* sp., *Pinus resinosa* and *Prunus persica* (Ginns, 1986; Griffin, 1968; Farr & Rossman, 2024; Mayers et al., 2020) and is present in Asia, North America and Europe (Farr & Rossman, 2024; GBIF, 2024). *Catunica adiposa* has been implicated in a human illness causing allergic fungal rhinosinusitis (AFRS) (Agarwal et al., 2014). *Catunica adiposa* was previously reported as *Ceratocystis adiposa*. *Ceratocystis* species are usually associated with ambrosia beetles, which *Ceratocystis adiposa* is not. Therefore, it was renamed to *Catunica adiposa* (Mayers et al., 2020). There is no additional information on *Catunica adiposa*
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *C. adiposa* can produce resting propagules or chlamydospores. *Catunica adiposa* produces perithecia, ascospores, conidia, and conidiophores (Hawes & Beckett, 1977; Griffin, 1968; Mayers et al., 2020; Nag Raj & Kendrick, 1975)

A.1.1.6 | *Cryphonectria parasitica*

Taxonomic information	Current valid scientific name: *Cryphonectria parasitica* Synonyms: *Diaporthe parasitica*, *Endothia gyrosa* var. *parasitica*, *Endothia parasitica, Valsonectria parasitica* (according to Index Fungorum, 2024) Name used in the EU legislation: *Cryphonectria parasitica* (Murrill) Barr [ENDOPA] Order: Diaporthales Family: Cryphonectriaceae Common name: chestnut blight, blight of chestnut, canker of chestnut, blight of oak Name used in the Dossier: –
Group	Fungi
EPPO code	ENDOPA
Regulated status	The pathogen is listed in Annex III and in Annex VI of Commission Implementing Regulation (EU) 2019/2072 as *Cryphonectria parasitica* (Murrill) Barr. [ENDOPA]. It is EU protected zone quarantine pests of Czechia, Ireland, and Sweden. It is also RNQP (Regulated non-quarantine pest) for plants for planting other than seeds of *Castanea* and *Castanea sativa*. *Cryphonectria parasitica* is a quarantine pest in Israel, Morocco, Norway and the USA (EPPO, 2024h). *Cryphonectria parasitica* is included in the EPPO A2 and in the A2 list of Jordan, Türkiye and COSAVE (Comite de Sanidad Vegetal del Cono Sur – Argentina, Brazil, Chile, Paraguay, Peru and Uruguay). It is also reported on A1 list of Argentina, Azerbaijan, Chile, the UK and IAPSC (Inter-African Phytosanitary Council) (EPPO, 2024h)
Pest status in Canada	*Cryphonectria parasitica* is present in Canada (Conners, 1967; Ginns, 1986; EPPO, 2024i; Farr & Rossman, 2024; GBIF, 2024; MyCoPortal, 2024), in provinces of British Columbia, Manitoba and Ontario (MyCoPortal, 2024)
Pest status in the EU	*Cryphonectria parasitica* is present in the EU. It is widespread in Croatia, Italy and Portugal. It has restricted distribution in Austria, Belgium, Bulgaria, France, Germany, Greece, Hungary, Romania, Slovakia, Slovenia and Spain. The pathogen is present with few occurrences in Czechia and the Netherlands. In Poland, the pathogen was eradicated (EPPO, 2024i). Different areas in the EU have different strains of *C. parasitica*, the ability of new strains to spread in areas already infested by other strains seems to be very limited (EFSA PLH Panel, 2016)
Host status on *Acer*	*Cryphonectria parasitica* may infect *Acer palmatum* (Spaulding, 1961; Farr & Rossman, 2024) and *A. rubrum* (Anderson & Babcock, 1913; Shear et al., 1917). *Acer* spp. are reported as minor incidental hosts by Rigling and Prospero (2018)
Asymptomatic plants	Endophytic behaviour of *Cryphonectria parasitica* has been reported in young chestnut shoots (Bissegger & Sieber, 1994) and imported chestnut plants that developed symptoms after 16 months of post-entry quarantine (Cunnington & Pascoe, 2003)
Association with wood	*Cryphonectria parasitica* is a canker pathogen that infects the bark and cambium and partially also the sapwood underneath the bark and cambium infections (EFSA, 2016; EPPO, 2005)
Temperature survival and humidity	Jaynes and DePalma (1984) reported that mycelial growth of *C. parasitica* was impaired at temperature of 50°C or higher. Mycelium grown on agar medium was completely killed after exposure to a temperature of 56°C or higher for 20–30 min. Survival of conidia was affected at temperature of 50°C or higher, but some conidia survived after being incubated at 60°C for 30 min (Jaynes & DePalma, 1984). There is no information regarding lethal humidity for this fungus
Ability to produce resting propagules/ chlamydospores	*Cryphonectria parasitica* does not create resting propagules or chlamydospores. *Cryphonectria parasitica* forms stromata in which asexual conidia are produced in pycnidia and sexual ascospores in perithecia (Rigling & Prospero, 2018)

A.1.1.7 | *Entoleuca mammata*

Taxonomic information	Current valid scientific name: *Entoleuca mammata* Synonyms: *Anthostoma blakei, Anthostoma morsei, Fuckelia morsei, Hypoxylon blakei, Hypoxylon holwayi, Hypoxylon mammatum, Hypoxylon morsei, Hypoxylon pauperatum, Hypoxylon pruinatum, Nemania mammata, Rosellinia pruinata, Sphaeria mammata, Sphaeria pruinata* (according to Index Fungorum, 2024) Name used in the EU legislation: *Entoleuca mammata* (Wahlenb.) Rogers and Ju Order: Xylariales Family: Xylariaceae Common name: Hypoxylon canker of poplar, canker of aspen Name used in the Dossier: –
Group	Fungi
EPPO code	HYPOMA
Regulated status	*Entoleuca mammata* is listed in Annex III of Commission Implementing Regulation (EU) 2019/2072 as protected zone quarantine pest for Ireland. The pathogen is quarantine pest in China and Israel. It is on the A1 list of Türkiye (EPPO, 2024j)
Pest status in Canada	*Entoleuca mammata* is present in Canada, in provinces of Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan (EPPO, 2024k; MyCoPortal, 2024), Newfoundland and Labrador, and Yukon (MyCoPortal, 2024)
Pest status in the EU	*Entoleuca mammata* is reported from the following EU MS: Austria, Belgium, Croatia, Czechia, Finland, France, Germany, Greece, Italy, Lithuania, the Netherlands, Slovakia, Slovenia, Sweden (EFSA PLH Panel, 2017b), Denmark (GBIF, 2024), Estonia (Lutter et al., 2019), Latvia (Zeps et al., 2016), Poland and Spain (Farr & Rossman, 2024)
Host status on *Acer*	*Entoleuca mammata* was reported on *Acer ginnala*, *A. rubrum*, *A. saccharum* and *Acer* sp. (Farr & Rossman, 2024; Ginns, 1986; Manion & Griffin, 1986)
Asymptomatic plants	The disease caused by *E. mammata* has a latent period and symptoms can appear 2 years after the ascospore infection (Sinclair & Lyon, 2005; Ostry & Anderson, 2009)
Association with wood	The pathogen is mostly found on trees 15–40 years old, but all ages can be infected (EFSA PLH Panel, 2017b; EPPO, 2024l). Infection usually starts from branches and twigs and then spreads to the main stem. *Entoleuca mammata* is most frequently found on stems about 1.5–2.5 m above the ground (Mathiassen, 1993). The cankers expand very rapidly (7–8 cm per month) in summer, and more slowly during winter; branches and stems can be girdled causing drying and breakage (EFSA PLH Panel, 2017b; Sinclair & Lyon, 2005). The ascospores of *E. mammata* infect a living wood penetrating in the periderm and invading tissues under the bark (sapwood) through mechanical wounds and injuries caused by woodpeckers and insects (Anderson et al., 1979; Ostry & Anderson, 1983). Only live wood is infected, and the fungus does not expand far into dead wood (Ostry, 2013). Infected wood, mostly with bark, may be a pathway for passive spread of *E. mammata* (EFSA PLH Panel, 2017b; EPPO, 2024l)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this pathogen. The only information available is as follows: optimum temperature for growth of mycelium is between 25°C and 28°C and for germination of ascospores is between 28°C and 30°C. Ascospores start to germinate when air is saturated, or plant surfaces are wet for 24–48 h and temperature is above 16°C (Sinclair & Lyon, 2005)
Ability to produce resting propagules/ chlamydospores	*Entoleuca mammata* has two types of spores: (1) conidia in hyphal pegs (asexual) and, (2) ascospores in perithecium (sexual) (Ostry & Anderson, 2009). There is no indication that the fungus can produce resting propagules or chlamydospores

A.1.1.8 | *Jamesreidia tenella*

Taxonomic information	Current valid scientific name: *Jamesreidia tenella* Synonyms: *Ceratocystis tenella*, *Ophiostoma tenellum* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Microascales Family: Ceratocystidaceae Common name: – Name used in the Dossier: – The species was first described as *Ceratocystis tenella* (Davidson, 1958) later on it was renamed as *Ophiostoma tenellum* (Villarreal et al., 2005) and recently as *Jamesreidia tenella* (De Beer et al., 2022)
Group	Fungi
EPPO code	–
Regulated status	*Jamesreidia tenella* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Jamesreidia tenella* (as *Ceratocystis tenella*) is present in North America (the USA and Canada) (Davidson, 1958; Farr & Rossman, 2024; GBIF, 2024; Griffin, 1968). It was reported from Canada on *Acer saccharum*, *Fagus grandifolia*, *Fagus* sp., *Picea mariana*, *Pinus banksiana*, *P. resinosa*, *P. strobus*, and *Quercus rubra* var. *borealis* (Farr & Rossman, 2024; Griffin, 1968; Ginns, 1986). It is present in provinces of Manitoba (Ginns, 1986; Olchowecki, 1972; Olchowecki & Reid, 1974) and Ontario (Ginns, 1986; Griffin, 1968)
Pest status in the EU	*Jamesreidia tenella* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)

(Continues)

(Continued)

Host status on *Acer*	*Jamesreidia tenella* (as *Ceratocystis tenella*) was reported on *Acer saccharum* in Canada (Ginns, 1986)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found
Association with wood	Generally, *Ceratocystis* species cause discoloration in the sapwood of conifers and hardwoods, also called 'blue-stain' (Griffin, 1968). *Jamesreidia tenella* (as *Ceratocystis tenella*) was isolated (1) from small secondary bark beetles associated with *Dendroctonus engelmanni* (current name: *Dendroctonus rufipennis*) and *Ips pilifrons* in *Picea engelmannii* logs, in Colorado, in January 1956 (Davidson, 1958) and (2) from bedlogs of Shiitake (*Lentinula edodes*) during the early stages of cultivation. It suppressed mycelial growth of *L. edodes* in sawdust and oak logs (Maekawa et al., 1987)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that the fungus can produce resting propagules or chlamydospores. *Jamesreidia tenella* produces perithecia, peridium, asci, ascospores, conidia and conidiophores (Davidson, 1958; Griffin, 1968)

A.2 | WOOD DECAY FUNGI (*ARMILLARIA CALVESCENS, ARMILLARIA GEMINA, ARMILLARIA NABSNONA, ARMILLARIA SINAPINA, BONDARZEWIA BERKELEYI, CYLINDROBASIDIUM CORRUGUM, MEGANOTUS EVERHARTII, PERENNIPORIA FRAXINOPHILA, RIGIDONOTUS GLOMERATUS*)

A.2.1 | Organism information

A.2.1.1 | *Armillaria* species (*A. calvescens*, *A. gemina*, *A. nabsnona* and *A. sinapina*)

Taxonomic information	**1. *Armillaria calvescens*** Current valid scientific name: *Armillaria calvescens* Synonyms: – Common name: – Name used in the Dossier: *Armillaria calvescens* **2. *Armillaria gemina*** Current valid scientific name: *Armillaria gemina* Synonyms: – Common name: – Name used in the Dossier: *Armillaria gemina* **3. *Armillaria nabsnona*** Current valid scientific name: *Armillaria nabsnona* Synonyms: – Common name: – Name used in the Dossier: – **4. *Armillaria sinapina*** Current valid scientific name: *Armillaria sinapina* Synonyms: – Common name: – Name used in the Dossier: *Armillaria sinapina* Order: Agaricales Family: Physalacriaceae Name used in the EU legislation: – Name used in the Dossier: –
Group	Fungi
EPPO code	*Armillaria calvescens*, *A. gemina*, *A. nabsnona*: – *Armillaria sinapina*: ARMLSI
Regulated status	*Armillaria* species (*A. calvescens, A. gemina, A. nabsnona* and *A. sinapina*) are neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Armillaria* species (*A. calvescens, A. gemina, A. nabsnona* and *A. sinapina*) are present in Canada (GBIF, 2024; McLaughlin, 2001; Volk et al., 1996). The species are present in the provinces of: – Alberta: *A. sinapina* (MyCoPortal, 2024); – British Columbia: *A. nabsnona* (Kim et al., 2006; MyCoPortal, 2024; Volk et al., 1996), and *A. sinapina* (Kim et al., 2006; MyCoPortal, 2024); – New Brunswick: *A. sinapina* (MyCoPortal, 2024); – Newfoundland and Labrador: *A. sinapina* (MyCoPortal, 2024); – Ontario: *A. calvescens* (McLaughlin, 2001; McLaughlin & Hsiang, 2010), *A. gemina* (McLaughlin, 2001; MyCoPortal, 2024), and *A. sinapina* (McLaughlin, 2001; MyCoPortal, 2024); – Quebec: *A. calvescens* (Kim et al., 2006; McLaughlin & Hsiang, 2010; MyCoPortal, 2024), *A. gemina* (McLaughlin & Hsiang, 2010; MyCoPortal, 2024), and *A. sinapina* (McLaughlin & Hsiang, 2010; MyCoPortal, 2024)
Pest status in the EU	*Armillaria gemina* and *A. nabsnona* are absent from the EU (Farr & Rossman, 2024; GBIF, 2024). There are three reports from Germany for *A. calvescens* (GBIF, 2024) and one report for *A. sinapina* (MyCoPortal, 2024)

(Continued)

Host status on *Acer*	*Armillaria calvescens*, *A. gemina* and *A. sinapina* were reported on *Acer saccharum* (Bérubé & Dessureault, 1989; McLaughlin & Hsiang, 2010). *Armillaria calvescens* and *A. gemina* were pathogenic to *Acer rubrum* (Brazee et al., 2011; Rizzo & Harrington, 1993). *Armillaria nabsnona* was reported on *Acer circinatum* and *A. macrophyllum* (Banik et al., 1996; Volk et al., 1996)
Asymptomatic plants	When *Armillaria* spp. are causing internal heart rot, infected trees often do not show any external symptoms. Wood decay or discoloration only becomes visible after cutting of the trees. However, the presence of the pathogen might still be difficult to recognise at the front of the infection
Association with wood	*Armillaria* species have both saprophytic and parasitic phase (Shaw & Kile, 1991), they can infect dead wood, weakened woody plants but also healthy woody plants. Fruiting bodies of *Armillaria* species develop on dead/moribund woody substrate and release basidiospores into the environment. Healthy trees are infected either by root contacts with infected woody substrates or by soil rhizomorphs growing out from infected woody substrate (Heinzelmann et al., 2019). Rhizomorphs can grow in the soil, on roots of trees and beneath loosened bark on stems (Bérubé & Dessureault, 1989; Heinzelmann et al., 2019). *Armillaria* invades the root system and lower stem of the infected trees. The infection causes white rot of roots and root collars, it kills the cambium and/or cause heart rot (Heinzelmann et al., 2019). *Armillaria calvescens*, *A. sinapina* and *A. gemina* are associated with butt rot of maple trees (McLaughlin, 2001)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for any of the *Armillaria* species except for *Armillaria novae-zelandiae* and *A. mellea*. *Armillaria novae-zelandiae* in blocks of wood (30 × 10 × 5 mm) was found to be very susceptible to heat treatment. It survived a heat treatment of 41°C for 30 min and treatment of 46°C for less than 1 min. However, it did not survive heat treatment of 41°C for 60 min, 46°C for 30 min and 51°C for less than 1 min (Ramsfield et al., 2010). *Armillaria mellea* was also found to be susceptible to heat treatment. When growing on sterilised citrus roots (2.5 × 13 cm) it was killed after exposure to 49°C for 30 min, 41°C for 4–7 h, 38°C for 24–38 h (Munnecke et al., 1976)
Ability to produce resting propagules/ chlamydospores	There is no indication that *Armillaria* species can produce resting propagules or chlamydospores. *Armillaria* species produce fruiting bodies (basidiocarps), rhizomorphs, mycelial fans, and basidiospores (Heinzelmann et al., 2019)

A.2.1.2 | *Bondarzewia berkeleyi*

Taxonomic information	Current valid scientific name: *Bondarzewia berkeleyi* Synonyms: *Bondarzewia berkeleyi* var. *dimidiata, Bondarzewia berkeleyi* var. *skeletigera, Bondarzewia berkeleyi* var. *villosior, Grifola berkeleyi, Polyporus berkeleyi* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Russulales Family: Bondarzewiaceae Common name: White root rot Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Bondarzewia berkeleyi* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Bondarzewia berkeleyi* is present in Canada in British Columbia, Ontario and Quebec (Ginns, 1986; GBIF, 2024; MyCoPortal, 2024)
Pest status in the EU	*Bondarzewia berkeleyi* was reported from Belgium (MyCoPortal, 2024) and Finland (GBIF, 2024)
Host status on *Acer*	*Acer macrophyllum* is a host of *Bondarzewia berkeleyi* according to Ginns (1986) and MyCoPortal (2024)
Asymptomatic plants	When *B. berkeleyi* is causing butt rot, infected trees may not show any external symptoms. Wood decay or discoloration only becomes visible after cutting of the trees. However, the presence of the pathogen might still be difficult to recognise at the front of the infection
Association with wood	*Bondarzewia* is a genus of polypore fungi phylogenetically related to *Heterobasidion,* saprophytic on dead wood but also parasitic on living trees, to which they cause severe white rot (Chen et al., 2016; Miller et al., 2006). *Bondarzewia berkeleyi* is widely distributed in temperate and tropical forests of the world; it is mostly found in North America, from Canada to Mexico, but it is also present in China, Japan, Papua and Oceania (Dai et al., 2007; Farr & Rossman, 2024; GBIF, 2024; McKenzie et al., 2002; Zhou et al., 2011). Main hosts in North America and Asia are *Quercus* spp. (Bishop & McGrath, 1978; Dai et al., 2007; Farr & Rossman, 2024; Guzmàn & Varela, 1979; Vernia, 1999); however other deciduous and conifer trees can be attacked, as *Castanea, Prunus, Abies, Acer, Agathis, Larix, Nothofagus, Pinus, Podocarpus, Pseudotsuga* (Dai et al., 2007; Farr & Rossman, 2024; Ginns, 1986; McKenzie et al., 2002). In China, *B. berkeleyi* is in the list of pathogenic wood-decaying fungi (Dai et al., 2007; Yuan et al., 2023) and in North Carolina (the USA) is considered a species causing economic losses as *Heterobasidion annosum, Phellinus pini* and *Ganoderma applanatum*. However, no specific information on the impact of *B. berkeleyi* was found. The pathogen causes root and butt rot in large diameter trees, mainly oaks, often leading the wood to hollow out; also coppice stems growing from infected stumps may be attacked. Infected roots can easily spread the pathogen to additional susceptible trees (Vernia, 1999; White et al., 2021). The basidiocarps usually form at the base of living trees. They are large, varying from 25–80 cm diameter, dry, velvety, off-white to tan, composed of one to five individual fronds that narrow at the base; each frond is ~6–25 cm wide, irregular or kidney shaped, slightly convex, or flat (White et al., 2021)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus

(Continues)

(Continued)

Ability to produce resting propagules/ chlamydospores	There is no indication that *B. berkeleyi* can produce resting propagules or chlamydospores *Bondarzewia berkeleyi* only produces basidiospores (Chen et al., 2016; Guzmàn & Varela, 1979; Vernia, 1999)

A.2.1.3 | *Cylindrobasidium corrugum*

Taxonomic information	Current valid scientific name: *Cylindrobasidium corrugum* Synonyms: *Coniophora corrugis*, *Corticium corruge* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Agaricales Family: Physalacriaceae Common name: – Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Cylindrobasidium corrugum* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Cylindrobasidium corrugum* is present in North America, in the USA and Canada (Anonymous, 1960; Farr & Rossman, 2024; Ginns, 1986; Lowe, 1969), it was reported from provinces of Alberta (MyCoPortal, 2024) and British Columbia (Fernando et al., 1999; Lowe, 1969; MyCoPortal, 2024; Redhead, 1997) on *Abies lasiocarpa*, *Picea glauca* and *Thuja plicata* (Lowe, 1969)
Pest status in the EU	*Cylindrobasidium corrugum* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)
Host status on *Acer*	*Cylindrobasidium corrugum* (as *Coniophora corrugis*) was reported on *Acer glabrum* in Rocky Mountains causing white rot (Farr & Rossman, 2024; Gilbertson, 1973; Gilbertson et al., 1975)
Asymptomatic plants	No specific information on the presence of asymptomatic plants was found
Association with wood	*Cylindrobasidium corrugum* causes white/wood/sapwood/heartwood rot (Anonymous, 1960; Gilbertson et al., 1975; Gilbertson & Bigelow, 1998; USDA, 2024). It was recorded on *Abies grandis*, *A. lasiocarpa*, *A. lasiocarpa* var. *arizonica*, *A. magnifica*, *A. magnifica* var. *shastensis*, *Acer glabrum*, *Juniperus scopulorum*, *Picea* sp., *P. engelmannii*, *P. glauca*, *P. pungens*, *Pinus contorta*, *P. contorta* var. *murrayana*, *P. flexilis*, *P. longaeva*, *P. ponderosa*, *Populus tremuloides*, *Pseudotsuga taxifolia*, *Ribes* sp., *Sambucus racemose*, *Thuja plicata*, *Tsuga mertensiana* and *T. heterophylla* (Anonymous, 1960; Gilbertson, 1973; Gilbertson et al., 1975; Ginns, 1986; Farr & Rossman, 2024; Lowe, 1969). According to Gilbertson (1973) *C. corrugum* commonly develops profusely in snow over the surfaces of living plants and foliage of fallen conifers as well as on dead branches and other dead wood on the ground. It is a common fungus in and around snowbanks at high elevations throughout the coniferous forests of western North America
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that the fungus can produce resting propagules or chlamydospores. *Cylindrobasidium corrugum* produces subicular hyphae, cystidia, basidia and basidiospores (Gilbertson, 1973; Ginns, 1998; Lin et al., 2021)

A.2.1.4 | *Meganotus everhartii*

Taxonomic information	Current valid scientific name: *Meganotus everhartii* Synonyms: *Fomes everhartii*, *Fulvifomes everhartii*, *Mucronoporus everhartii*, *Phellinus everhartii*, *Pyropolyporus everhartii*, *Scindalma everhartii* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Hymenochaetales Family: Hymenochaetaceae Common name: Everhart's polypore Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Meganotus everhartii* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Meganotus everhartii* is reported from Canada (Conners, 1967; Farr & Rossman, 2024; GBIF, 2024; Lowe, 1952; MyCoPortal, 2024), in provinces of Ontario (Conners, 1967; Ginns, 1986; Lowe, 1952; MyCoPortal, 2024), Prince Edward Island (Conners, 1967; Ginns, 1986), and Quebec (Conners, 1967)
Pest status in the EU	*Meganotus everhartii* (as *Fomes everhartii*) was recorded in France in 1919 on *Ostrya virginiana* and in Sweden in 1921 on dead birch (GBIF, 2024; MyCoPortal, 2024). Since then, no additional record was found for the EU countries (Farr & Rossman, 2024; GBIF, 2024; MyCoPortal, 2024)
Host status on *Acer*	*Meganotus everhartii* (as *Fomes everhartii*) was reported on *Acer saccharum* causing white spongy rot in Ontario (Conners, 1967)
Asymptomatic plants	No information. However, asymptomatic stages are common for wood decay fungi, in particular for those associated with heartwood

(Continued)

Association with wood	*Meganotus everhartii* is a polypore, which causes a white heart rot of living hardwoods (Bessette et al., 2021; Glaeser & Smith, 2013). It is typical on live trunks of oaks (*Quercus*) (Glaeser & Smith, 2013; Riffle & Conway, 1986; Worrall, 2016) and walnuts (*Juglans*) (Bessette et al., 2021; Glaeser & Smith, 2013). But it was also reported on *Acer*, *Betula*, *Castanea*, *Fagus*, *Ostrya*, *Populus*, *Prosopis*, *Pyrus*, and *Ulmus* (Farr & Rossman, 2024). The mycelium of *M. everhartii* can grow even into the sapwood of living trees (Von Schrenk & Spaulding, 1909). *Meganotus everhartii* creates conks (fruiting bodies/sporocarps) on trunks. The conks are perennial, sessile and hoof shaped. The upper surface is dark brown to black, velvety when young but becoming smooth and eroded with age (Glaeser & Smith, 2013). The interior of the conks is rusty brown (Ostry et al., 2011). Baxter (1925) states: 'some trees may be completely infected before any one part of the wood is entirely disintegrated. In one of the oaks decayed by the fungus, the visible rot had not advanced beyond a small part of the infected trunk. In this area, however, the wood was badly decayed. In other oaks the noticeable rot occurred throughout the main trunk, but the wood was not yet appreciably destroyed. In some trees the rot areas appeared to be well defined, while in others there was more of a gradation between the sound and the noticeably decayed wood'. *Meganotus everhartii* may under favourable conditions continue to grow on limbs/branches after they have been blown from the tree (Baxter, 1925)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *M. everhartii* can produce resting propagules or chlamydospores *Meganotus everhartii* produces sterile rimose sporocarps (=conks) and sporophores (Hirt, 1930)

A.2.1.5 | *Perenniporia fraxinophila*

Taxonomic information	Current valid scientific name: *Perenniporia fraxinophila* Synonyms: *Fomes fraxinophilus*, *Fomitopsis fraxinophila*, *Polyporus fraxinophilus*, *Poria fraxinophila*, *Scindalma fraxinophilum* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Polyporales Family: Polyporaceae Common name: Name used in the Dossier: –
Group	Fungi
EPPO code	–
Regulated status	*Perenniporia fraxinophila* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Perenniporia fraxinophila* is found throughout North America in the range of ash with the exception of the Pacific Northwest and Gulf Coast (Glaeser & Smith, 2013). It was recorded in Canada (Conners, 1967; Ginns, 1986; GBIF, 2024; MyCoPortal, 2024) in provinces of Alberta, Northwest Territories, (Ginns, 1986), Ontario (Conners, 1967; Ginns, 1986; MyCoPortal, 2024), Manitoba, and Quebec (MyCoPortal, 2024)
Pest status in the EU	*Perenniporia fraxinophila* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)
Host status on *Acer*	*Perenniporia fraxinophila* was recorded on *Acer negundo* and *A. rubrum* (Anonymous, 1960; Worrall, 2016)
Asymptomatic plants	No information. However, asymptomatic stages are common for wood decay fungi, in particular for those associated with heartwood
Association with wood	*Perenniporia fraxinophila* causes a heart rot disease, a stem decay and a white trunk rot of living ash trees (*Fraxinus* – mainly *Fraxinus pennsylvanica* and *Fraxinus americana*) and other hardwood species including *Acer* (Glaeser & Smith, 2013; Lesica et al., 2003; Riffle & Walla, 1986; Worrall, 2016). Basidiospores released from basidiocarps (also called sporocarps/conks/fruiting bodies) during wet periods germinate to produce hyphae (Solomon et al., 1993). The hyphae enter the trees through wounds or broken limbs and causes decay, which is followed by development of sporocarps. Sometimes the sporocarps are not observed. The disease mainly weakens the heart wood and makes branches and trunks more susceptible for breakage by wind and ice. The disease slows the growth of the trees and rarely kills them (Lesica et al., 2003). Sporocarps are perennial, hard, and woody when they are matured (Riffle & Walla, 1986). According to Worrall (2016) sporocarps created by fungi that cause stem decays are often the first outward evidence of infection, but they only appear years after decay begins. Moreover, sporocarps may never appear, even when the tree is extensively decayed. On *Fraxinus pennsylvanica* the decay is surrounded by wide brown zone. Invaded tissues became light brown and later dark brown; decayed wood has straw to white colour (Riffle & Walla, 1986)
Temperature survival and humidity	Isolates of *P. fraxinophila* were incubated for two weeks at different temperature (10, 15, 20, 25, 30, 35, 40 and 45°C) and daily growth was measured. The results were: optimal temperature for growth of *P. fraxinophila* is between 25°C and 30°C. Maximum growth temperature is 35°C. There was no growth when temperature reached 40°C and 45°C. The thermal death point for *P. fraxinophila* was 40°C (Flott & Gilbertson, 1991)
Ability to produce resting propagules/ chlamydospores	*Perenniporia fraxinophila* produces chlamydospores (Flott & Gilbertson, 1991), sporocarps (=conks/basidiocarps/ basidiomes/basidiomata) and basidiospores (Ashok & Prasher, 2014; Lesica et al., 2003). *Perenniporia fraxinophila* has tough, felt-like, white mycelial mats that eventually develop some darker pigmentation (Flott & Gilbertson, 1991)

A.2.1.6 | *Rigidonotus glomeratus*

Taxonomic information	Current valid scientific name: *Rigidonotus glomeratus* Synonyms: *Inonotus glomeratus, Inonotus heinrichii, Polyporus glomeratus, Polystictus glomeratus, Xanthochrous glomeratus, Xanthochrous glomeratus* subsp. *heinrichii, Xanthochrous heinrichii* (according to Index Fungorum, 2024) Name used in the EU legislation: – Order: Hymenochaetales Family: Hymenochaetaceae Common name: – Name used in the Dossier: *Inonotus glomeratus*
Group	Fungi
EPPO code	–
Regulated status	*Rigidonotus glomeratus* is neither regulated anywhere in the world, nor listed by EPPO
Pest status in Canada	*Rigidonotus glomeratus* is present in Canada (Callan, 1998; Conners, 1967; Ginns, 1986; MyCoPortal, 2024; Ryvarden, 2005), in provinces of British Columbia (Callan, 1998; MyCoPortal, 2024), Nova Scotia, Ontario, Quebec (Conners, 1967; Ginns, 1986; MyCoPortal, 2024), Alberta, Manitoba and New Brunswick (MyCoPortal, 2024)
Pest status in the EU	*Rigidonotus glomeratus* is absent from the EU (Farr & Rossman, 2024; GBIF, 2024)
Host status on *Acer*	*Rigidonotus glomeratus* was reported on *Acer negundo, A. rubrum, A. saccharum* and *Acer* spp. (Anonymous, 1960; Campbell & Davidson, 1939a, 1939b; Ginns, 1986; Good & Nelson, 1951; Overholts, 1917; Shigo, 1969)
Asymptomatic plants	No information. However, asymptomatic periods are common for all wood decay fungi
Association with wood	*Rigidonotus glomeratus* causes white to light-brown spongy heart rot of maples, especially *Acer saccharum* (Campbell & Davidson, 1939a) and it is associated with cankers on *Acer rubrum* particularly in connection with branch stubs (Campbell & Davidson, 1939b) and wounds above the butt (Walters & Yawney, 1990). Some of the attacked maple trees created dark brown wound gum in the wood (with higher pH) as a response to the invasion of the fungus. This reaction appeared to inhibit development of the decay in the dark zone – slow delignification in the dark zone and rapid breakdown of both lignin and cellulose (Good & Nelson, 1951). *Rigidonotus glomeratus* enters maple trees via wounds in the bark and forms sterile conks around the infection courts. The mycelium invades and decays the wood while the sterile fruit bodies push a wedge into the outer bark and kill the cambium, causing canker. The wood beneath the dead cambium is discoloured as a response to the injury (Shigo, 1969). According to Ryvarden (2005) *R. glomeratus* does not fruit on living trees, but often produces sterile conks on *Acer*. It produces large basidiocarps on stumps and fallen trees in which it continues to decay after death of the host. The fruiting conks on dead and downed trees have yellowish-brown colour (Berry, 1973). The mycelium was isolated from almost all tissues in the decayed maple wood except for the outer part of the dark brown zone, or in the regions above the typical decay, where discoloration was the only indication of infection. It appeared in fibres and vessels, but not in the rays. Dead cells were found in the rays and xylem parenchyma at the outer limit of the dark zone (Good & Nelson, 1951)
Temperature survival and humidity	There is no information regarding lethal temperatures and humidity for this fungus
Ability to produce resting propagules/ chlamydospores	There is no indication that *R. glomeratus* can produce resting propagules or chlamydospores. *Rigidonotus glomeratus* produces basidiocarps, basidia and basidiospores (Ryvarden, 2005)

A.3 | AMBROSIA BEETLES (*ANISANDRUS OBESUS, ANISANDRUS SAYI, CORTHYLUS COLUMBIANUS, EUWALLACEA VALIDUS, MONARTHRUM FASCIATUM, MONARTHRUM MALI, XYLEBORUS FERRUGINEUS, XYLOTERINUS POLITUS*)

A.3.1 | Organism information

Taxonomic information	**1. *Anisandrus obesus*** Current valid scientific name: *Anisandrus obesus* Synonyms: *Xyleborus obesus, Xyleborus serratus, Anisandrus populi* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: – Name used in the Dossier: – **2. *Anisandrus sayi*** Current valid scientific name: *Anisandrus sayi* Synonyms: *Xyleborus sayi, Xyleborus neardus, Anisandrus minor* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera

(Continued)

	Family: Curculionidae Subfamily: Scolytinae Common name: – Name used in the Dossier: – **3. *Corthylus columbianus*** Current valid scientific name: *Corthylus columbianus* Synonyms: – Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: Columbian timber beetle Name used in the Dossier: *Corthylus columbianus* **4. *Euwallacea validus*** Current valid scientific name: *Euwallacea validus* Synonyms: *Xyleborus validus* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: larger Sakhalin-fir bark beetle Name used in the Dossier: – **5. *Monarthrum fasciatum*** Current valid scientific name: *Monarthrum fasciatum* Synonyms: *Bostrichus fasciatus, Pterocyclon fasciatum* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: yellow-banded ambrosia beetle Name used in the Dossier: – **6. *Monarthrum mali*** Current valid scientific name: *Monarthrum mali* Synonyms: *Monaryhrum praestum, Monaryhrum omissum, Pterocyclon mali* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: apple wood stainer Name used in the Dossier: – **7. *Xyleborus ferrugineus*** Current valid scientific name: *Xyleborus ferrugineus* Synonyms: *Xyleborus confusus, Xyleborus fuscatus* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: bark locette, black twig borer Name used in the Dossier: – **8. *Xyloterinus politus*** Current valid scientific name: *Xyloterinus politus* Synonyms: *Bostrichus politus, Xyloterus unicolor* Name used in the EU legislation: Scolytinae spp. (non-European) [1SCOLF] Order: Coleoptera Family: Curculionidae Subfamily: Scolytinae Common name: pinhole borer Name used in the Dossier: *Xyloterinus politus*
Group	Insects
EPPO code	*Anisandrus obesus*: ANIDOB *Anisandrus sayi*: ANIDSA *Corthylus columbianus*: CORHCL *Euwallacea validus*: XYLBVA *Monarthrum fasciatum*: MNTHFA *Monarthrum mali*: MNTHMA *Xyleborus ferrugineus*: XYLBFE *Xyloterinus politus*: XYORPO
Regulated status	*Anisandrus obesus, A. sayi, Corthylus columbianus, Euwallacea validus, Monarthrum fasciatum, M. mali, Xyleborus ferrugineus*, and *Xyloterinus politus* are members of the Scolytinae spp. (non-European) [1SCOLF], which are listed in Annex II/A of Commission Implementing Regulation (EU) 2019/2072. *Xyleborus ferrugineus* is in the A1 list for Chile and in the A2 list of APPPC (Asia and Pacific Plant Protection Commission) (EPPO, 2024m)

(Continues)

(Continued)

Pest status in Canada	The ambrosia beetles (*Anisandrus obesus, A. sayi, Corthylus columbianus, Euwallacea validus, Monarthrum fasciatum, M. mali, Xyleborus ferrugineus,* and *Xyloterinus politus*) are present in Canada (Atkinson, 2024; Majka et al., 2007). The species are present in the provinces of: – British Columbia: *Monarthrum mali*, *Xyloterinus politus* (Atkinson, 2024); – New Brunswick: *Anisandrus obesus*, *Anisandrus sayi*, *Monarthrum mali*, *Xyloterinus politus* (Atkinson, 2024); – Nova Scotia: *Corthylus columbianus* (Majka et al., 2007); – Ontario: *Anisandrus obesus*, *Anisandrus sayi*, *Euwallacea validus*, *Monarthrum fasciatum*, *Monarthrum mali*, *Xyleborus ferrugineus*, *Xyloterinus politus* (Atkinson, 2024); – Quebec: *Anisandrus obesus*, *Anisandrus sayi*, *Monarthrum mali*, *Xyloterinus politus* (Atkinson, 2024).
Pest status in the EU	*Anisandrus obesus, A. sayi, Corthylus columbianus, Euwallacea validus, Monarthrum fasciatum,* and *M. mali* are absent from the EU. Two species were reported from France: *Xyleborus ferrugineus* (GBIF, 2024) and *Xyloterinus politus* (EPPO, 2024n)
Host status on *Acer*	All the taxa have *Acer* species as host plants: *Anisandrus obesus: Acer* spp., *A. rubrum, A. saccharum* (Atkinson, 2024; Cognato et al., 2009; Wood & Bright, 1992). *Anisandrus sayi: Acer* spp., *A. rubrum, A. saccharinum, A. saccharum* (Atkinson, 2024; Deyrup, 1981; Wood & Bright, 1992). *Corthylus columbianus: Acer rubrum, A. saccharinum, A. saccharum* (Atkinson, 2024; Atkinson et al., 1991; Wood & Bright, 1992). *Euwallacea validus: Acer* spp., *Acer pensylvanicum* (Berger, 2017; EPPO, 2020; Wood & Bright, 1992) *Monarthrum fasciatum: Acer rubrum* (Atkinson, 2024; Wood & Bright, 1992). *Monarthrum mali: Acer rubrum* (Atkinson, 2024; Wood & Bright, 1992). *Xyleborus ferrugineus: Acer rubrum* (Atkinson, 2024; Wood & Bright, 1992). *Xyloterinus politus: Acer* spp., *Acer rubrum, A. saccharum, A. campestre* (Atkinson, 2024, EPPO, 2024n)
Asymptomatic plants	No specific information on the presence of asymptomatic plants is found. Similarly, like other ambrosia beetles, initial phases of infestation are associated with few external symptoms. While there is no visible injury in the bark at early stage of colonisation, frass is produced and examination of the wood under the infested spot bored by the beetle, reveals the brownish staining of the xylem and necrosis caused by the fungus (Mendel et al., 2017)
Association with wood	***Anisandrus obesus*** is usually found on young stems 5–20 (30) cm diameter. The maternal galleries are biramous, 1.6–1.8 mm diameter; lateral tunnels are on average 29.8 mm long. The depth in the outer portion of the wood ranges from 4.0 to 10.0 mm in *Populus grandidentata* (Dodge, 1938; Cassar et al., 2016). The fungal symbiont of *A. obesus* is *Ambrosiella hartigii* (Mayers et al., 2015). ***Anisandrus sayi*** has a pattern attack to young stems and gallery shape similar to that of *A. obesus*, but smaller limbs and branches are colonised (Wood, 1982). *Ambrosiella hartigii* and *A. batrae* are reported as fungal symbionts (Mayers et al., 2015). ***Corthylus columbianus*** is well known as species attacking healthy vigorous trees that usually survive after the brood is emerged, and the entry holes of the former tunnels are then covered by the tree growth (Wood, 1982; Kirkendall et al., 2015). The beetle is very common mostly on *Acer rubrum* and *A. saccharinum*, causing considerable degrade to lumber since all size of stems can be infested, from saplings to mature large diameter trees (Nord & McManus, 1972). Entry holes 2.0 mm diameter (larger than other ambrosia beetles) with granular powder, is an external symptom easy to recognise on standing trees/logs attacked by *C. columbianus*. The gallery system consists of a primary tunnel and one to four secondary channels at right angles; tertiary channels are occasionally also observed. The maximum penetration of the tunnel into sapwood is 60 mm (Nord & McManus, 1972). According to Mayers et al. (2015) the fungal symbiont of *C. columbianus* is *Ambrosiella xylebori*. The lack of harm caused by the beetle is due to the low virulence of its ambrosial fungus (Smith & Hulcr, 2015). ***Euwallacea validus*** usually attacks stressed and dying trees or trees that recently died (Berger, 2017). It is also known to colonise trees in advanced stage if decay, as trunks and branches on the ground or submerged by water (Smith & Hulcr, 2015); in Japan, *E. validus* breeds in logs, stumps and unthrifty material larger than 8 cm in diameter (Wood, 1982). However, the beetle may also infest living *Ficus*, as observed in greenhouses in Japan, as well as nearby healthy trees of *Ailanthus altissima* infected by verticillium wilt in the USA (Smith & Hulcr, 2015). According to EPPO (2020), *E. validus* is easily spread with wood, wood packaging material, wood chips, hogwood, processing wood residues and possibly plants for planting and cut branches, as confirmed by number of interceptions in logs, timber, and wooden packaging worldwide (EPPO, 2020). *Euwallacea validus* has a gallery system presumably similar to that of *E. fornicatus* – a simple gallery encircling the stem, with a few longitudinal tunnels in small branches (EPPO, 2020, 2024o) but no details are available about the depth of the tunnels into the wood. However, being a xyleborine species long time identified as *Xyleborus validus* (Wood, 1982) and considering its size, it may be assumed that the depth of its galleries into the wood is similar to that of *Xylebous ferrugineus* (up to 30 cm in depth). As other *Euwallacea* species, *E. validus* is in symbiotic relationships with *Fusarium* AF-clade fungi and *Fusarium oligoseptatum*, as well as with *Raffaelea subfusca* (Aoki et al., 2018; Osborn et al., 2023). *Euwallacea validus* is also a vector of the pathogenic fungus *Verticillium nonalfalfae* on *Ailanthus altissima* and *Acer pensylvanicum* in the USA (EPPO, 2020). ***Monarthrum fasciatum*** is a polyphagous species mostly found on Fagaceae (*Quercus* and *Fagus*) but frequently also on *Acer* species (Wood, 1982). The beetle markedly prefers large diameter stems and branches (> 24 cm) mainly attacking weakened or recently dead trees. However, severe damage on freshly felled logs of *Liquidambar styraciflua* was also observed in the USA (Baker, 1972). Galleries 25 mm long on average were recorded from infested oak wood (Smith & Hulcr, 2015). *Monilia brunnea* is the commonest fungal symbiont of *M. fasciatum* (Smith & Hulcr, 2015), which is also vector of the pathogenic fungus *Geosmithia morbida* (Moore et al., 2019)

(Continued)

	Monarthrum mali is very similar to *M. fasciatum*, so that all information outlined on that species can be assumed. According to Wood (1982), however, *M. mali* also attacks minor diameter young trees (> 10 cm), and it is considered a pest in apple, plum and cherry orchards in the USA (Smith & Hulcr, 2015). ***Xyleborus ferrugineus*** attacks a wide range of species of woody plants, mostly deciduous trees larger than 10 cm in diameter. Among *Acer* species, only *Acer rubrum* is known to be host (Wood & Bright, 1992). The beetles usually colonise cut or broken trees but can also infest slightly weakened plants causing their death. Important damage of *X. ferrugineus* is mainly on fresh felled trees and logs, on both forest logging yards or storage areas. The tunnels bored by adult beetles usually penetrate the entire depth of the sapwood from 2 to 30 cm, sometimes also reaching the hardwood (Wood, 1982). *Fusarium solani*, *Cephalosporium* sp. and *Graphium* sp. are known as fungal symbionts of *X. ferrugineus* (Baker & Norris, 1968); more recently, also *Ambrosiella* sp. and *Fusarium* AF-9 have been found as associated with the beetle (Mayers et al., 2015; Osborn et al., 2023). ***Xyloterinus politus*** attacks dying or recently dead trees, usually in the basal region of the trunk; it is also found on windthrows, recently felled trees and logs (Dodge, 1938; MacLean & Giese, 1967). Entry holes are 1.5–1.6 mm diameter and the main tunnel may extend into the sapwood up to 45–55 mm. From one to three secondary branches up to 14.1 mm long are excavated at right angle by females (Maclean & Giese, 1967). Some ambrosia yeasts as *Saccharomycopsis microspora, Wickerhamomyces hampshirensis, Candida mycetangii, C. xyloterini* and *C. palmyrensis* are associated with *Xyloterinus politus* (Suh & Zhou, 2010). According to Mayers (2018), fungal symbionts of *X. politus* are also *Raffaelea* cf. *canadensis* RNC 5 and *Kaarikia ambrahamsonii*
Temperature survival and humidity	No specific information available
Size at different life stages	***Anisandrus obesus***: adult female 2.8–3.5 mm, 2.0–2.2 × as long as wide; adult male 1.5–1.8 mm (Wood, 1982); female pupa 3.5 mm, male pupa 1.8 mm (Cassar et al., 2016). ***Anisandrus sayi***: adult female 2.3–2.6 mm, 2.2 × as long as wide (Wood, 1982); egg 0.70 × 0.36 mm (Hazen & Roeper, 1980). ***Corthylus columbianus***: adult male–female 3.6–3.8 mm, 2.4 × as long as wide; egg 1.00 × 0.5 mm; first instar larva 1.00 mm, mature larva 4.0 mm (Nord & McManus, 1972; Wood, 1982). ***Euwallacea validus***: adult female 3.4–3.8 mm 2.4 × as long as wide; male 2.3 mm (Wood, 1982). No information about the size of other life stages was found. ***Monarthrum fasciatum***: adult male–female 2.3–2.8 mm, 3.2 × as long as wide (Wood, 1982). No information about the size of other life stages was found. ***Monarthrum mali***: adult male–female 1.8–2.0 mm, 3.2 × as long as wide. No information about the size of other life stages was found. ***Xyleborus ferrugineus***: adult female 2.0–3.3 mm, 27–3.0 × as long as wide; male 1.8 mm (Wood, 1982); egg 0.70 mm (Beeman & Norris, 1977). ***Xyloterinus politus***: adult female 3.3–3.7 mm, 2.7 × as long as wide; adult male 2.7–2.9 mm, 2.4 × as long as wide (Wood, 1982); egg 0.89 × 0.66 mm; new hatched larvae 0.48–0.44 mm; second instar larvae 0.95 mm; third instar larvae 2.8 mm; pupa 3.07 × 1.25 mm (MacLean & Giese, 1967). Only poor information on egg and larvae size of ambrosia beetles is available in the literature. Egg sizes from other similar ambrosia beetle species are: *Xyleborus glabratus* (0.63 × 0.27 mm – Brar et al., 2013; *Xylosandrus compactus* (0.55 × 0.28 mm – Hara & Beardsley, 1979), *Xylosandrus germanus* (0.67 × 0.38 mm – Ranger et al., 2016). The measures of larvae are usually reported as head-capsule size in different instars

A.4 | OTHER INSECTS *(ANELAPHUS PUMILUS, ANTHOPHYLAX ATTENUATUS, ARRHENODES MINUTUS, ASTYLOPSIS MACULA, BELLAMIRA SCALARIS, BRACHYLEPTURA RUBRICA, CENTRODERA DECOLORATA, CHRYSOBOTHRIS FEMORATA, CHRYSOBOTHRIS MALI, CLYTUS RURICOLA, DICERCA DIVARICATA, ECYRUS DASYCERUS, GLYCOBIUS SPECIOSUS, PARELAPHIDION INCERTUM, PIDONIA RUFICOLLIS, PRIONOXYSTUS ROBINIAE, STERNIDIUS MISELLUS, STRANGALEPTA ABBREVIATA, TRIGONARTHRIS PROXIMA, TYPOCERUS DECEPTUS)*

A.4.1 | Organism information

A.4.1.1 | *Arrhenodes minutus*

Taxonomic information	Current valid scientific name: *Arrhenodes minutus* Synonyms: *Arrhenodes minuta*, *Arrenodes minutus*, *Brentus brunneus*, *Brentus minutus*, *Brentus mucillosus*, *Brentus septentrionis*, *Curculio minutus*, *Eupsalis lecontei*, *Eupsalis minuta*, *Eupsalis sallei*, *Platysystrophus minutus* Name used in the EU legislation: *Arrhenodes minutus* Order: Coleoptera Family: Brentidae Common name: Oak timberworm Name used in the Dossier: –
Group	Insects
EPPO code	ARRHMI
Regulated status	*Arrhenodes minutus* is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072 as *Arrhenodes minutus* Drury [ARRHMI]. The pest is quarantine pest in Moldova. It is on the A1 list of Georgia, Türkiye and the U K (EPPO, 2024p)

(Continues)

(Continued)

Pest status in Canada	*Arrhenodes minutus* is present in Canada in New Brunswick, Nova Scotia, Ontario and Quebec (EPPO, 2024q)
Pest status in the EU	*Arrhenodes minutus* is absent from the EU (EPPO, 2024q; EFSA, 2023b)
Host status on *Acer*	*Acer negundo, Acer rubrum* and *Acer* spp. are potential hosts of *Arrhenodes minutus* according to EFSA (2023b)
Asymptomatic plants	No specific information available
Association with wood	The primitive weevil *Arrhenodes minutus* is a wood borer causing severe degrade of timber in the eastern North America. It is also considered a potential vector of the pathogenic fungus *Bretziella fagacearum* (EFSA, 2023). *Quercus, Fagus, Ulmus* and *Populus* are main hosts of the beetle; *Quercus coccinea* and *Q. velutina* are the more susceptible (EFSA, 2023b). *Acer* spp., *Acer negundo* and *A. rubrum* are considered potential hosts, since clusters of adults have been observed under loose bark (Solomon, 1995; Dajoz, 2005); however, no larval tunnels nor any kind of inner wood infestation have been recorded on *Acer* species to date. Adults are attracted by standing trees with bark wounds exposing the wood; no trees without exposed wood are attacked according to Buchanan (1960). Eggs are laid on both living and dead standing trees (in this last case in wounds made before the trees died) (USDA, 1985). Small and large trees and also freshly felled logs can be attacked, ranging from about 14 to 47 cm diameter (Buchanan, 1960). The larvae penetrate directly into the wood, boring tunnels that go across the wood to the opposite side of the tree. Larvae then turn back newly crossing the wood towards the entry point, where pupation occurs (Solomon, 1995). Tunnels are initially 0.2 mm diameter and progressively enlarge to 4.0 mm with the growth of larvae. Galleries bored in all directions throughout the wood are often so numerous that wood become unmerchantable (Bright, 1993). The life cycle is usually 3 years, only few individuals need 2 or 4 years to complete the development (Buchanan, 1960). Wood with or without bark of both main and potential host plants is a pathway for the pest (EFSA PLH Panel, 2019). Wooden furniture can also be a pathway (EPPO, 2024r)
Temperature survival and humidity	No specific information available
Size at different life stages	Adults: 7–25 mm females; 7–35 mm males (USDA, 1985). Eggs: < 1 mm diameter (Buchanan, 1960). Larvae: 12–24 mm long, 2–4 mm wide when full grown (Solomon, 1995). Pupa: 10 mm (EPPO, 2024r)

A.4.1.2 | *Astylopsis macula*

Taxonomic information	Current valid scientific name: *Astylopsis macula* Synonyms: *Lamia macula, Amniscus macula, Leptostylus macula, Astylopsis maculata* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: – Name used in the Dossier: –
Group	Insects
EPPO code	–
Regulated status	*Astylopsis macula* is neither regulated anywhere in the world nor listed by EPPO
Pest status in Canada	*Astylopsis macula* is native to North America. In Canada, it is present in New Brunswick, Nova Scotia, Ontario and Quebec (Tavakilian & Chevillotte, 2024)
Pest status in the EU	*Astylopsis macula* is absent from the EU (GBIF, 2024)
Host status on *Acer*	*Acer pensylvanicum, A. rubrum* and *Acer* sp. are hosts of *A. macula* (Craighead, 1923; Gosling, 1984; Monné & Nearns, 2023; Tavakilian & Chevillotte, 2024) Two similar north American species also feed on *Acer*: *Astylopsis collaris* on *Acer negundo* and *A. fascipennis* on *Acer rubrum*; however, none of the two is found in Canada (Monné & Nearns, 2023)
Asymptomatic plants	No specific information on the presence of asymptomatic plants is found. Similarly, like other longhorn beetles, initial phases of infestation are associated with very few external symptoms, and it can be expected that the plants remain asymptomatic for a few weeks after hatching of the larvae
Association with wood	*Astylopsis macula* is a cerambycid beetle in the subfamily Lamiinae, tribe Acanthocinini, commonly found throughout the eastern USA and Canada (Craighead, 1923). It is a highly polyphagous insect, feeding on over 30 species of deciduous trees and shrubs, such as *Acer, Castanea, Quercus, Fagus, Alnus, Betula, Ostrya, Carya, Juglans, Lioriodendron, Malus, Prunus, Populus, Sorbus, Tilia, Ulmus* (Tavakilian & Chevillotte, 2024). However, *Castanea dentata* is probably the most common host of *A. macula*, since the adults feed on pycnidia, perithecia and conidia of *Cryphonectria parasitica*, so being a vector of the pathogen (Craighead, 1923; Halik & Bergdahl, 2002). In addition to this, the adults of *A. macula* can also carry conidia of the exotic pathogenic fungus *Sirococcus clavigignenti-juglandacearum*, the agent of canker disease on butternut (*Juglans cinerea*), of which it is considered the more efficient vector (Halik & Bergdahl, 2002). Despite being a vector of pathogenic fungi, *Astylopsis macula* is not known to be a pest. The beetle only attacks stems and large branches of dead trees or logs, overwintering as larvae beneath the bark. Pupation takes place in the bark or between the bark and wood, and adults fly from May to July (Craighead, 1923, Halik & Bergdahl, 2002). No detailed information on how deep the larvae of *A. macula* can penetrate the wood. However, according to Craighead (1923), *Astylopsis* are all bark feeders in the larval stage, entirely feeding in the bark proper or between the bark and wood, and pupation can occur in the outer layer of the sapwood only when the bark is thin

(Continued)

Temperature survival and humidity	No specific information available
Size at different life stages	Adults of *Astylopsis macula* are 5–9 mm long (Tavakilian & Chevillotte, 2024). No information was found on other life stages. Craighead (1923) provides a very detailed description of larvae, but no size information is given

A.4.1.3 | *Chrysobothris femorata* and *C. mali*

Taxonomic information	**1. *Chrysobothris femorata*** Current valid scientific name: *Chrysobothris femorata* Synonyms: *Buprestis femorata, Chrysobothris horni, Chrysobothris horni, Chrysobothris obscura* Name used in the EU legislation: – Order: Coleoptera Family: Buprestidae Common name: Flat-headed Appletree Borer (FAB) Name used in the Dossier: *Chrysobothris femorata* Note on taxonomy: Recent research has established that *Chrysobothris femorata* co-occurs with a suite of cryptic species; this is a complex of 12 closely related species, and adult beetles within the group are often morphologically indistinguishable. Because of this, the number of *Chrysobothris* species within the group is continuously being amended (Williamson, 2022; Rudolph & Wiman, 2023) **2. *Chrysobothris mali*** Current valid scientific name: *Chrysobothris mali* Synonyms: – Name used in the EU legislation: – Order: Coleoptera Family: Buprestidae Common name: Pacific Flat-headed Borer (PFB) Name used in the Dossier: –
Group	Insects
EPPO code	*Chrysobothis femorata*: CHRBFE *Chrysobothris mali*: CHRBMA
Regulated status	*Chrysobothris femorata* and *C. mali* are both included in the A1 EPPO list *Chrysobothris mali* is also in the A1 list for COSAVE (Comite de Sanidad Vegetal del Cono Sur): Argentina, Bolivia, Brazil, Chile, Paraguay, Peru, Uruguay (EPPO, 2024s, 2024t)
Pest status in Canada	*Chrysobothris femorata* is present in Canada in Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, Saskatchewan (EPPO, 2021). *Chrysobothris mali* is present in Canada in Alberta, British Columbia, Manitoba, Saskatchewan (EPPO, 2021)
Pest status in the EU	Both *Chrysobopthris femorata* and *C. mali* are absent from the EU (GBIF, 2024; EPPO, 2021)
Host status on *Acer*	*Acer negundo, A. platanoides, A. rubrum, A. saccharinum, A. saccharum, A. truncatum* and *A. x freemani* are hosts of *Chrysobothris femorata* (EPPO, 2024u). *Acer macrophyllum, A. negundo, A. platanoides, A. pseudoplatanus, A. rubrum, A. saccharinum* and *A. saccharum* are hosts of *Chrysobothris mali* (EPPO, 2024v)
Asymptomatic plants	Plants may remain asymptomatic or with almost undetectable symptoms in early stages of infestation. Infestations are usually not apparent until larvae are large enough to produce visible injury on the trunk surface or branch dieback occurs (Oliver et al., 2010), which takes several months after egg-laying
Association with wood	*Chrysobothris femorata* and *C. mali* are two common north American wood borers with a similar biology, well known for damaging many species of deciduous trees (EPPO, 2021). The *C. femorata* host list includes 59 host species in 33 genera and 17 families; the beetle is mostly associated with the genera *Betula, Populus* and *Quercus. Chrysobothris mali* is known to utilise 88 host species in 54 genera and 16 families and is strongly associated with Rosaceae in the genera *Amelanchier, Cercocarpus* and *Prunus* (Rudolph, 2022). Both the borers, however, frequently attack *Acer* trees of any age (EPPO, 2021), and due to their highly polyphagous habits, they are considered economically important pests in a wide range of high value tree plantations (Rudolph, 2022). In Canada, *C. mali* is considered a pest for newly planted trees in the Pacific coast and British Columbia (Capizzi et al., 1982); it also reported as a pest of apple saplings. However, it is assumed that most of Canada probably has only suboptimal climatic conditions for both the species (EPPO, 2021). Main impact is on young plants in commercial nurseries and landscape (including urban trees), often due to mortality of newly transplanted or weakened trees (EPPO, 2021). In young trees < 5 cm diameter with thin bark, spiral larval tunnels sometimes encircle and girdle stem causing the death (EPPO, 2021). There is poor information about the damage and impact of both the species on large mature trees in forests or wood plantations. Attacks by *C. femorata* and *C. mali* only rarely kill mature trees but can weaken them and contribute to their death. In older trees with thick bark, galleries may be confined to a circular area, and wounds may be enlarged by succeeding generations (Steed & Burton, 2015; EPPO, 2021). Adults lay eggs in bark crevices, and larvae develop in the outer layer of the wood. The full-grown larvae of both the species bore galleries 2.5–5 cm deep in the wood of the tree. The presence of larvae and pupae of *C. femorata* or *C. mali* in the wood depends on the size of the tree and the thickness of the bark and sapwood. In young trees with smaller diameters and restricted wood depth, the galleries occur at 1–2 cm depth and larval galleries may measure 5 cm in length, although longer galleries (up to 20 cm) can be observed for *C. femorata*.

(Continues)

(Continued)

	In large diameter material, tunnels may be found in the superficial layer of the sapwood up to 5 cm deep and never in the heartwood (EPPO, 2021). Immature stages present in the wood of living trees before cutting continue their development as long as the material is suitable, but no information is available on the conditions allowing the larval development. Complete development with adult emergence is assessed to be more likely for late larval stages and pupae than for earlier stages (EPPO, 2021). *C. femorata* adults may emerge from logs felled 3 months before (Potter et al., 1988) and emergence from wood 3 years after felling is reported (Fenton, 1942). *Chrysobothris* species are frequently intercepted on wood at ports of entry (EPPO, 2021). However, important differences must be emphasised about different life stages. On round wood, eggs and young larvae are restricted to wood with bark, while mature larvae, pupae and freshly formed adults may be associated with wood with, or without bark (EPPO, 2021). Debarking remove or destroy both eggs and young larvae, also exposing other life stages to the risk of drying. Processing into sawn wood usually removes the external parts of the logs where larvae are present, accelerating the drying of wood, which become unsuitable for immature stages survival. For this reason, sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages, even though *C. mali* can also develop on material of smaller diameter (EPPO, 2021)
Temperature survival and humidity	No specific information available
Size at different life stages	***Chrisobothris femorata*** Adults: female 9.62–14.22 mm (11.82); male 9.09–12.58 mm (10.99) (Rudolph, 2022) Eggs: 1.5 mm (EPPO, 2021) One-day larva: 1.3–2.0 mm (Fenton, 1942) Mature larva: 15–25 mm long (EPPO, 2021) Pupa: 11–12 mm (Maxwell, 1937); 7–19 mm (Steed & Burton, 2015) ***Chrysobothris mali*** Adults: female 6.14–11.36 mm (8.45); male 5.61–11.99 mm (8.14) (Rudolph, 2022); 6–12 mm (Hallinen et al., 2021) Eggs: 1.0 mm (EPPO, 2021) Mature larva: 15–18 mm long (Burke & Böving, 1929) Pupa: 6–11 mm long (Steed & Burton, 2015)

A.4.1.4 | *Dicerca divaricata*

Taxonomic information	Current valid scientific name: *Dicerca divaricata* Synonyms: *Buprestis divaricata, Dicerca aestiva, Dicerca angusticauda, Dicerca aurichalcea, Dicerca dubia, Dicerca divaricata, Dicerca incisa, Dicerca limula, Dicerca nigra, Dicerca parumpunctata, Dicerca rustica, Dicerca subaequalis, Dicerca vancouveri, Stenuris aurichalcea, Stenuris divaricata, Stenuris parumpunctata* Name used in the EU legislation: – Order: Coleoptera Family: Buprestidae Common name: Divergent beech beetle, flatheaded cherry tree borer Name used in the Dossier: –
Group	Insects
EPPO code	DICCDI
Regulated status	*Dicerca divaricata* is neither regulated anywhere in the world nor listed by EPPO
Pest status in Canada	*Dicerca divaricata* is present in North America – in the USA and Canada (Nelson, 1975; GBIF, 2024). It is reported from provinces of Alberta, Manitoba, New Brunswick, Nova Scotia, Ontario and Quebec (Nelson, 1975; Campbell et al., 1989)
Pest status in the EU	*Dicerca divaricata* is absent from the EU (GBIF, 2024)
Host status on *Acer*	*Dicerca divaricata* was reported rearing on *Acer saccharum* and was collected from *A. negundo* and *A. rubrum* (Nelson, 1975)

A.4.1.5 | *Glycobius speciosus*

Taxonomic information	Current valid scientific name: *Glycobius speciosus* Synonyms: *Plagionotus speciosus* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: Sugar maple borer, SMB Name used in the Dossier: –
Group	Insects
EPPO code	GLYOSE
Regulated status	*Glycobius speciosus* is neither regulated anywhere in the world nor listed by EPPO
Pest status in Canada	*Glycobius speciosus* is native to North America (Herrick, 1935). It is present in Canada, in provinces of New Brunswick, Nova Scotia, Ontario, Prince Edward Island and Québec (Webster et al., 2009; Adams, 2017; Adams et al., 2023)
Pest status in the EU	*Glycobius speciosus* is absent from the EU (GBIF, 2024)

(Continued)

Host status on *Acer*	*Glycobius speciosus* is a monophagous longhorn wood boring beetle, which attacks *Acer saccharum* (Felt, 1905; Herrick, 1935; Adams et al., 2023)
Asymptomatic plants	No specific information on the presence of asymptomatic plants is found. Similarly, like other longhorn beetles, initial phases of infestation are associated with very few external symptoms, and it can be expected that the plants remain asymptomatic for a few weeks after hatching of the larvae
Association with wood	All life stages of *G. speciosus* (egg, larva (5 instars), pupa, adult) are associated with the wood (Felt, 1905; Adams, 2017). The beetle has 2-year life cycle. Females lay eggs on bark cracks or crevices in summer (Felt, 1905; Solomon, 1995). Newly hatched larva mines under the bark of a trunk or larger branches of living maple trees (Herrick, 1935; Yanega, 1996), within the first 5 m of the bole (Newton & Allen, 1982). The gallery remains between the inner bark and sapwood (Felt, 1905). According to Adams et al. (2023), a typical gallery is shallowly engraved on the xylem, immediately under the bark. Periodically, sections of a 2nd-year gallery penetrate the xylem as much as 2–4 cm. Gallery lengths based on the larval instars are as follows: first instar ≤ 50 mm, second instar 51–101 mm, third instar 102–284 mm, fourth instar 285–343 mm and fifth instar 344–1500 mm (Adams, 2017). The last instar larva transforms to a pupa in spring. Adult emerges in summer from the trunk through an oval hole about 3/8 by 5/8 inch in diameter (about 9.5 by 15.8 mm in diameter) (Felt, 1905; Adams et al., 2023). The trees are rarely killed by the borer, but the larval galleries in the sapwood can cause imperfections (Newton & Allen, 1982)
Temperature survival and humidity	No specific information available
Size at different life stages	The size of the eggs is approximately 3 mm (Adams et al., 2023) The length of first-year larvae found in September is about ½ inch long (around 12.7 mm long) (Felt, 1905). The length of the fully grown larvae is about 2 inches long (around 50 mm long) (Felt, 1905; Herrick, 1935). According to Solomon (1995), the larva is between 40 and 58 mm long The size of the adults is about 20–30 mm long (Yanega, 1996). There is no information regarding the size of the pupae. However, pupae of longhorn beetles are more or less the same size as the adults

A.4.1.6 | Other longhorn beetles (*Anelaphus pumilus, Anthophylax attenuatus, Bellamira scalaris, Brachyleptura rubrica, Centrodera decolorata, Clytus ruricola, Ecyrus dasycerus, Parelaphidion incertum, Pidonia ruficollis, Sternidius misellus, Strangalepta abbreviata, Trigonarthris proxima, Typocerus deceptus*)

Taxonomic information	**1. *Anelaphus pumilus*** Current valid scientific name: *Anelaphus pumilus* Synonyms: *Anoplium pumilum*, *Elaphidion pumilum*, *Hypermallus pumilus*, *Romaleum pumilum* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: – Name used in the Dossier: – **2. *Anthophylax attenuatus.*** Current valid scientific name: *Anthophylax attenuatus* Synonyms: *Anthophilax alternatus*, *Anthophilax antennatus*, *Argaleus attenuatus*, *Leptura attenuata*, *Pachyta attenuata* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: mottled longhorned beetle Name used in the Dossier: – **3. *Bellamira scalaris*** Current valid scientific name: *Bellamira scalaris* Synonyms: *Bellamira coarctatus*, *Leptura coarctata*, *Leptura scalaris*, *Strangalia coarctata*, *Strangalia scalaris*, *Toxotus coarctatus* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: ladder-marked long-horned beetle Name used in the Dossier: – **4. *Brachyleptura rubrica*** Current valid scientific name: *Brachyleptura rubrica* Synonyms: *Anoplodera rubrica*, *Leptura erythoptera*, *Leptura rubrica*, *Strangalia rubrica* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: red-winged longhorn beetle

(Continues)

(Continued)

Name used in the Dossier: –

5. *Centrodera decolorata*

Current valid scientific name: *Centrodera decolorata*

Synonyms: *Centrodera decolorata* subsp. *lacustris*, *Centrodera rubidus*, *Rhagium decoloratum*, *Toxotus decoloratus*, *Toxotus rubidus*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: discoloured long-horned beetle, flower long-horned beetle

Name used in the Dossier: –

6. *Clytus ruricola*

Current valid scientific name: *Clytus ruricola*

Synonyms: *Anthoboscus catulus*, *Anthoboscus ruricola*, *Callidium ruricola*, *Chlorophorus ruricola*, *Clytanthus catulus*, *Clytanthus ruricola*, *Clytus catulus*, *Clytus gazella*, *Clytus hamatus*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: round-necked longhorn beetle

Name used in the Dossier: –

7. *Ecyrus dasycerus*

Current valid scientific name: *Ecyrus dasycerus*

Synonyms: *Ecyrus dasycerus* subsp. *dasycerus*, *Ecyrus exiguus, Ecyrus obscurus, Encyrus dasycerus, Exocentrus dasycerus, Exocentrus exiguus, Exocentrus obscurus, Lamia dasycerus, Oebaceres exiguus*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: flat-faced longhorn beetle

Name used in the Dossier: –

8. *Parelaphidion incertum*

Current valid scientific name: *Parelaphidion incertum*

Synonyms: *Elaphidion incertum*, *Elaphidion neglectum*, *Elaphidionoides incertus*, *Hypermallus brevicornis*, *Hypermallus incertus*, *Hypermallus neglectus*, *Hypermallus obsolescens*, *Parelaphidion incertum*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: –

Name used in the Dossier: –

9. *Pidonia ruficollis*

Current valid scientific name: *Pidonia ruficollis*

Synonyms: *Grammoptera ruficollis, Grammoptera sphaericollis, Hapalosalia laeviceps, Hapalosalia lineicornis, Hapalosalia ribex, Hapalosalia ruficollis, Hapalosalia sphaericollis, Hapalosalia sphaericollis* subsp. *ruficollis, Hapalosalia sphaericollis* var. *ruficollis, Hapalosalia straussi, Hapalosalia vibex, Hapalosalia vibex* subsp. *fragilis, Leptura allecta, Leptura nitidicollis, Leptura paupercula, Leptura ruficollis, Leptura ruficollis* var. *sphaericollis, Leptura sphaericollis, Leptura sphaericollis* f. *ruficollis, Leptura sphaericollis* var. *allecta, Leptura sphaericollis* var. *paupercula, Leptura sphaericollis* var. *ruficollis, Leptura straussi, Leptura vibex, Pidnota ruficollis, Pidonia allecta, Pidonia laeviceps, Pidonia lineicornis, Pidonia nitidicollis, Pidonia paupercula, Pidonia ruficollis, Pidonia ruficollis* var. *sphaericollis, Pidonia ruficollis var. vibex, Pidonia sphaericollis, Pidonia sphaericollis* subsp. *ruficollis, Pidonia straussi, Pidonia vibex, Pidonia vibex* subsp. *fragilis, Strangalia ruficollis*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: stripe-legged long-horned beetle

Name used in the Dossier: –

10. *Sternidius misellus*

Current valid scientific name: *Sternidius misellus*

Synonyms: *Leiopus misellus*, *Liopinus misellus*, *Liopus crassulus*, *Liopus misellus*, *Sternidius alpha* subsp. *misellus*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: –

Name used in the Dossier: –

11. *Strangalepta abbreviata*

Current valid scientific name: *Strangalepta abbreviata*

Synonyms: *Anoplodera vittata*, *Anoplodera vittata* var. *saratogensis*, *Leptura abbreviata*, *Leptura gulosa*, *Leptura nitidipennis*, *Leptura semivittata*, *Leptura vittata*, *Strangalepta gulosa*, *Strangalepta nitidipennis*, *Strangalepta semivittata*, *Strangalepta vittata*, *Strangalepta vittata* subsp. *gulosa*

Name used in the EU legislation: –

Order: Coleoptera

Family: Cerambycidae

Common name: abbreviated long-horned beetle, flower longhorn beetle

(Continued)

	Name used in the Dossier: – **12. *Trigonarthris proxima*** Current valid scientific name: *Trigonarthris proxima* Synonyms: *Anoplodera proxima*, *Cercolia kempiana*, *Cercolia proxima*, *Leptura kempiana*, *Leptura proxima*, *Leptura subpubescens*, *Trigonarthris kempiana*, *Trigonarthris subpubescens* Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: proximal long-horned beetle, flower longhorn beetle Name used in the Dossier: – **13. *Typocerus deceptus*** Current valid scientific name: *Typocerus deceptus* Synonyms: – Name used in the EU legislation: – Order: Coleoptera Family: Cerambycidae Common name: flower longhorn beetle Name used in the Dossier: –
Group	Insects
EPPO code	*Anelaphus pumilus*, *Anthophylax attenuatus*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Clytus ruricola*, *Ecyrus dasycerus*, *Parelaphidion incertum*, *Pidonia ruficollis*, *Sternidius misellus*, *Strangalepta abbreviata*, *Trigonarthris proxima*, *Trigonarthris subpubescens*, *Typocerus deceptus*: – *Bellamira scalaris*: STRLSC
Regulated status	
Pest status in Canada	Longhorn beetles (*Anelaphus pumilus*, *Anthophylax attenuatus*, *Bellamira scalaris*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Clytus ruricola*, *Ecyrus dasycerus*, *Parelaphidion incertum*, *Pidonia ruficollis*, *Sternidius misellus*, *Strangalepta abbreviata*, *Trigonarthris proxima*, *Typocerus deceptus*) are present in Canada (GBIF, 2024; McNamara, 1991; Mccorquodale et al., 2007; Saint-Germain, 2007; Webster et al., 2009). The species are present in the provinces of: – Manitoba: *Clytus ruricola*, *Sternidius misellus, Trigonarthris proxima* (McNamara, 1991); – New Brunswick: *Anthophylax attenuatus*, *Bellamira scalaris*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Clytus ruricola, Strangalepta abbreviata* (McNamara, 1991; Webster et al., 2009), *Sternidius misellus*, *Trigonarthris proxima* (Webster et al., 2009); – Nova Scotia: *Anthophylax attenuatus*, *Bellamira scalaris*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Strangalepta abbreviata, Trigonarthris proxima* (McNamara, 1991; Webster et al., 2009), *Clytus ruricola* (Webster et al., 2009); – Ontario: *Anelaphus pumilus*, *Anthophylax attenuatus*, *Bellamira scalaris*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Clytus ruricola, Ecyrus dasycerus, Strangalepta abbreviata, Trigonarthris proxima* (McNamara, 1991; Mccorquodale et al., 2007), *Parelaphidion incertum, Sternidius misellus* (McNamara, 1991), *Pidonia ruficollis* (Mccorquodale et al., 2007); – Prince Edward Island: *Anthophylax attenuatus*, *Bellamira scalaris*, *Clytus ruricola, Strangalepta abbreviata* (Webster et al., 2009); – Quebec: *Anthophylax attenuatus*, *Bellamira scalaris, Clytus ruricola* (McNamara, 1991; Saint-Germain, 2007), *Brachyleptura rubrica*, *Centrodera decolorata, Ecyrus dasycerus, Strangalepta abbreviata* (McNamara, 1991), *Pidonia ruficollis* (Saint-Germain, 2007), *Trigonarthris proxima* (McNamara, 1991); – Saskatchewan: *Bellamira scalaris*, *Clytus ruricola* (McNamara, 1991).
Pest status in the EU	*Anelaphus pumilus, Anthophylax attenuatus*, *Bellamira scalaris*, *Brachyleptura rubrica*, *Centrodera decolorata*, *Clytus ruricola*, *Ecyrus dasycerus*, *Parelaphidion incertum*, *Pidonia ruficollis*, *Sternidius misellus*, *Trigonarthris proxima* and *Typocerus deceptus* are absent from the EU (GBIF, 2024). *Clytus ruricola* and *Strangalepta abbreviata* were reported from Germany (GBIF, 2024)
Host status on *Acer*	*Anelaphus pumilus* was reported on *Acer saccharum* (MacRae & Rice, 2007; Monné & Nearns, 2023). *Anthophylax attenuatus* was reported on *Acer* sp. (Androw & Keeney, 1999) and on *Acer saccharum* (Vance et al., 2003). *Bellamira scalaris* was reported on *Acer rubrum* (Vlasak & Vlasakova, 2021). *Brachyleptura rubrica* was reported on *Acer* (MacRae & Rice, 2007) and on *Acer rubrum* (Vlasak & Vlasakova, 2021) *Centrodera decolorata* was reported on *Acer saccharum* (Vlasak & Vlasakova, 2021). *Clytus ruricola* was reported on *Acer saccharum* (Vance et al., 2003), *A. pensylvanicum*, *A. rubrum* and *A. saccharinum* (Monné & Nearns, 2023). *Ecyrus dasycerus* was reported on *Acer saccharum* (MacRae & Rice, 2007), *A. negundo* and *A. rubrum* (Vlasak & Vlasakova, 2021). *Parelaphidion incertum* was reported on *Acer negundo* (Vlasak & Vlasakova, 2021). *Pidonia ruficollis* was reported on *Acer saccharum* (Vance et al., 2003; Vlasak & Vlasakova, 2021). *Sternidius misellus* was reported on *Acer rubrum* (MacRae & Rice, 2007). *Strangalepta abbreviata* was reported on *Acer saccharum* (MacRae & Rice, 2007) and *A. rubrum* (Vlasak & Vlasakova, 2021). *Trigonarthris proxima* was reported on *Acer rubrum* (Vlasak & Vlasakova, 2021). *Typocerus deceptus* was reported on *Acer rubrum* (Vlasak & Vlasakova, 2021)
Asymptomatic plants	No specific information on the presence of asymptomatic plants is found. Similarly, like other longhorn beetles, initial phases of infestation are associated with very few external symptoms, and it can be expected that the plants remain asymptomatic for a few weeks after hatching of the larvae

A.4.1.7 | *Prionoxystus robiniae*

Taxonomic information	Current valid scientific name: *Prionoxystus robiniae* Synonyms: *Cossus robiniae* Name used in the EU legislation: – Order: Lepidoptera Family: Cossidae Common name: Carpenter worm, carpenterworm moth Name used in the Dossier: –
Group	Insects
EPPO code	PRIXRO
Regulated status	*Prionoxystus robiniae* is not regulated in the EU. It is on A1 list of Chile (EPPO, 2024w)
Pest status in Canada	*Prionoxystus robiniae* is native to North America and it is distributed throughout southern Canada (Solomon & Hay, 1974), in provinces of Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec and Saskatchewan (Pohl et al., 2018)
Pest status in the EU	*Prionoxystus robiniae* is absent from the EU (GBIF, 2024)
Host status on *Acer*	*Prionoxystus robiniae* feeds on various deciduous trees, including *Acer* species (Hannon et al., 2017). It attacked *Acer saccharinum* in Montreal (Petch & Maltais, 1932) and it was recorded on *A. negundo*. The moth did not survive in *Acer rubrum* (Solomon, 1988)
Asymptomatic plants	Although asymptomatic plants are not expected, initial infestations are difficult to detect until the following spring when larvae begin expelling noticeable quantities of frass from the burrows
Association with wood	Eggs, larvae (7–30 instars) and pupae of *Prionoxystus robiniae* are associated with the wood (Hannon et al., 2017; Solomon & Hay, 1974). No tree size preference has been noted (found down to 5 cm diameter stems). The moth is not known to attack dead trees, but it can complete its lifecycle in a tree after it has died (Steed & Burton, 2015). Depending on the climate, the moth has between 1- and 4-year life cycle (Hannon et al., 2017; Solomon & Hay, 1974). Females lay eggs in crevices on the bark, either singly or in small groups of two to six eggs (Steed & Burton, 2015). Larvae then enter the bark and sapwood of trunks of hardwood trees (Solomon & Hay, 1974). Later on, the larvae bore into the heartwood and push frass out of the entrance hole. The pupation is completed close to the exit hole and adults emerge between late spring and summer (Hannon et al., 2017). Completed galleries may reach a length of 9 inches (about 22.89 cm) and exceed 1/2 inch in diameter (about 1.27 cm) (Karren & Roe, 2019). According to Solomon (1995) and Steed and Burton (2015), the galleries are between 1.2 and 1.6 cm in diameter and 12–22 cm long. Based on the pictures provided in Hannon et al. (2017), the gallery with a female larva inside had a width with the same measurement as the diameter of an American quarter from 1982, which is 2.43 cm
Temperature survival and humidity	No specific information available
Size at different life stages	Sexual dimorphism exists in larvae, pupae and adults (Hannon et al., 2017). Eggs are around 0.23 mm long and 0.15 mm wide (Solomon, 1995; Steed & Burton, 2015). Newly hatched larvae are ¼ inch long (about 0.6 cm long) (Karren & Roe, 2019) and can reach a size of 2.5 cm within a month (Hannon et al., 2017). Fully grown larvae can be 1.2 cm in diameter (Solomon & Hay, 1974). Based on the pictures provided in Hannon et al. (2017), the ultimate female instar is about 7 cm long and 2 cm wide and the ultimate male larva is about 5 cm long and 1 cm wide. According to Karren and Roe (2019), the full-grown larvae are 2–3 inches long (5–7.6 cm long). The female pupae are 3.8–5 cm long and male pupae are about 2.5 cm long (Hannon & Beers, 2024). Females are 3.8–5 cm long (Hannon & Beers, 2024) and their wingspan is between 6 and 8.5 cm (Hannon et al., 2017). Males are 2.5 cm long (Hannon & Beers, 2024) and their wingspan is between 4.3 and 6 cm (Hannon et al., 2017)

APPENDIX B

Web of Science All Databases Search String

In Table B.1, the search string for *Acer saccharum* used in Web of Science is reported. Totally, 886 papers were retrieved. Titles and abstracts were screened, and 28 pests were added to the list of pests (see Appendix H).

TABLE B.1 String for *Acer saccharum*.

Web of Science All databases	**TOPIC:** "Acer saccharum" OR "Saccharodendron saccharum" OR "hard maple" OR "rock maple" OR "rocki maple" OR "sugar maple" **AND** **TOPIC:** pathogen* OR pathogenic bacteria OR fung* OR oomycet* OR myce* OR bacteri* OR virus* OR viroid* OR insect$ OR mite$ OR phytoplasm* OR arthropod* OR nematod* OR disease$ OR infecti* OR damag* OR symptom* OR pest$ OR vector OR hostplant$ OR "host plant$" OR host OR "root lesion$" OR decline$ OR infestation$ OR damage$ OR symptom$ OR dieback* OR "die back*" OR "malaise" OR aphid$ OR curculio OR thrip$ OR cicad$ OR miner$ OR borer$ OR weevil$ OR "plant bug$" OR spittlebug$ OR moth$ OR mealybug$ OR cutworm$ OR pillbug$ OR "root feeder$" OR caterpillar$ OR "foliar feeder$" OR virosis OR viroses OR blight$ OR wilt$ OR wilted OR canker OR scab$ OR rot OR rots OR rotten OR "damping off" OR "damping-off" OR blister$ OR "smut" OR mould OR mould OR "damping syndrome$" OR mildew OR scald$ OR "root knot" OR "root-knot" OR rootknot OR cyst$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding" **NOT** **TOPIC:** "winged seeds" OR metabolites OR *tannins OR climate OR "maple syrup" OR syrup OR mycorrhiz* OR "carbon loss" OR pollut* OR weather OR propert* OR probes OR spectr* OR antioxidant$ OR transformation OR RNA OR DNA OR "Secondary plant metabolite$" OR metabol* OR "Phenolic compounds" OR Quality OR Abiotic OR Storage OR Pollen* OR fertil* OR Mulching OR Nutrient* OR Pruning OR drought OR "human virus" OR "animal disease*" OR "plant extracts" OR immunological OR "purified fraction" OR "traditional medicine" OR medicine OR mammal* OR bird* OR "human disease*" OR biomarker$ OR "health education" OR bat$ OR "seedling$ survival" OR "anthropogenic disturbance" OR "cold resistance" OR "salt stress" OR salinity OR "aCER method" OR "adaptive cognitive emotion regulation" OR nitrogen OR hygien* OR "cognitive function$" OR fossil$ OR *toxicity OR Miocene OR postglacial OR "weed control" OR landscape **NOT** **TOPIC:** "Acanthophysium oakesii" OR "Acarosporina microspora" OR "Aceria elongata" OR "Aceria elongatus" OR "Aceria modesta" OR "Aceria modestus" OR "Aceria regulus" OR "Acleris chalybeana" OR "Acremonium bacillisporum" OR "Acronicta americana" OR "Acronicta dactylina" OR "Acronicta retardata" OR "Actias luna" OR "Actinopelte dryina" OR "Aculops aceris" OR "Aculops maculatus" OR "Akanthomyces attenuatus" OR "Akanthomyces lecanii" OR "Aleurocorticium acerinum" OR "Aleurocorticium alliaceum" OR "Aleurocorticium candidum" OR "Aleurocorticium microsporum" OR "Aleurodiscus acerinus var. alliaceus" OR "Aleurodiscus acerinus var. dryinus" OR "Aleurodiscus oakesii" OR "Alsophila pometaria" OR "Alternaria brassicae" OR "Ambrosiella brunnea" OR "Amphipyra pyramidoides" OR "Anacamptodes ephyraria" OR "Anisandrus dispar" OR "Anisandrus obesus" OR "Anisandrus sayi" OR "Anisota rubicunda" OR "Anoplophora glabripennis" OR "Antaeotricha leucillana" OR "Antheraea polyphemus" OR "Anthostoma decipiens" OR "Antrodia albida" OR "Antrodia malicola" OR "Aplosporella clintonii" OR "Aporpium caryae" OR "Archips cerasivorana" OR "Archips fuscocupreanus" OR "Armillaria calvescens" OR "Armillaria gallica" OR "Armillaria gemina" OR "Armillaria ostoyae" OR "Armillaria sinapina" OR "Armillaria tabescens" OR "Arthrobotrys arthrobotryoides" OR "Ascocoryne sarcoides" OR "Athelia scutellaris" OR "Atheliachaete sanguinea" OR "Aurantiporus fissilis" OR "Aureobasidium apocryptum" OR "Aureobasidium pullulans" OR "Bactrodesmium obovatum" OR "Bactrodesmium pallidum" OR "Bactrodesmium spilomeum" OR "Baltazaria galactina" OR "Besma endropiaria" OR "Besma quercivoraria" OR "Bispora betulina" OR "Bispora effusa" OR "Bisporomyces lignicola" OR "Bjerkandera adusta" OR "Boeremia exigua" OR "Brachydesmiella biseptata" OR "Brachysporium nigrum" OR "Brunneoporus malicola" OR "Cacumisporium capitulatum" OR "Cadophora fastigiata" OR "Cadophora melinii" OR "Caloptilia aceris" OR "Caloptilia umbratella" OR "Calosphaeria microtheca" OR "Cameraria aceriella" OR "Cameraria saccharella" OR "Campaea perlata" OR "Camposporium ontariense" OR "Candelabrochaete septocystidia" OR "Capronia chlorospora" OR "Capronia minima" OR "Catastega aceriella" OR "Catunica adiposa" OR "Ceraceomyces americanus" OR "Ceraceomyces serpens" OR "Ceratocystis acericola" OR "Ceratocystis major" OR "Ceratocystis piceae" OR "Ceratocystis rostrocoronata" OR "Ceratocystis spinulosa" OR "Ceratocystis tenella" OR "Cerioporus leptocephalus" OR "Cerioporus squamosus" OR "Cerioporus varius" OR "Ceriporia spissa" OR "Ceriporia tarda" OR "Cerococcus parrotti" OR "Cerrena unicolor" OR "Chaetosphaeria tortuosa" OR "Chionaspis acericola" OR "Chionomyces ontariensis" OR "Chloridium lignicola" OR "Chlorociboria aeruginosa" OR "Choristoneura fractivittana" OR "Chrysobothris femorata" OR "Chrysobothris mali" OR "Cingilia catenaria" OR "Cladosporium cladosporioides" OR "Cladosporium confusum" OR "Cladosporium humile" OR "Clavaria stricta" OR "Climacocystis borealis" OR "Climacodon septentrionalis" OR "Clonostachys rosea" OR "Coccomyces coronatus" OR "Collybia velutipes" OR "Columnosphaeria fagi" OR "Coniochaeta subcorticalis" OR "Coniochaeta velutina" OR "Coniophora arida" OR "Coniophora betulae" OR "Coniophora puteana" OR "Coniothyrium fuckelii" OR "Coprinellus micaceus" OR "Coprinus micaceus" OR "Cordana pauciseptata" OR "Cordyceps farinosa" OR "Coriolellus malicola" OR "Coriolopsis gallica" OR "Coriolus hirsutus" OR "Coriolus pubescens" OR "Coriolus versicolor" OR "Coronicium alboglaucum" OR "Corthylus columbianus" OR "Corthylus punctatissimus" OR "Corticium confluens" OR "Corticium galactinum" OR "Corticium leucoxanthum" OR "Corticium pini-canadensis" OR "Corticium roseocarneum" OR "Corticium scutellare" OR "Corticium tuberculatum" OR "Corticium vellereum" OR "Coryneum negundinis" OR "Criconema arkaense" OR "Cristinia helvetica" OR "Cristulariella depraedans" OR "Cristulariella moricola" OR "Cristulariella pyramidalis" OR "Crocigrapha normani" OR "Cryptendoxyla hypophloia" OR "Cryptococcus williamsi" OR "Cryptodiaporthe acerina" OR "Cryptodiaporthe myinda" OR "Cryptodiaporthe petiolophila" OR "Cryptostroma corticale" OR "Crystallicutis serpens" OR "Cylindrobasidium evolvens" OR "Cylindrocarpon candidulum" OR "Cystostereum murraii" OR "Cystostereum murrayi" OR "Cystostereum pini-canadensis" OR "Cytospora ceratosperma" OR "Cytospora chrysosperma" OR "Cytospora decipiens" OR "Cytospora populina" OR "Dactylaria acerina" OR "Daedalea ambigua" OR "Daedalea confragosa" OR "Daedalea unicolor" OR "Daedaleopsis confragosa" OR "Dasychira

(Continues)

(Continued)

dorsipennata" OR "Dasychira obliquata" OR "Dasychira plagiata" OR "Datronia mollis" OR "Davidsoniella virescens" OR "Dendrocorticium roseocarneum" OR "Dendrocorticium violaceum" OR "Dendrominia dryina" OR "Dendrophoma pulvis-pyrius" OR "Dendrophora versiformis" OR "Dendrothele acerina" OR "Dendrothele alliacea" OR "Dendrothele candida" OR "Dendrothele microspora" OR "Dermea acerina" OR "Desarmillaria tabescens" OR "Diaporthe acerina" OR "Diaporthe dubia" OR "Diaspidiotus ancylus" OR "Diaspidiotus juglansregiae" OR "Diatrype albopruinosa" OR "Diatrype hochelagae" OR "Diatrype macounii" OR "Diatrype stigma" OR "Diatrypella frostii" OR "Dicarpella dryina" OR "Dichomeris ligulella" OR "Dichostereum effuscatum" OR "Dichostereum pallescens" OR "Dictyoporthe acerophila" OR "Dictyosporium toruloides" OR "Diderma radiatum" OR "Diplococcium catenulatum" OR "Diplodia acericola" OR "Discosphaerina fagi" OR "Discula campestris" OR "Dothidotthia negundinis" OR "Drepanaphis acerifoliae" OR "Drepanaphis carolinensis" OR "Drepanaphis choanotricha" OR "Drepanaphis idahoensis" OR "Drepanaphis kanzensis" OR "Drepanaphis keshenae" OR "Drepanaphis knowltoni" OR "Drepanaphis minutus" OR "Drepanaphis nigricans" OR "Drepanaphis pallida" OR "Drepanaphis parva" OR "Drepanaphis parvus" OR "Drepanaphis sabrinae" OR "Drepanaphis simpsoni" OR "Drepanaphis tissoti" OR "Drephanaphis sabrinae" OR "Dryocampa rubicunda" OR "Dryoxylon onoharaense" OR "Durella compressa" OR "Eacles imperialis" OR "Efibula tuberculata" OR "Efibulella deflectens" OR "Elmerina caryae" OR "Endophragmiella ontariensis" OR "Ennomos magnaria" OR "Ennomos subsignaria" OR "Eotetranychus aceri" OR "Eotetranychus carpini" OR "Eotetranychus pruni" OR "Eotetranychus tiliarium" OR "Eotetranychus uncatus" OR "Epicoccum nigrum" OR "Epicoccum purpurascens" OR "Erannis tiliaria" OR "Erythricium salmonicolor" OR "Euclea delphinii" OR "Eutrapela clemataria" OR "Eutypa ludibunda" OR "Eutypa spinosa" OR "Eutypella parasitica" OR "Eutypella stellulata" OR "Exidia glandulosa" OR "Exidia nucleata" OR "Favolus alveolaris" OR "Favolus alveolarius" OR "Flammula alnicola" OR "Flammulina velutipes" OR "Fomes applanatus" OR "Fomes conchatus" OR "Fomes connatus" OR "Fomes everhartii" OR "Fomes fomentarius" OR "Fomes fraxineus" OR "Fomes igniarius" OR "Fomes igniarius var. laevigatus" OR "Fomes pinicola" OR "Fomitiporia punctata" OR "Fomitopsis pinicola" OR "Fusarium solani" OR "Fuscoporia ferrea" OR "Fuscoporia ferruginosa" OR "Fuscoporia gilva" OR "Fusicladium humile" OR "Ganoderma applanatum" OR "Ganoderma lucidum" OR "Ganoderma resinaceum" OR "Ganoderma sessile" OR "Ginnsia viticola" OR "Glaucolepis saccharella" OR "Gliocladium roseum" OR "Gloeocystidiellum clavuligerum" OR "Gloeocystidiellum leucoxanthum" OR "Gloeohypochnicium analogum" OR "Gloeophyllum trabeum" OR "Gloeoporus dichrous" OR "Gloeosporium affine" OR "Gloeosporium apocryptum" OR "Gloeosporium decolorans" OR "Gloeosporium hysterioideum" OR "Gloeosporium saccharinum" OR "Gloeosporium saccharini" OR "Glycobius speciosus" OR "Gnomonia petiolophila" OR "Gnomoniella petiolophila" OR "Gnomoniella tenella" OR "Gomphus floccosus" OR "Grandinia helvetica" OR "Granulobasidium vellereum" OR "Graphium giganteum" OR "Grovesinia moricola" OR "Grovesinia pyramidalis" OR "Gymnopilus junonius" OR "Gymnopilus spectabilis" OR "Haematostereum rugosum" OR "Hainesia lythri" OR "Halyomorpha halys" OR "Halysidota tessellaris" OR "Hapalopilus rutilans" OR "Haploa lecontei" OR "Helicogloea exigua" OR "Helminthosporium velutinum" OR "Hemistropharia albocrenulata" OR "Hericium americanum" OR "Hericium coralloides" OR "Hericium erinaceus" OR "Hericium ramosum" OR "Heterocampa biundata" OR "Heterocampa guttivitta" OR "Hyalophora cecropia" OR "Hydnoporia corrugata" OR "Hydnoporia tabacina" OR "Hydnum erinaceus" OR "Hydnum septentrionale" OR "Hydropisphaera peziza" OR "Hygrophorus lignicola" OR "Hylocurus rudis" OR "Hymenochaete corrugata" OR "Hymenochaete rubiginosa" OR "Hymenochaete tabacina" OR "Hypagyrtis unipunctata" OR "Hypena baltimoralis" OR "Hyphantria cunea" OR "Hyphoderma heterocystidiatum" OR "Hyphoderma litschaueri" OR "Hyphoderma puberum" OR "Hyphoderma sambuci" OR "Hyphoderma setigerum" OR "Hyphodontia arguta" OR "Hyphodontia aspera" OR "Hyphodontia crustosa" OR "Hyphodontia spathulata" OR "Hyphodontia subalutacea" OR "Hypholoma incertum" OR "Hypochnicium analogum" OR "Hypochnicium bombycinum" OR "Hypochnicium vellereum" OR "Hypothenemus dissimilis" OR "Hypothenemus eruditus" OR "Hypothenemus interstitialis" OR "Hypoxylon cohaerens" OR "Hypoxylon deustum" OR "Hypoxylon fragiforme" OR "Hypoxylon fuscum" OR "Hypoxylon rubiginosum" OR "Hypoxylon serpens" OR "Hypsizygus ulmarius" OR "Hysterium pulicare" OR "Inonotus cuticularis" OR "Inonotus glomeratus" OR "Iridopsis ephyraria" OR "Irpex lacteus" OR "Irpex latemarginatus" OR "Irpex mollis" OR "Irpex tulipiferae" OR "Irpiciporus pachyodon" OR "Ischnoderma resinosum" OR "Itame loricaria" OR "Itame pustularia" OR "Jackrogersella cohaerens" OR "Jalapriya toruloides" OR "Jattaea microtheca" OR "Junghuhnia nitida" OR "Kabatiella apocrypta" OR "Keithomyces carneus" OR "Kirschsteiniothelia acerina" OR "Kneiffia subalutacea" OR "Laeticorticium violaceum" OR "Laetiporus cincinnatus" OR "Laetiporus sulphureus" OR "Lambdina fiscellaria" OR "Lasiosphaeria ovina" OR "Laxitextum bicolor" OR "Lecanicillium attenuatum" OR "Lentinus brumalis" OR "Lentinus levis" OR "Lentinus rudis" OR "Lenzites betulina" OR "Lenzites betulinus" OR "Lepidosaphes ulmi" OR "Leptothyrium acerinum" OR "Libertella acerina" OR "Licea operculata" OR "Lithophane antennata" OR "Lithophane bethunei" OR "Lithophane innominata" OR "Lithophane laticinerea" OR "Lomographa vestaliata" OR "Longistigma caryae" OR "Lopharia cinerascens" OR "Lophiostoma excipuliforme" OR "Lophiostoma pileatum" OR "Lophocampa caryae" OR "Lophocampa maculata" OR "Lopholeucaspis japonica" OR "Lycia ursaria" OR "Lycogala flavofuscum" OR "Lycoperdon pyriforme" OR "Lycoperdon umbrinum" OR "Lycorma delicatula" OR "Lymantor decipiens" OR "Lymantria dispar" OR "Lymantria mathura" OR "Lyomyces crustosus" OR "Lyomyces sambuci" OR "Lytrosis unitaria" OR "Macaria loricaria" OR "Macaria pustularia" OR "Machimia tentoriferella" OR "Macrodiaporthe everhartii" OR "Macrohyporia extensa" OR "Macrurocampa marthesia" OR "Malacosoma americana" OR "Malacosoma americanum" OR "Malacosoma disstria" OR "Marquandomyces marquandii" OR "Massaria inquinans" OR "Massariovalsa sudans" OR "Mastigosporella nyssae" OR "Megalocystidium leucoxanthum" OR "Melanconis everhartii" OR "Melanconis sudans" OR "Melanolophia canadaria" OR "Melanomma pulvis-pyrius" OR "Melanopsamma pomiformis" OR "Meloidogyne hapla" OR "Menispora tortuosa" OR "Merulius tremellosus" OR "Microthelia acerina" OR "Monodictys paradoxa" OR "Monostichella hysterioidea" OR "Monostichella hysteroidea" OR "Monostichella hysterioidea" OR "Morrisonia confusa" OR "Morrisonia latex" OR "Mortierella isabellina" OR "Mutatoderma heterocystidium" OR "Mutatoderma mutatum" OR "Mycena corticola" OR "Mycena meliigena" OR "Myrmaecium fulvopruinatum" OR "Myrmaecium rubricosum" OR "Myxarium nucleatum" OR "Nadata gibbosa" OR "Naemosphaera acerina" OR "Necator salmonicolor" OR "Nectria cinnabarina" OR "Nectria coccinea" OR "Nectria peziza" OR "Nectria purtonii" OR "Nemania serpens" OR "Nematocampa limbata" OR "Nemoria mimosaria" OR "Neocucurbitaria cava" OR "Neodermea acerina" OR "Neonectria caespitosa" OR "Neonectria coccinea" OR "Neoprociphilus aceris" OR "Neosteingelia texana" OR "Obrussa ochrefasciella" OR "Odontia crustosa" OR "Odontia fimbriata" OR "Odonticium septocystidia" OR "Oedocephalum cristallinum" OR "Oedocephalum crystallinum" OR "Olethreutes appendiceum" OR "Olethreutes glaciana" OR "Olethreutes nigranum" OR "Oligonychus aceris" OR "Operophtera bruceata" OR "Operophtera brumata" OR

(Continued)

	"Ophiostoma rostrocoronatum" OR "Ophiostoma tenellum" OR "Orgyia antiqua" OR "Orgyia leucostigma" OR "Orthosia garmani" OR "Orthosia revicta" OR "Oxyporus corticola" OR "Oxyporus latemarginatus" OR "Oxyporus populinus" OR "Paecilomyces carneus" OR "Paecilomyces farinosus" OR "Paecilomyces marquandii" OR "Paleacrita vernata" OR "Palthis angulalis" OR "Pandemis canadana" OR "Pandemis lamprosana" OR "Pandemis limitata" OR "Panellus serotinus" OR "Panellus stipticus" OR "Panus rudis" OR "Panus stipticus" OR "Panus strigosus" OR "Pappia fissilis" OR "Paraclemensia acerifoliella" OR "Parallelia bistriaris" OR "Patellaria compressa" OR "Penicillium brevicompactum" OR "Penicillium citrinum" OR "Penicillium frequentans" OR "Penicillium glabrum" OR "Penicillium granulatum" OR "Penicillium herquei" OR "Penicillium implicatum" OR "Penicillium lividum" OR "Penicillium multicolor" OR "Penicillium thomii" OR "Peniophora affinis" OR "Peniophora aspera" OR "Peniophora cinerea" OR "Peniophora heterocystidia" OR "Peniophora hydnoides" OR "Peniophora ludoviciana" OR "Peniophora mutata" OR "Peniophora sambuci" OR "Peniophora sanguinea" OR "Peniophora versiformis" OR "Peniophora viticola" OR "Peniophorella pubera" OR "Peridea basitriens" OR "Peridea ferruginea" OR "Peridroma saucia" OR "Periphyllus acericola" OR "Periphyllus aceris" OR "Periphyllus americanus" OR "Periphyllus californiensis" OR "Periphyllus hirticornis" OR "Periphyllus kuwanai" OR "Periphyllus lyropictus" OR "Periphyllus testudinaceus" OR "Pezicula acericola" OR "Pezicula cinnamomea" OR "Phaeoacremonium leptorrhynchum" OR "Phaeoacremonium leptorhynchum" OR "Phaeostalagmus arbusculus" OR "Phanerochaete affinis" OR "Phanerochaete cremea" OR "Phanerochaete filamentosa" OR "Phanerochaete laevis" OR "Phanerochaete sordida" OR "Phanerochaete tuberculata" OR "Phanerochaete velutina" OR "Phellinopsis conchata" OR "Phellinus everhartii" OR "Phellinus ferreus" OR "Phellinus ferruginosus" OR "Phellinus fragrans" OR "Phellinus gilvus" OR "Phellinus igniarius" OR "Phellinus laevigatus" OR "Phellinus punctatus" OR "Phellinus viticola" OR "Phenacoccus acericola" OR "Phenacoccus grandicarpus" OR "Phenacoccus hortonarum" OR "Phialocephala botulispora" OR "Phialocephala lagerbergii" OR "Phialophora botulispora" OR "Phialophora fastigiata" OR "Phialophora lagerbergii" OR "Phialophora melinii" OR "Phigalia titea" OR "Phlebia acerina" OR "Phlebia deflectens" OR "Phlebia ludoviciana" OR "Phlebia radiata" OR "Phlebia rufa" OR "Phlebia tremellosa" OR "Phleogena faginea" OR "Phloeospora aceris" OR "Phobetron pithecium" OR "Pholiota adiposa" OR "Pholiota albocrenulata" OR "Pholiota alnicola" OR "Pholiota aurivella" OR "Pholiota flammans" OR "Pholiota spectabilis" OR "Pholiota squarrosoides" OR "Phoma cava" OR "Phoma exigua" OR "Phomopsis platanoidis" OR "Phyllactinia marissallii" OR "Phyllactinia marissalii" OR "Phyllocoptes aceris" OR "Phyllonorycter clemensella" OR "Phyllonorycter lucidicostella" OR "Phyllosticta aceris" OR "Phyllosticta minima" OR "Phyllosticta minutella" OR "Phyllosticta minutissima" OR "Phyllosticta saccharina" OR "Phyllotopsis nidulans" OR "Phymatotrichopsis omnivora" OR "Physalacria inflata" OR "Phytobia setosa" OR "Phytophthora plurivora" OR "Pilidium acerinum" OR "Pilidium lythri" OR "Pityophthorus lautus" OR "Plagiostoma petiolophilum" OR "Plagiostoma pseudobavaricum" OR "Plagodis alcoolaria" OR "Plagodis serinaria" OR "Pleonectria pyrrhochlora" OR "Pleuroceras tenellum" OR "Pleurothecium recurvatum" OR "Pleurotus cornucopiae" OR "Pleurotus ostreatus" OR "Pleurotus sapidus" OR "Pleurotus ulmarius" OR "Plicatura crispa" OR "Plicaturopsis crispa" OR "Pluteus admirabilis" OR "Pococera asperatella" OR "Podofomes mollis" OR "Polyporus adustus" OR "Polyporus albellus" OR "Polyporus badius" OR "Polyporus biformis" OR "Polyporus brumalis" OR "Polyporus cuticularis" OR "Polyporus delectans" OR "Polyporus dichrous" OR "Polyporus elegans" OR "Polyporus gilvus" OR "Polyporus glomeratus" OR "Polyporus hirsutus" OR "Polyporus nidulans" OR "Polyporus obtusus" OR "Polyporus pargamenus" OR "Polyporus pubescens" OR "Polyporus radiatus" OR "Polyporus resinosus" OR "Polyporus spumeus" OR "Polyporus squamosus" OR "Polyporus sulphureus" OR "Polyporus tulipiferae" OR "Polyporus varius" OR "Polyporus velutinus" OR "Polyporus versicolor" OR "Poria ambigua" OR "Poria candidissima" OR "Poria corticola" OR "Poria eupora" OR "Poria ferrea" OR "Poria ferruginosa" OR "Poria punctata" OR "Porotheleum perenne" OR "Pratylenchus penetrans" OR "Pratylenchus vulnus" OR "Probole amicaria" OR "Prolimacodes badia" OR "Prosthecium acerinum" OR "Prosthecium acerophilum" OR "Prosthecium pyriforme" OR "Prosthecium stylosporum" OR "Proteoteras aesculana" OR "Proteoteras moffatiana" OR "Protoboarmia porcelaria" OR "Psathyrella incerta" OR "Pseudosciaphila duplex" OR "Pseudospiropes obscurus" OR "Pseudospiropes simplex" OR "Pseudovalsa stylospora" OR "Pulveria porrecta" OR "Pycnoporus cinnabarinus" OR "Pyrrharctia isabella" OR "Radulomyces confluens" OR "Radulum orbiculare" OR "Raffaelea brunnea" OR "Ramaria stricta" OR "Ramichloridium anceps" OR "Repetophragma ontariense" OR "Rhinocladiella anceps" OR "Rhizochaete americana" OR "Rhizochaete filamentosa" OR "Rhodinia newara" OR "Rhyncaphytoptus constrictus" OR "Rhytisma acerinum" OR "Rhytisma punctatum" OR "Rutherfordia major" OR "Sarcodontia delectans" OR "Sarcodontia spumea" OR "Sarcomyxa serotina" OR "Sarocladium bacillisporum" OR "Sawadaea bicornis" OR "Schizophyllum commune" OR "Schizoxylon microsporum" OR "Schizura concinna" OR "Schizura ipomoeae" OR "Schizura unicornis" OR "Sclerotiomyces colchicus" OR "Scopuloides hydnoides" OR "Scutellinia scutellata" OR "Scytinostroma galactinum" OR "Septoria aceris" OR "Septoria saccharina" OR "Shenahweum minutum" OR "Shevtchenkella dentilobus" OR "Shevtchenkella variabilis" OR "Spadicoides catenulata" OR "Sparganothis acerivorana" OR "Sparganothis niveana" OR "Sparganothis pettitana" OR "Sphaeronaema acerinum" OR "Spilosoma virginica" OR "Spongipellis borealis" OR "Sporidesmium ontariense" OR "Stachybotrys atra" OR "Stachybotrys chartarum" OR "Steccherinum ciliolatum" OR "Steccherinum fimbriatum" OR "Stegonsporium acerinum" OR "Stegonsporium acerophilum" OR "Stegonsporium ovatum" OR "Stegonsporium pyriforme" OR "Stereum cinerascens" OR "Stereum complicatum" OR "Stereum hirsutum" OR "Stereum murrayi" OR "Stereum ostrea" OR "Stereum roseocarneum" OR "Stereum rugosum" OR "Stictis radiata" OR "Strossmayeria bakeriana" OR "Stylonectria purtonii" OR "Symmerista canicosta" OR "Symmerista leucitys" OR "Synanthedon acerni" OR "Synanthedon acerrubri" OR "Takamatsuella circinata" OR "Taphrina dearnessii" OR "Taphrina sacchari" OR "Tetracis cachexiata" OR "Tetracladium marchalianum" OR "Tetranychus mcdanieli" OR "Tetranychus urticae" OR "Thelephora murrayi" OR "Thelonectria veuillotiana" OR "Thyridopteryx ephemeraeformis" OR "Thyronectria pyrrhochlora" OR "Thysanorea obscura" OR "Tomentella ruttneri" OR "Tomentella stuposa" OR "Tomentella umbrinospora" OR "Tortricidia flexuosa" OR "Tortricidia pallida" OR "Torula ligniperda" OR "Trametes cinnabarina" OR "Trametes hirsuta" OR "Trametes malicola" OR "Trametes mollis" OR "Trametes pubescens" OR "Trametes sepium" OR "Trametes versicolor" OR "Trechispora candidissima" OR "Trichaptum biforme" OR "Trichoderma hamatum" OR "Trichoderma harzianum" OR "Trichoderma koningii" OR "Trichoderma lignorum" OR "Trichoderma viride" OR "Tricladium angulatum" OR "Tripospermum myrti" OR "Trogia crispa" OR "Tubakia dryina" OR "Tubercularia ulmea" OR "Tubercularia vulgaris" OR "Turbinellus floccosus" OR "Tyromyces chioneus" OR "Umbelopsis isabellina" OR "Umbelopsis versiformis" OR "Uncinula circinata" OR "Ustulina deusta" OR "Valsa ambiens" OR "Valsa ambiens subsp. ambiens" OR "Valsa ambiens subsp. leucostomoides" OR "Valsa ceratophora" OR "Valsa decorticans" OR "Valsa etherialis" OR "Valsa leucostomoides" OR "Valsa myinda" OR "Valsaria fulvopruinata" OR "Valsaria insitiva" OR "Valsaria rubricosa" OR "Vanderbylia fraxinea" OR "Vararia effuscata" OR "Vararia

(Continues)

(Continued)

	investiens" OR "Vararia pallescens" OR "Vasates aceris" OR "Vasates aceriscrumena" OR "Venturia acerina" OR "Verticillium lecanii" OR "Verticillium psalliotae" OR "Vitreoporus dichrous" OR "Volvariella bombycina" OR "Wolfiporia extensa" OR "Xanthoporia radiata" OR "Xiphinema americanum" OR "Xylaria bulbosa" OR "Xylaria polymorpha" OR "Xyleborinus saxesenii" OR "Xyleborus dispar" OR "Xylella fastidiosa" OR "Xylodon asper" OR "Xylodon radula" OR "Xylosandrus compactus" OR "Xylosandrus germanus" OR "Xyloterinus politus" OR "Zygodesmus rubiginosus"

APPENDIX C

Literature review on temperature limits for the survival of plant pests

The searches were conducted in December 2023 in SCOPUS and Web of Science.

The total number of records after de-duplication was 1234. After title and abstract screening, 206 references were included for full-text screening. The final number of relevant articles was 35.

References were excluded if they did not contain information on temperature or moisture limits of survival of pest species.

TABLE C.1 String for *pest species relevant for maple veneer.*

Web of Science All databases SCOPUS	**TOPIC:** "Agrilus anxius" or "Agrilus gravis" or "Agrilus torpidus" or "bronze birch borer" or "Arrhenodes minutus" or "Arrenodes minutus" or "Brentus brunneus" or "Brentus minutus" or "Brentus mucillosus" or "Brentus septentrionis" or "Curculio minutus" or "Eupsalis lecontei" or "Eupsalis minuta" or "Eupsalis sallei" or "Platysystrophus minutus" or "oak timberworm" or "Cryphonectria parasitica" or "Diaporthe parasitica" or "Endothia gyrosa var. parasitica" or "Endothia parasitica" or "Valsonectria parasitica" or "chestnut blight" or "blight of chestnut" or "canker of chestnut" or "blight of oak" or "Davidsoniella virescens" or "Endoconidiophora virescens" or "Ceratocystis virescens" or "Ophiostoma virescens" or "sapstreak disease of maple" or "Entoleuca mammata" or "Sphaeria mammata" or "Hypoxylon mammatum" or "Nemania mammata" or "Sphaeria pruinata" or "Rosellinia pruinata" or "Hypoxylon pruinatum" or "Hypoxylon pauperatum" or "Hypoxylon morsei" or "Anthostoma morsei" or "Fuckelia morsei" or "Hypoxylon blakei" or "Anthostoma blakei" or" Hypoxylon holwayi" or "canker of poplar" or "Phytophthora ramorum" or "Sudden Oak Death" or "ramorum bleeding canker" or "ramorum blight" or "ramorum leaf blight" or "twig and leaf blight" or "Xylella fastidiosa" or "Anaheim disease" or "California vine disease" or "citrus variegated chlorosis" or "leaf scorch of almond" or "leaf scorch of American sycamore" or "leaf scorch of coffee" or "leaf scorch of elm" or" leaf scorch of maple" or "leaf scorch of mulberry" or "leaf scorch of oleander" or "olive quick decline syndrome" or "peach phony disease" or "Pierce's disease of grapevine" or "plum leaf scald" or "dwarf disease of lucerne" or "dwarf disease of alfalfa" or "Anisandrus maiche" or "Xyleborus maiche "or "Anisandrus obesus" or "Xyleborus obesus" or "Xyleborus serratus" or "Anisandrus sayi" or "Anisandrus minor" or "Xyleborus sayi" or "Corthylus columbianus" or "Columbian timber beetle" or "Corthylus punctatissimus" or "Crypturgus punctatissimus" or "pitted ambrosia beetle" or "Euwallacea validus" or "Xyleborus validus" or "Hylocurus rudis" or "Micracisoides rudis" or "Micracis rudis" or "Hylocurus biorbis" or "Micracis biorbis" or "Hylocurus torosus" or "Hypothenemus eruditus" or "Hypothenemus boildieui" or "Hypothenemus citri" or "Stephanoderes annulus" or "Lamantor decipiens" or "Xylocleptes decipiens" or "Monarthrum fasciatum" or "Pterocyclon fasciatum" or "Corthylomimus fasciatus" or "Bostrichus fasciatus" or "Pterocyclon simile" or "Pterocyclon gracile" or "yellow-banded timber beetle" or "Monarthrum mali" or "Pterocyclon mali" or "Tomicus mali" or "Pterocyclon longulum" or "Monarthrum praeustum" or "Pterocyclon praeustum" or "Pterocyclon opacifrons" or "Monarthrum omissum" or "apple wood stainer" or "Pityophthorus lautus" or "Pityophthorus natalis" or "Pityophthorus rhois" or "Pityophthorus rhois swainei" or "Pityophthorus rhois hamamelidus" or "Pityophthorus rhois acerni" or "Procryphalus utahensis" or "Procryphalus aceris" or "Procryphalus salicis" or "Xyleborus affinis" or "Xyleborus mascarensis" or "Xyleborus affinis parvus" or "Xyleborus affinis mascarensis" or "Xyleborus affinis fuscobrunneus" or "Xyleborus sacchari" or "Xyleborus subaffinis" or "Xyleborus societatis" or "Xyleborus proximus" or "oak ambrosia beetle" or "shot-hole borer of sugarcane" or "Xyleborus ferrugineus" or "Xyleborus confuses" or "Xyleborus fuscatus" or "Bostrichus ferrugineus" or "Tomicus trypanaeoides" or "Xyleborus retusicollis" or "Xyleborus amplicollis" or "Xyleborus insularis" or "Xyleborus tanganus" or "Xyleborus nyssae" or "Xyleborus soltaui" or "Xyleborus hopkinsi" or "Xyleborus argentinensis" or "Xyleborus rufopiceus "or "Xyleborus schedli "or "Xyleborus nesianus" or "Xyleborus notatus" or "Xyleborus subitus" or "bark locette" or "black twig borer" or "Xyloterinus politus" or "Bostrichus politus" or "Xyloterus unicolor" or "Astylopsis macula" or "Amniscus macula" or "Lamia macula" or "Chrysobothris femorata" or "Buprestis femorata" or "Chrysobothris nigritula" or "Chrysobothris obscura" or "Chrysobothris horni" or "flat-headed apple tree borer" or "flatheaded appletree borer" or "Chrysobothris mali" or "Pacific flat-headed borer" or "Pacific flatheaded borer" or "Glycobius speciosus" or "Plagionotus speciosus" or "sugar maple borer" or "Ptilinus basalis" or "Deathwatch beetle" or "Prionoxystus robiniae" or "Cossus robiniae" or "carpenter worm" or "Synanthedon acerni" or "Synanthedon acerni biscki" or "Sylvora acerni maple borer" or "maple callus borer" or "Acarosporina microspore" or "Schizoxylon microsporum" or "Armillaria calvescens" or "Armillaria gemina" or "Armillaria nabsnona" or "Armillaria sinapina" or "Bondarzewia berkeleyi" or "Polyporus berkeleyi" or "Grifola berkeleyi "or "Grifola gigantea sensu "or "Polyporus laetus sensu "or "Bondarzewia berkeleyi var. villosior" or "Bondarzewia berkeleyi var. dimidiate" or "Bondarzewia berkeleyi var. skeletigera" or "Berkeley's polypore" or "stump blossoms" or "Catunica adiposa" or "Ceratocystis major" or "Sphaeronaema adiposum" or "Ceratostomella adiposa" or "Ophiostoma adiposum" or "Endoconidiophora adiposa" or "Ceratocystis adiposa" or "Ophiostoma majus" or "Ceratostomella major" or "black rot of sugarcane" or "Ophiostoma tenellum" or "Ceratocystis tenella" or "Poria spissa" or "Polyporus spissus" or "Gloeoporus spissus" or "Polyporus croceus" or "Polyporus crociporus" or "Boletus juglandinus" or "Polyporus juglandinus" or "Poria juglandina" or "Mucronoporus spissus" or "Physisporinus spissus" or "Meruliopsis spissa" or "Caloporus spissus" or "Polyporus cruentatus" or "Poria cruentata" or "Trametes cruenta" or "Poria crocipora" or "Cylindrobasidium corrugum" or "Coniophora corrugis" or "Corticium corruge" or "Phellinus everhartii" or "Fomes everhartii" or "Mucronoporus everhartii" or "Scindalma everhartii" or "Pyropolyporus everhartii" or "Fulvifomes everhartii" or "canker rot" or "Biscogniauxia atropunctata" or "Hypoxylon atropunctatum" or "Sphaeria atropunctata" or "Diatrype atropunctata" or "Anthostoma atropunctatum" or "Nummularia atropunctata" or "Numulariola atropunctata" or "Albocrustum atropunctatum" or "Nummularia cinerea" or "Biscogniauxia maritima" or "Biscogniauxia atropunctata var. maritima" or "Biscogniauxia atropunctata var. intermedia" or "hypoxylon canker" or "Camillea tinctor" or "Hypoxylon tinctor" or "Sphaeria tinctor" or "Diatrype tinctor" or "Nummularia tinctor" or "Valsa tinctor" or "Numulariola tinctor" or "Annulohypoxylon truncatum" or

(Continues)

(Continued)

	"Hypoxylon truncatum" or "Sphaeria truncate" or "Hypoxylon annulatum var. truncatum" or "Sphaeria truncatula" or "Sphaeria annulata var. depressa" or "Hypoxylon annulatum var. depressum" or "Sphaeria depressa" or "Cryptovalsa depressa" or "Engizostoma depressum" or "Inonotus glomeratus" or "Polyporus glomeratus" or "Polystictus glomeratus" or "Xanthochrous glomeratus" or "Xanthochrous glomeratus subsp. Heinrichii" or "Xanthochrous heinrichii" or "Inonotus heinrichii" or "white rot" or "Lentinus levis" or "Panus strigosus" or "Panus levis" or "Pocillaria levis" or "Pleurotus levis" or "Lentinus sullivantii" or "Pocillaria sullivantii" or "Pleurotus strigosus" or "Giant Panus" or "Perenniporia fraxinophila" or "Fomes fraxinophilus" or "Polyporus fraxinophilus" or "Scindalma fraxinophilum" or "Poria fraxinophila" or "Fomitopsis fraxinophila" or "ash heart rot" or "Stegonsporium ovatum" or "Steganosporium ovatum" or "Stilbospora ovata" or "Melanconium ovatum" or "Melanconium ovatum var. fusiforme" or "Strumella coryneoidea" or "Strumella canker" or "Tubercularia ulmea" or "canker and die back of Siberian Elm" or "Valsa etherialis" or "Engizostoma etheriale" **AND** **TOPIC:** ((heat* OR temperature* OR thermal OR thermic) AND (death* OR disinfect* OR disinfest* OR kill* OR inactivat* OR surviv* OR decontaminat* OR extreme OR limit OR limits OR resistan* OR stress OR tolerance OR tolerant OR treatment* OR trial*)) OR ((humidit* OR moisture*) AND (death* OR decontaminat* OR disinfect* OR inactivat* OR surviv*))

APPENDIX D

Information retrieved from literature review

Data on the temperature limits retrieved from articles identified in the systematic review and from additional sources are included in the Tables D.1–D.4.

TABLE D.1 *Phythophtora ramorum.*

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Life stage	Reference
55		60 min	Hyphen/all life stages	Swain et al. (2006)
	55	30 min	Hyphen/all life stages	Swain et al. (2006)
80, 60, 40		15 min, 3 days, 3 days	Propagules	Yakabe and MacDonald (2010)
	30	7–56 days (a reduction of propagules in soil of 22%–37% was observed)	Propagules	Yakabe and MacDonald (2010)
50		30 min steaming, dry heat was slightly less effective	Not specified	Schweigkofler, Kosta, Huffman, and Suslow (2014)
40		1 day	Chlamydospores	Tooley et al. (2008)
41.9		5 days	Not specified	Noble et al. (2011)
45		18 min	Sporangia	Noble et al. (2009)
50 (North American A2) 45 (European A1)	45 (North American A2)	30 min	Sporangia, Chlamydospores + mycelium	Linderman and Davis (2008)
50, 42.5, 40		2.5, 30, 120 min	Hyphae	Browning et al. (2008)
	35		Hyphae	Browning et al. (2008)
55		2 weeks	Not specified	Harnik et al. (2004)
	55	1 week	Not specified	Harnik et al. (2004)
50		20 min	Inoculum/Chlamydospores	Funahashi and Parke (2018)
50		30 min (wet heat)	Not specified (on leaf discs)	Schweigkofler, Kosta, Huffman, Sharma, et al. (2014)
	50	30 min (dry heat)	Not specified (on leaf discs)	Schweigkofler, Kosta, Huffman, Sharma, et al. (2014)
60		30 min (dry heat)	Not specified (on leaf discs)	Schweigkofler, Kosta, Huffman, Sharma, et al. (2014)
	60	60 min	Mycelium	Chimento et al. (2012)
	56	30 min	Not specified (grown in wood)	Tubajika et al. (2007)

TABLE D.2 Other fungal and oomycete species.

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Life stage	Species	Reference
32.8		5 days	Not specified	*Phytophthora kernoviae*	Noble et al. (2011)
70		60 min	Not specified	*Grossmannia clavigera*	Wong et al. (2020)
105	80	15 min	Not specified	*Monascus ruber*	Sasaki and Yamanaka (2020)
105	80	15 min	Not specified	*Penicillium spinulosum*	Sasaki and Yamanaka (2020)
105	80	15 min	Not specified	*Byssochlamys nivea*	Sasaki and Yamanaka (2020)
105	80	15 min	Not specified	*Penicillium grevilleicola*	Sasaki and Yamanaka (2020)
105	80	15 min	Not specified	*Penicillium rosemaculatum*	Sasaki and Yamanaka (2020)
> 80–50		4 h in wood	Mycelia	17 species of indoor wood destroying fungi	Schmidt (2007)

(Continues)

TABLE D.2 (Continued)

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Life stage	Species	Reference
80–55		1–24 h on agar medium	Mycelia	17 species of indoor wood destroying fungi	Schmidt (2007)
43	43	48 h/24 h	Not specified Infected *Quercus* billets, hot air treatment	*Ceratocystis fagacearum* (current name: *Bretziella fagacearum*)	Jones (1973)
49	49	12 h/6 h	Not specified Infected *Quercus* billets, hot water treatment	*Ceratocystis fagacearum* (current name: *Bretziella fagacearum*)	Jones (1973)
40	40	12 h/1 h	Not specified Agar medium, hot air treatment	*Ceratocystis fagacearum (current name: Bretziella fagacearum)*	Jones (1973)
56		30 min	Not specified Infected *Quercus rubra* logs	*Ceratocystis fagacearum* (current name: *Bretziella fagacearum*)	Juzwik et al. (2019)
	58	7 days	Chlamydospores	*Microdochium nivale*	Noble et al. (2009)
64		7 days	Chlamydospores	*Microdochium nivale*	Noble et al. (2009)
60		1 day		*P. brassicae*	Noble et al. (2009)
50, 45, 40		6 h, 12 h, 1 days	Sclerotia	*Sclerotium cepivorum*	McLean et al. (2001)
	45		Not specified, enzymatic activity was measured	*Fomes* sp.	Martinez-Valdez et al. (2022)
50	45	30 min	Chlamydospores + mycelium	*Cylindrocladium scoparium*	Linderman and Davis (2008)
50	45	30 min	Oospores + mycelium	*Pythium irregulare*	Linderman and Davis (2008)
50	45	30 min	Chlamydospores + mycelium	*Thielaviopsis basicola*	Linderman and Davis (2008)
50		71 min	Inoculum/Oospores	*Phytophthora pini*	Funahashi and Parke (2018)
42.5	42.5	24 h/8 h	Not specified Agar medium	*Ceratocystis platani*	Pilotti et al., 2016
76	71	30 min	Mycelium in wood blocks	*Shizophyllum commune*	Ramsfield et al. (2010)

TABLE D.3 Bacteria.

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Species	Reference
60		1 h	Different bacterial plant pathogens	Noble et al. (2009)
42		180 min	*Xylella fastidiosa*	Martins et al. (2007)
	42	45 min	*Xylella fastidiosa*	Martins et al. (2007)
42		180 min	*Xanthomonas citri*	Martins et al. (2007)
	42	45 min	*Xanthomonas citri*	Martins et al. (2007)
37		3 days	*Xylella fastidiosa*	Feil and Purcell (2001)

TABLE D.4 Insects.

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Life stage	Species	Reference
56 (bolt core target temp.)		Bolt core target temp. for 30 min Temp. in heat chamber: 70°C	J-larval stage within pupal cells	*Agrilus anxius*	Haack and Petrice (2022)
56 (bolt core target temp.)	50	Bolt core target temp. for 30 min Temp. in heat chamber: 70°C/65°C	J-larval stage within pupal cells	*Agrilus panipennis*	Haack and Petrice (2022)

TABLE D.4 (Continued)

Lethal temperature (°C)	Non-lethal temperature (°C)	Duration of exposure	Life stage	Species	Reference
60 (bolt core target temp.)	56	Bolt core target temp. for 30 min Temp. in heat chamber: 75°C/65°C	J-larval stage within pupal cells	*Agrilus bilineatus*	Haack and Petrice (2022)
60 (bolt core)	56	Bolt core target temp. for 30 min Temp. in heat chamber: 75°C/65°C	J-larval stage within pupal cells	*Agrilus sulcicollis*	Haack and Petrice (2022)
60 (bolt core)	56	Bolt core target temp. for 30 min Temp. in heat chamber: 75°C/70°C	Larvae	*Ips* sp.	Haack and Petrice (2022)
56 (bolt core)		Bolt core target temp. for 30 min Temp. in heat chamber: 70°C	Larvae	*Pissodes* sp.	Haack and Petrice (2022)
60 (bolt core)	56	Bolt core target temp. for 30 min Temp. in heat chamber: 75°C/65°C	Larvae	*Cerambycidae*	Haack and Petrice (2022)
> 62		< 1 min		Storage pests	Fields et al. (2012)
50–62		< 1 h		Storage pests	Fields et al. (2012)
44, 46, 48 and 50		40, 8, 4 and 2 min		*Dendroctonus armandi*	Zhao et al. (2018)

APPENDIX E

Estimated temperatures reached inside the logs and veneer sheets

In order to evaluate the phytosanitary efficacy of the heat treatments (water bath and high heat drying), the temperatures reached inside the logs and veneer sheets were estimated by the hearing expert Wolfgang Gindl-Altmutter using a simplified approach according to the Textbook 'Wärmeübertragung - Grundlagen und Praxis' by Böckh and Wetzel (2017), based on the general heat transfer equation:

$$\frac{\partial - \partial_\infty}{\partial_A - \partial_\infty} = \frac{4}{\pi} \cdot \sum_{n=1}^{\infty} \frac{1}{n} \cdot e^{\frac{n^2 \cdot \pi^2 \cdot a \cdot t}{4 \cdot s^2}} \cdot \sin \frac{n \cdot \pi \cdot x}{2 \cdot s}$$

A = start, α = thermal diffusivity (thermal conductivity/density × specific heat capacity), t = time, s = distance, n = number of iterations, x = distance from the surface.

In order to carry out these simplified calculations, the graphical solutions for the temperature curves in plates and circular cylinders (p. 50–51 in Böckh & Wetzel, 2017) were applied to veneer sheets and logs. The following input parameters for relevant physical properties of maple wood were considered according to literature. For the calculations, it was assumed that the moisture content is reduced from 20% to 40% at the beginning of drying to 8%–12% at the end of the process. This was considered by working with average values between the starting and end points (high and low moisture content) in the case of veneer drying. For logs, a higher moisture level of 100% was assumed and the physical values were adjusted accordingly. An overview on the input parameters is presented in Table E.1.

TABLE E.1 Input parameters for the calculations of the temperature inside veneers and logs.

Physical wood property	Value used for veneers	Value used for logs
Thermal conductivity λ (W/mK)	0.25	0.381
Heat capacity c (J/kgK)	1850	2800
Density (kg/m^3)	700	1000
Thermal diffusivity a (m^2/s)	0.25/(1850 × 700)	0.381/(2800 × 1000)

Since the heat transfer equation only considers temperature gradients within a solid body, the transfer of heat into said body, i.e. from air to wood in the case of veneer drying and from water to wood in the case of pre-heating of logs, was considered. According to literature, a coefficient of heat transfer of 50 (W/m^2K) assuming air velocity of 5 m/s was used for veneer drying and a value of 1000 (W/m^2K) was used for log pre-heating in water. The same physical wood properties were used.

Table E.2 provides the results of the temperature estimates inside veneer sheets. The calculations assume a starting temperature of 50°C and the ranges of drying temperatures and duration of drying as provided by the applicant as best-case and worst-case scenarios with regard to temperatures reached and duration of heating.

TABLE E.2 Drying temperatures and temperatures reached inside the core of veneer sheets.

		0.7 mm veneer sheets	6 mm veneer sheets
Worst case	Drying temperature/time of drying	90°C/90 s	122°C/120 s
	Core temperature and time to reach it	87°C after 30 s 90°C after 90 s	57°C after 60 s 70°C after 120 s
Best case	Drying temperature/time of drying	110°C/120 s	145°C/180 s
	Core temperature and time to reach it	108°C after 60 s 110°C after 120 s	73°C after 120 s 92°C after 180 s

The temperature in the core and 5 cm from the surface logs in the water bath was calculated for the different time steps given provided by the applicant (see Table 3 in Section 3.3.2), two different log diameters (36 and 56 cm) and with different starting temperatures reflecting average outside temperatures in spring/autumn, summer and winter in the area of veneer production in Canada (Figures E.1 and E.2).

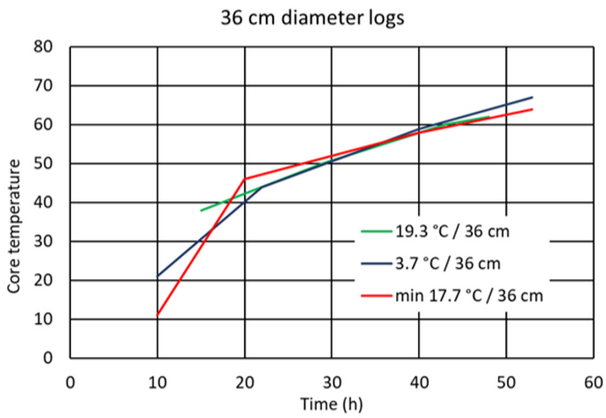


FIGURE E.1 Log core temperature development over time in the water bath for logs with a diameter of 36 cm.

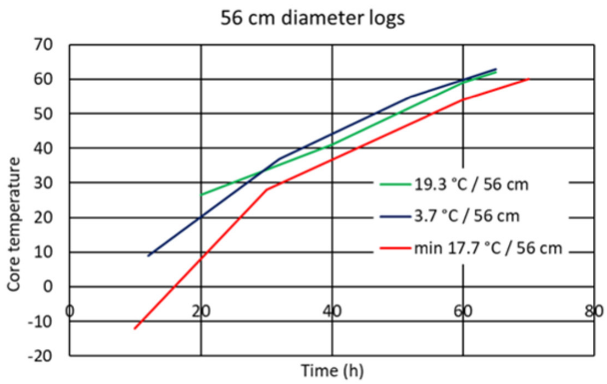
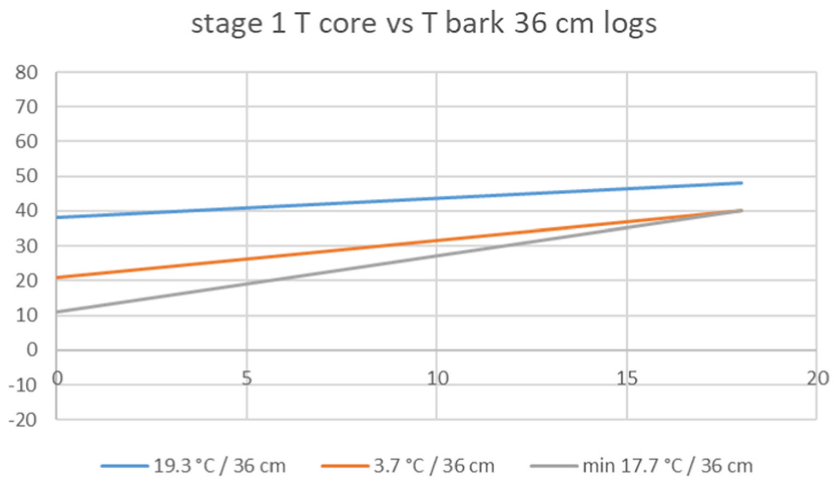


FIGURE E.2 Log core temperature development over time in the water bath for logs with a diameter of 56 cm.

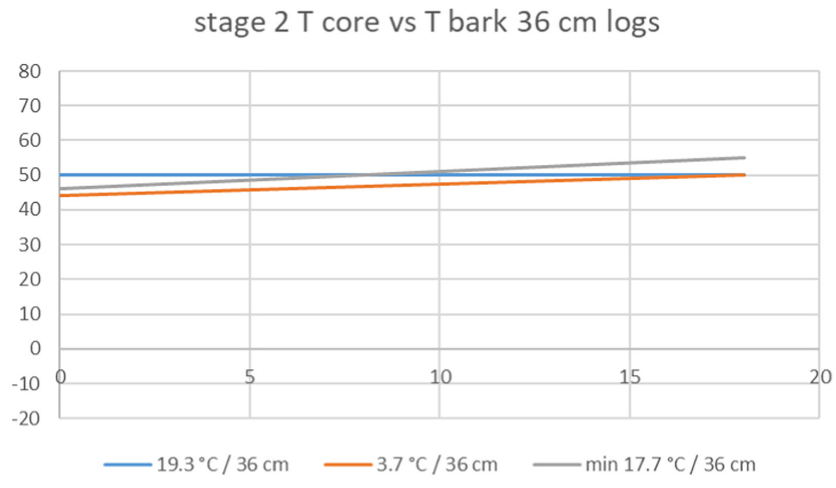
Core to bark temperature gradient in 36 cm logs (*x*: distance in cm from core to bark, *y*: temperature in°C)

Time to reach 50°C core temp.: Summer: 29 h, Spring: 29 h, Winter: 27 h.

Stage 1: 15 h (Summer), 10 h (Spring), 10 h (Winter)

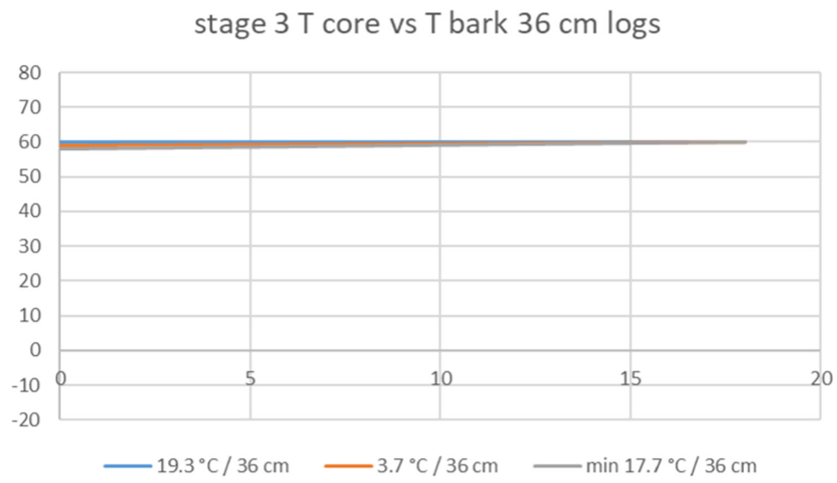


Stage 2: 14 h (Summer), 12 h (Spring), 10 h (Winter)

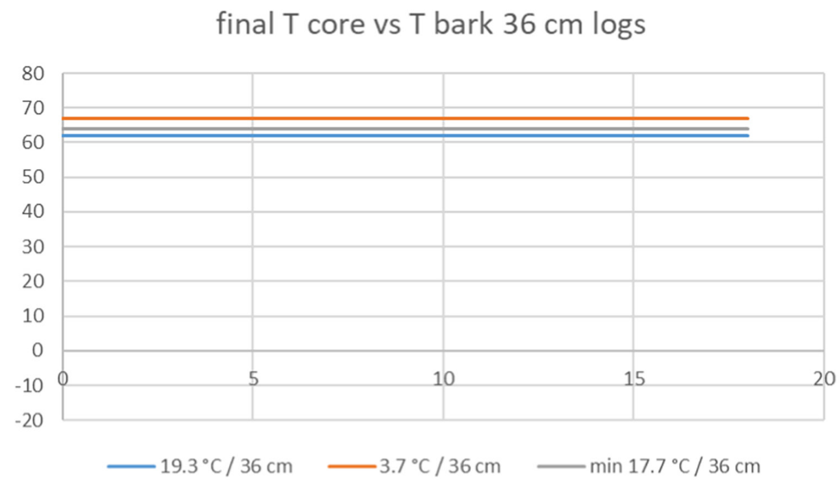


Time to reach 50°C core temp.: Summer: 29 h, Spring: 29, Winter: 27.

Stage 3: 14 h (Summer), 18 h (Spring), 20 h (Winter)



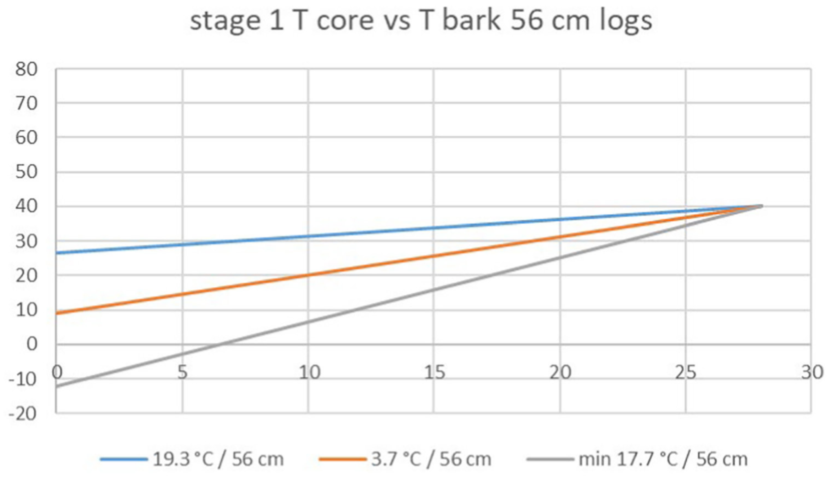
Stage 4: 5 h (Summer), 13 h (Spring), 13 h (Winter)



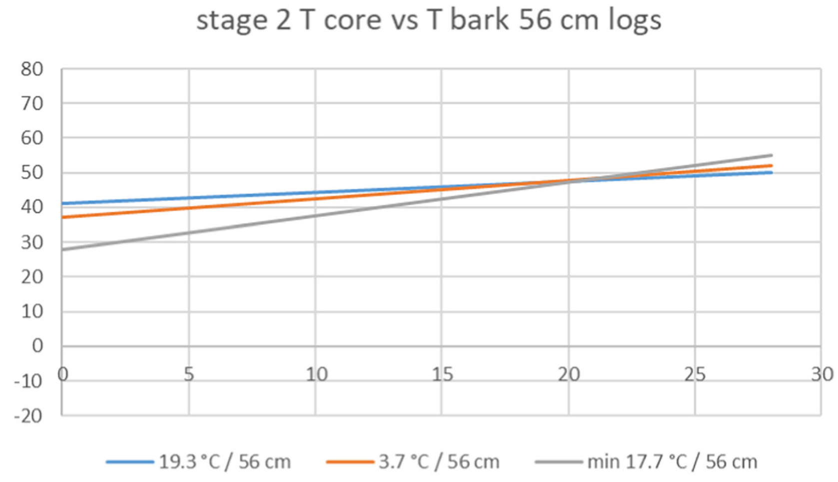
Core to bark temperature gradient in 56 cm logs (*x*: distance in cm from core to bark, *y*: temperature in°C)

Time to reach core temp. of 50°C: Summer 50 h, Spring 47 h, Winter 55 h.

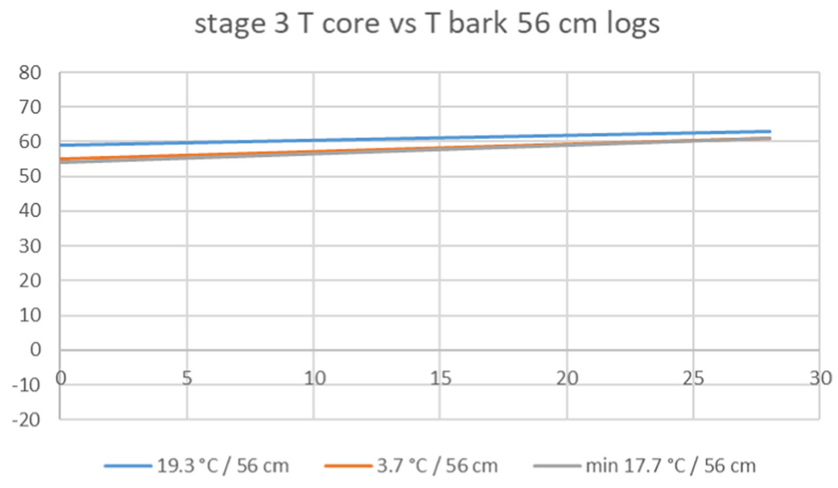
Stage 1: 20 h (Summer), 12 h (Spring), 10 h (Winter)



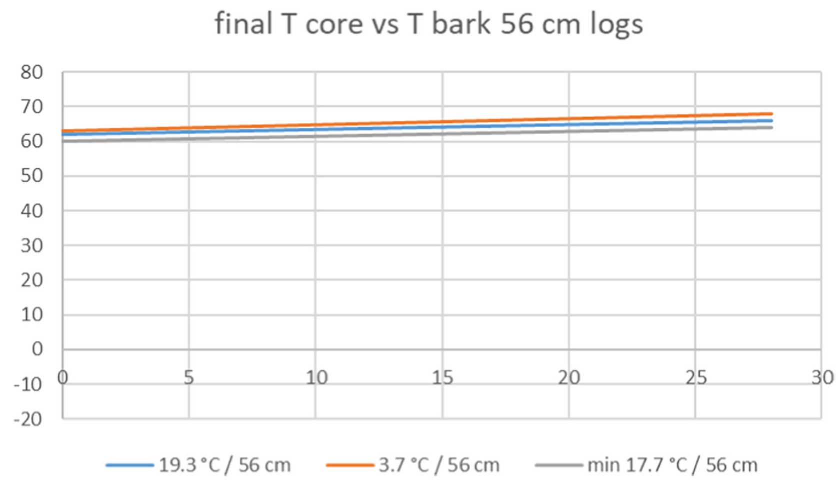
Stage 2: 20 h (Summer), 20 h (Spring), 20 h (Winter)



Stage 3: 20 h (Summer), 20 h (Spring), 30 h (Winter)



Stage 4: 5 h (Summer), 13 h (Spring), 10 h (Winter)



APPENDIX F

Risk Mitigation measures

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
Bacteria								
1	*Xylella fastidiosa*	Bacteria	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process. Nevertheless, infected trees may remain asymptomatic Uncertainties: • None	Expected to be fully effective, since the temperature reached at the core exceeds the limit of survival of *X. fastidiosa* of 42°C for more than 22 min up to 60 h Uncertainties: • None	Not effective Uncertainties: • None	Not effective Uncertainties: • None	The drying process is expected to have an effect on the bacteria survival, but there is a lack of scientific data on such an effect Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Effective
						Not effective Uncertainties: • None	The drying process is expected to have an effect on the bacteria survival, but there is a lack of scientific data on such an effect Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Effective
Fungi/Oomycetes								
2	*Davidsoniella virescens*	Fungi	Not expected to be highly effective, as foliar and branch symptoms may appear 1–6 years after infection (Sinclair & Lyon, 2005). Staining of wood should be visible after cutting but early colonisation could go undetected. Furthermore, there is no surveillance for this fungal pathogen Uncertainties: • Whether and for how long an infected plant could remain asymptomatic	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum.	Not or partially effective. The fungus is associated with the functional xylem and sapwood Uncertainties: • Whether the fungus could be present in the central cylinder of the tree	Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely but cannot be excluded due to lack of information for this species
						Not effective Uncertainties: • None	No information for this species but expected to be effective Uncertainties: • Whether the treatment will completely kill the pathogen inoculum • Level of efficacy of this treatment in killing the pathogen inoculum	Survival very unlikely but cannot be excluded due to lack of information for this species

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
3	*Phytophthora ramorum*	Oomycetes	Not effective: *Acer* spp. are poor hosts of *P. ramorum*. Infections, if present would be difficult to recognise Uncertainties: • There is no surveillance in the forests • Whether there are asymptomatic stages on Acer is not known	Highly effective but some survivors cannot be excluded. Most papers reported for killing was 40°C, only one reported survivors at 60°C Uncertainties: • Whether the water bath could completely kill the pest/inoculum	Partially effective. Debarking would remove all the bark infection and also infection of the sapwood to a depth of at least 3 mm up to 1 cm Uncertainties: • Whether the pathogen could colonise deeper tissues under the bark	This step has no effect in killing the pest Uncertainties: • None	Fully effective in killing all inoculum	Effective
						This step has no effect in killing the pest Uncertainties: • None	Highly effective in killing the pest but some survivors may not be excluded	Survival very unlikely but cannot be excluded
Fungi – Canker species								
4	*Acarosporina microspora*	Fungi	Partially effective if cankers are visible Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Partially effective: debarking will remove bark infections Uncertainties: • None	Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species
						Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species
5	*Annulohypoxylon truncatum*	Fungi	Partially effective if cankers are visible Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Partially effective: Debarking will remove bark infections Uncertainties: • None	Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species
						Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
6	*Biscogniauxia atropunctata*	Fungi	Not effective because pathogen can be present asymptomatically in the sapwood and bark Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Partially effective since the pathogen can be present in the sapwood Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species
7	*Camillea tinctor*	Fungi	Partially effective if cankers are visible Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Partially effective since the pathogen can be present in the sapwood Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species
8	*Catunica adiposa*	Fungi	Partially effective if sapwood stain would be visible after cutting. Little information for this species, expected to be present in the sapwood Uncertainties: • Whether sapwood stain would be visible after cutting	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Partially effective since the pathogen can be present in the sapwood Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
9	*Cryphonectria parasitica*	Fungi	Not effective: *Acer* spp. are poor hosts of *C. parasitica*. Infections, if present would be difficult to recognise Uncertainties: • Whether and to which extent the pest will determine symptoms on *Acer* spp	Highly effective, some surviving mycelium cannot be excluded Uncertainties: • Whether the treatment is sufficient to kill completely the pathogen inoculum	Highly effective. Debarking and rounding will remove all the bark infections, all fruiting bodies, and mycelium in the sapwood to a depth of at least 3 mm. Only some mycelium, potentially present deeper in the sapwood would remain Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	Fully effective. Not expected to survive this treatment Uncertainties: • None Highly effective. Some surviving mycelium cannot be excluded Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Effective Survival very unlikely, but it cannot be completely excluded
10	*Entoleuca mammata*	Fungi	Not expected to be completely effective, as symptoms can appear 2 years after the ascospore infection (Sinclair & Lyon, 2005; Ostry & Anderson, 2009). Furthermore, there is no surveillance for this fungal pathogen Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Not effective. The fungus invades tissues under the bark Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective Uncertainties: • Whether the treatment will kill completely the pathogen inoculum No information for this species but expected to be effective. Uncertainties: • Whether the treatment will completely kill the pathogen inoculum • Level of efficacy of this treatment in killing the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
11	*Jamesreidia tenella*	Fungi	It is expected to be rather effective as trees affected by blue stain are generally declining. There is no surveillance on this fungus Uncertainties: • Whether asymptomatic stages exist	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Not or only partially effective. The fungus is associated with sapwood Uncertainties: • None	Not effective Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
						Not effective Uncertainties: • None	No information for this species but expected to be effective. Uncertainties: • Whether the treatment will completely kill the pathogen inoculum • Level of efficacy of this treatment in killing the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
Fungi – Wood decay species								
12	*Armillaria calvescens*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees Uncertainties: • The extent to which internal decay is visible after cutting	Highly effective, some surviving mycelia cannot be excluded Uncertainties: • Level of efficacy of this treatment in killing completely the pathogen inoculum	Not effective if Armillaria causes internal heart rot Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective
						Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
13	*Armillaria gemina*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees Uncertainties: • The extent to which internal decay is visible after cutting	Highly effective, some surviving mycelia cannot be excluded Uncertainties: • Level of efficacy of this treatment in killing completely the pathogen inoculum	Not effective if *Armillaria* causes internal heart rot Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective
						Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective
14	*Armillaria nabsnona*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees Uncertainties: • The extent to which internal decay is visible after cutting	Highly effective, some surviving mycelia cannot be excluded. Uncertainties: • Level of efficacy of this treatment in killing completely the pathogen inoculum	Not effective if *Armillaria* causes internal heart rot Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective
						Partially effective as the central part of the stem is not used for veneer production Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010) Uncertainties: • None	Effective

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
15	*Armillaria sinapina*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees. Uncertainties: • The extent to which internal decay is visible after cutting.	Highly effective, some surviving mycelia cannot be excluded. Uncertainties: • Level of efficacy of this treatment in killing completely the pathogen inoculum.	Not effective if *Armillaria* causes internal heart rot. Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010). Uncertainties: • None	Effective
						Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	Fully effective. Not expected to survive this treatment based on Ramsfield et al. (2010). Uncertainties: • None	Effective
16	*Bondarzewia berkeleyi*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees. Uncertainties: • The extent to which internal decay is visible after cutting.	No information for this species but expected to be partially effective. Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum.	Not effective if internal heart rot is present. Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
						Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species.

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
17	*Cylindrobasidium corrugum*	Fungi	Partially effective, if internal heart rot is visible after cutting of the trees. Uncertainties: • The extent to which internal decay is visible after cutting.	No information for this species but expected to be partially effective. Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum.	Not effective. Uncertainties: • None	Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum.	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
						Partially effective as the central part of the stem is not used for veneer production. Uncertainties: • None	No information for this species, but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum.	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
18	*Rigidonotus glomeratus*	Fungi	Effective, at least partially, if heart rot is visible after cutting the trees. However, asymptomatic periods are common for wood decay fungi. Furthermore, there is no surveillance for this fungal pathogen. Uncertainties: • None	No information for this species but expected to be partially effective. Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum.	Not effective. The fungus is associated with both heartwood and sapwood. Uncertainties: • None	Not effective. Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species.
						Not effective. Uncertainties: • None	No information for this species but expected to be effective. Uncertainties: • Whether the treatment will completely kill the pathogen inoculum. • Level of efficacy of this treatment in killing the pathogen inoculum.	Survival very unlikely, but it cannot be excluded due to lack of information for this species.

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
19	*Perenniporia fraxinophila*	Fungi	Effective, at least partially, if heart rot is visible after cutting the trees. However, asymptomatic periods are common for wood decay fungi. Furthermore, there is no surveillance for this fungal pathogen Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Not effective. The fungus is associated with heartwood Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum. No information for this species but expected to be effective. Uncertainties: • Whether the treatment will completely kill the pathogen inoculum. • Level of efficacy of this treatment in killing the pathogen inoculum.	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species
20	*Meganotus everhartii*	Fungi	Effective, at least partially, if heart rot is visible after cutting the trees. However, asymptomatic periods are common for wood decay fungi. Furthermore, there is no surveillance for this fungal pathogen Uncertainties: • None	No information for this species but expected to be partially effective Uncertainties: • Level of efficacy of this treatment in killing the pathogen inoculum	Not effective because the fungus is mainly associated with heartwood, although the mycelium can grow even into the sapwood of living trees (Von Schrenk & Spaulding, 1909) Uncertainties: • None	Not effective Uncertainties: • None Not effective Uncertainties: • None	No information for this species but expected to be highly effective. Uncertainties: • Whether the treatment will kill completely the pathogen inoculum No information for this species but expected to be effective Uncertainties: • Whether the treatment will completely kill the pathogen inoculum • Level of efficacy of this treatment in killing the pathogen inoculum	Survival very unlikely, but it cannot be excluded due to lack of information for this species Survival very unlikely, but it cannot be excluded due to lack of information for this species
Ambrosia beetles (Scolytinae non-European)								
21	*Anisandrus obesus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi. Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
22	*Anisandrus sayi*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
23	*Corthylus columbianus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
24	*Euwallacea validus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive.	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
25	*Monarthrum fasciatum*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi. Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
26	*Monarthrum mali*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi. Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
27	*Xyleborus ferrugineus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
28	*Xyloterinus politus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective for prevention of the colonisation, not effective for suppressing the beetle	Effective Partially effective as the adults and larvae are small and can easily survive	Effective Partially effective. The drying process renders the wood unsuitable for the survival of all stages and the associated fungi Uncertainties: • Whether the treatment is killing the associated fungi	Effective Partially effective
Bark beetles (Scolytinae non-European)								
29	*Hylocurus rudis*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (weakened trees) and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Effective	Effective Effective	Effective Effective	Effective Effective
30	*Pityophthorus lautus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (very weakened or dead trees) and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Effective	Effective Effective	Effective Effective	Effective Effective

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
31	*Procryphalus utahensis*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions (very weakened or dead trees) and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Effective	Effective Effective	Effective Effective	Effective Effective
Insects								
32	*Anelaphus pumilus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
33	*Anthophylax attenuatus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
34	*Arrhenodes minutus*	Insects	Partially effective. The beetle only attacks stems of dying trees or logs Uncertainties: • Whether Acer is a host, theoretically under a loose bark (wounds) the larvae could settle	No information for this species but expected to be partially effective. Uncertainties: • Level of efficacy of this treatment in killing the pest	Partially effective. Debarking removes adults possibly sitting under loose bark in proximity of wounds Uncertainties: • The frequency of wounds and loose bark on harvested trees	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing some risk of containing living larval stages	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
35	*Astylopsis macula*	Insects	Partially effective. The beetle only attacks stems and large branches of dead trees or logs	No information for this species but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and pupa (pupation takes place in the bark or between the bark and wood), exposing also other life stages to the risk of desiccation Uncertainties: • How deep the larvae of *A. macula* can penetrate the wood	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
36	*Bellamira scalaris*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
37	*Brachyleptura rubrica*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
38	*Centrodera decolorata*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
39	*Chrysobothris femorata*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
40	*Chrysobothris mali*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
41	*Clytus ruricola*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
42	*Dicerca divaricata*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
43	*Ecyrus dasycerus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
44	*Glycobius speciosus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
45	*Parelaphidion incertum*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continues)

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
46	*Pidonia ruficollis*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
47	*Prionoxystus robiniae*	Insects	Partially effective. A tree which is colonised in an advanced stage it is easily detected by the frass coming out of the tree. Only early stages might be more difficult to detect	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation, but older larvae can bore into the heartwood	Effective Partially effective. Fully grown larvae of *Prionoxystus robiniae* can be 1.2 cm in diameter. But small larvae could survive the cutting	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
48	*Sternidius misellus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

(Continued)

N	Pest name	Group	(1) Selection of trees for veneer production	(2) Water bath	3) Debarking and rounding	(4) (a) Cutting to 0.7 mm (4) (b) Cutting up to 6 mm	(5) (a) Drying up to 0.7 mm (5) (b) Drying up to 6 mm	(6) (a) Conclusion for 0.7 mm (6) (b) Conclusion for 6 mm
49	*Strangalepta abbreviata*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
50	*Trigonarthris proxima*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production
51	*Typocerus deceptus*	Insects	Partially effective. It is expected that trees heavily affected by the pest are not in optimal conditions and, therefore, can be discarded in this step of the process	No information for this species, but expected to be partially effective	Partially effective. Debarking removes or destroys both eggs and young larvae, exposing also other life stages to the risk of desiccation	Effective Partially effective. Sawn wood less than 6 mm of thickness is assumed posing minimal risk of containing living stages. In case of survival, signs of the pest would be visible	Effective Partially effective. The drying process renders the wood unsuitable for the survival of immature stages	Effective Partially effective, but it is unlikely that the organism can complete the development inside the veneer after the production

APPENDIX G

Elicited values for pest freedom

This appendix provides the rating based on expert judgement on the likelihood of pest freedom for veneer sheets of 0.7 mm and 6 mm thickness.

The following describes the conditions common for the EKEs of *P. ramorum*, *D. virescens*, canker fungi, wood decay fungi, wood boring insects and ambrosia beetles.

Trees with visible symptoms do not enter the production system.

Quality checks of veneer sheets will lead to removal of sheets with visible defects.

The veneers have to undergo the following process which has a strong influence on the survival of pests potential found in the final product:

1. Water bath with heating of logs
2. Debarking and rounding of logs (removal of bark and sapwood to a depth of 3–10 mm)
3. Slicing
4. Final drying with high temperature

For further details with the description and evaluation of the different production steps, see Sections 3 and 6.

A best-case scenario and a worst-case scenario were developed which is relevant for all elicited groups (see below Table G.1). The best-case and worst-case scenario for heating in the water bath and the final drying with high temperature are based on the temperature ranges provided by the applicant and calculations provided by the hearing expert.

TABLE G.1 Factors considered in the best-case and worst-case scenarios.

Factor	Best case	Worst case
Abundance of the pests	Low prevalence in the production area	High prevalence in the production area
Symptoms	Symptoms usually visible	Presence of asymptomatic plants
Temperature and duration of temperature in the core and outer wood of logs in the water bath	Core temperature of 50°C maintained for 26 h Outer wood (5 cm) temperature of 50°C and above maintained for 60 h, 60°C and higher for at least 5h	Core temperature of 50°C maintained for 22 min Outer wood (5 cm) 50°C maintained for 22 min*
Removal of sapwood	10 mm sapwood is removed	3 mm sapwood is removed
0.7 mm veneer sheets	Core temperature after 60 s is 108°C and reaches 110°C after 120 s	Core temperature after 30 s is 87°C and reaches 90°C after 90 s
6 mm veneer sheets	Core temperature after 120 s is 73°C and reaches 92°C after 180 s	Core temperature after 60 s is 57°C and reaches 70°C after 120 s

*Logs can be removed from the water bath as soon as the core temperature reaches 50°C and enter the next production steps within 22 min. It is assumed that the temperature inside the logs will not significantly change during 22 min.

G.1 | OVERALL LIKELIHOOD OF PEST FREEDOM OF *PHYTOPHTHORA RAMORUM* FOR VENEER THICKNESS OF 6 MM

The heat during final drying of veneer sheets of a thickness of 0.7 mm exceeds the thermotolerance of *P. ramorum,* and hence, the elicitation was conducted only for a veneer sheet thickness of 6 mm

G.1.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

P. ramorum was only reported in nurseries in west Canada but not in eastern and south-eastern Canada where *Acer* trees for veneer production are grown. The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). *P. ramorum* does not inhabit the core of the wood. Only few thick veneers of 6 mm can be derived from one log (compared to thin veneer sheets). A combination of the following was considered: *Acer* is a poor host, restricted distribution, possible pest free area, very unlikely to survive treatment.

G.1.2 | Reasoning for a scenario which would lead to a reasonably high number of veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied are applied (see scenario description in Appendix G Table G.1). Although very unlikely, it cannot be ruled out that *P. ramorum* can enter the production and survive the treatment.

G.1.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

Most *Acer* logs will come from pest-free areas and the different steps in the production make it very unlikely to survive for *P. ramorum*; therefore, the distribution curve should be moved to the left. However, some uncertainties remain and it cannot be ruled out that an infected tree enters the production and that *P. ramorum* could survive the production process

G.1.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is very low and the uncertainties around the median estimate are generally low, but they are slightly higher regarding overestimating the real value, and hence, the upper quartile is moved slightly further away from the median estimate.

G.1.5 | Elicitation outcomes of the assessment of the pest freedom for *Phytophthora ramorum* on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.2) and pest freedom (Table G.3).

TABLE G.2 Elicited and fitted values of the uncertainty distribution of pest infestation by *P. ramorum* per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					1.00		2.00		4.00					15.00
EKE	0.190	0.275	0.378	0.546	0.751	1.01	1.29	2.00	3.09	3.95	5.31	7.30	10.5	14.5	21.0

Note: The EKE results are the Lognorm (3.3305, 4.449) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.3.

TABLE G.3 The uncertainty distribution of sheets free of *P. ramorum* per 10,000 sheets calculated by Table G.2.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9985					9996		9998		9999					10,000
EKE results	9979	9985	9989	9993	9995	9996	9997	9998.0	9998.7	9999.0	9999.2	9999.5	9999.6	9999.7	9999.8

Note: The EKE results are the fitted values.

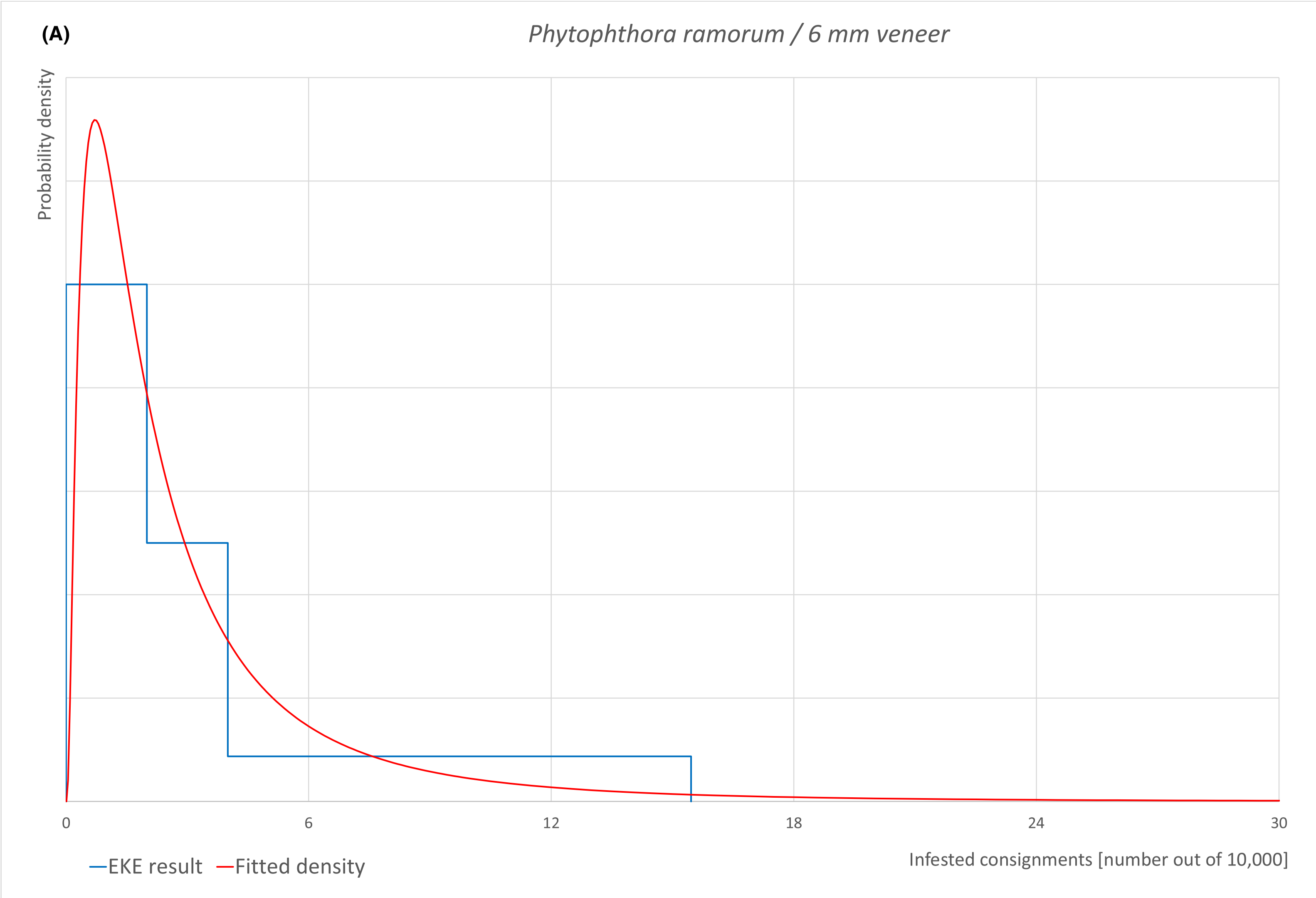


FIGURE G.1 (Continued)

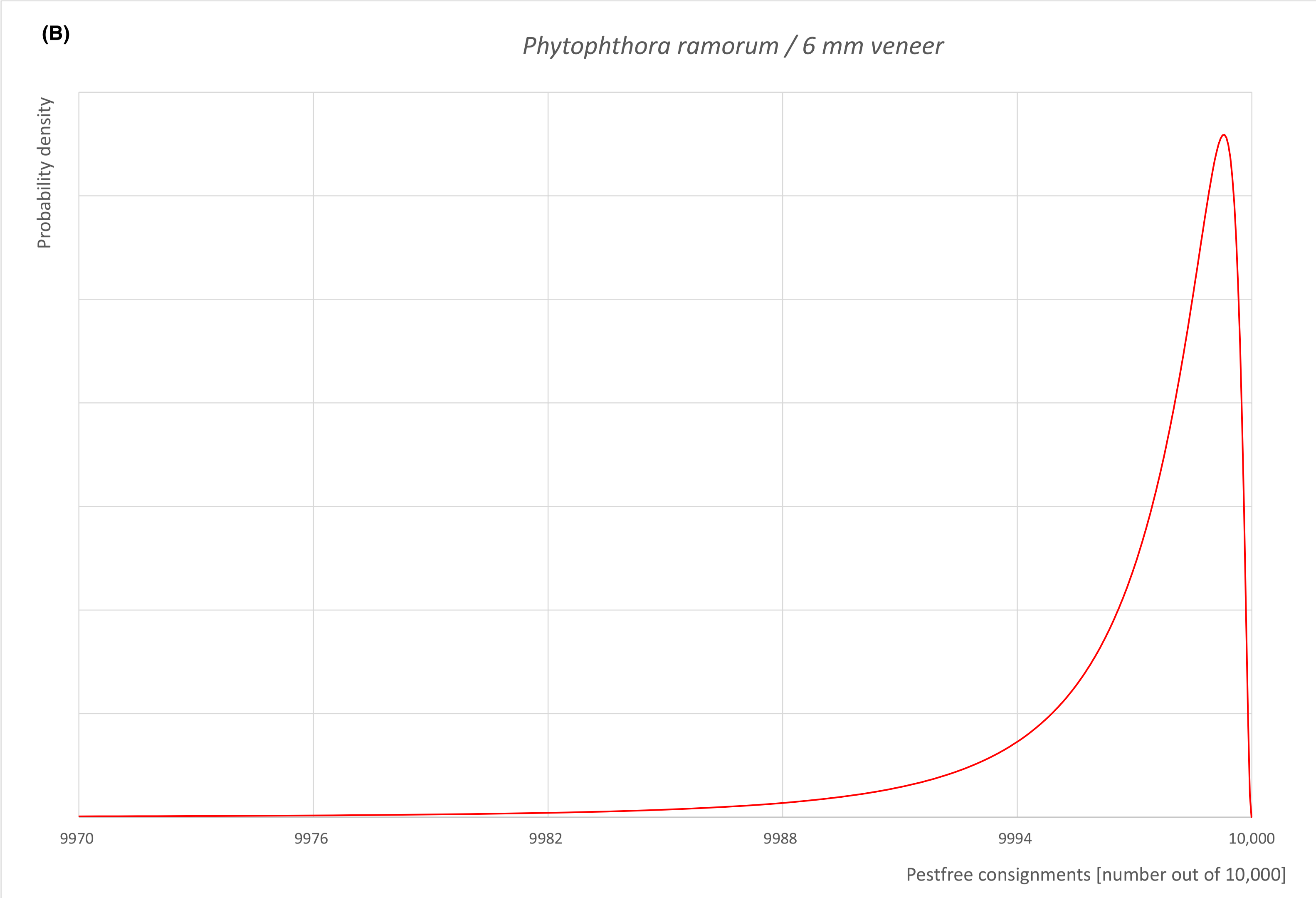


FIGURE G.1 (Continued)

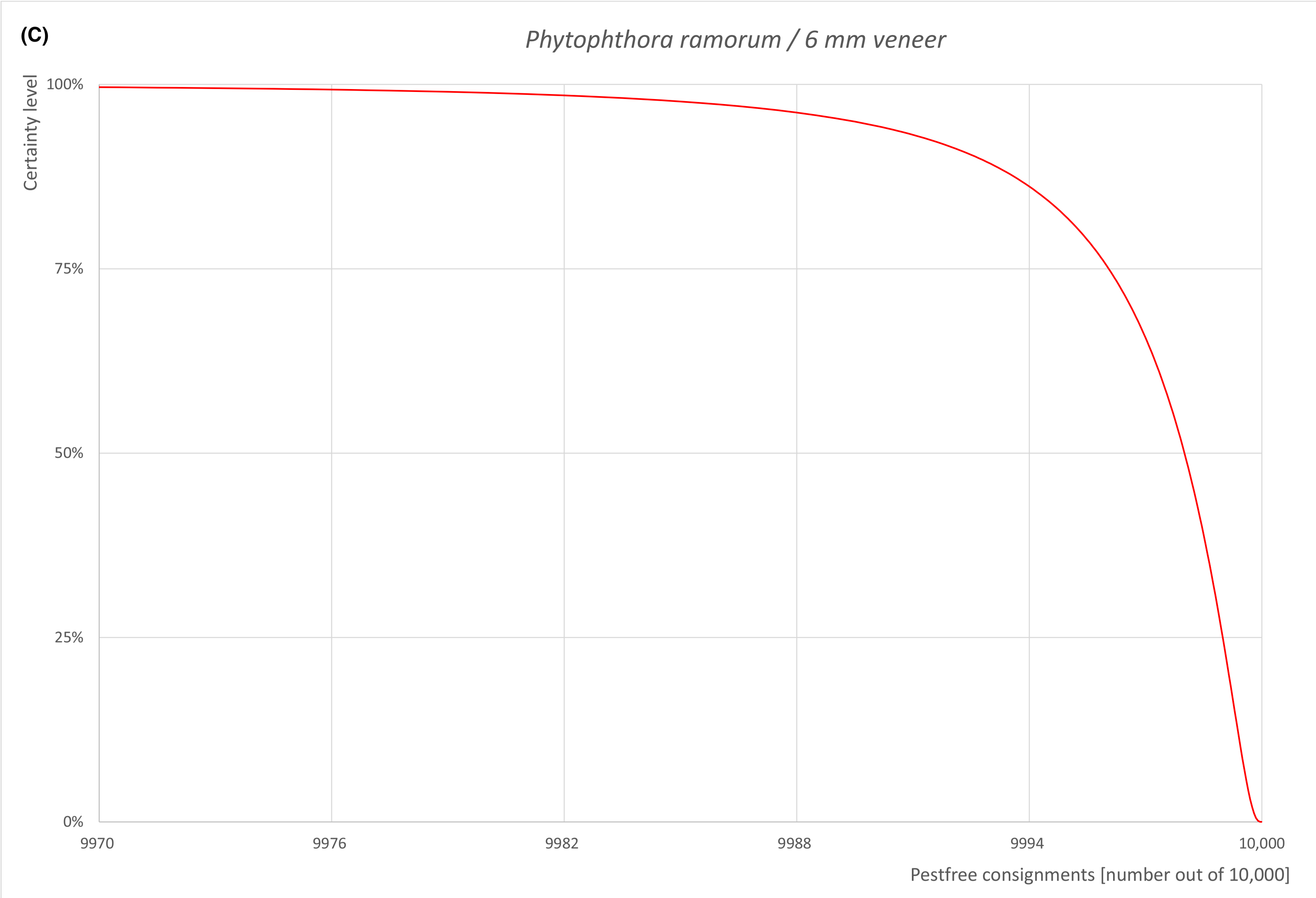


FIGURE G.1 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. =1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.2 | OVERALL LIKELIHOOD OF PEST FREEDOM OF *DAVIDSONIELLA VIRESCENS* FOR VENEER THICKNESS OF 0.7 MM

G.2.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Several steps in the production will reduce the risk, such as the selection of trees and quality control of veneers, the high efficacy of heat treatments (water bath and drying). Only a small proportion of infested trees enter the production.

G.2.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

D. virescens is probably widespread in the area where *Acer* is grown, and *Acer* is a major host of *D. virescens*. An asymptomatic phase cannot be ruled out. The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). It is unlikely that *D. virescens* survives the veneer production, but it cannot be excluded that some inoculum could survive.

G.2.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

All steps in the production chain will be very efficient to kill the pest. For the thin veneer sheets, the final high heat drying will be particularly efficient due to the high temperatures. An infection will result in staining which will result in rejection of infected sheets during the quality check.

G.2.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is very low and the uncertainties around the median estimate are generally low, but they are slightly higher regarding overestimating the real value, and hence, the upper quartile is moved slightly further away from the median estimate.

G.2.5 | Elicitation outcomes of the assessment of the pest freedom for *Davidsoniella virescens* on veneer sheets thickness of 0.7 mm

The following tables show the elicited and fitted values for pest infestation (Table G.4) and pest freedom (Table G.5).

TABLE G.4 Elicited and fitted values of the uncertainty distribution of pest infestation by *D. viresens* per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0.00					1.50		3.00		6.00					20.00
EKE	0.291	0.419	0.575	0.828	1.14	1.52	1.94	2.99	4.61	5.88	7.87	10.8	15.5	21.3	30.8

Note: The EKE results are the Lognorm (4.9388, 6.4946) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.5.

TABLE G.5 The uncertainty distribution of sheets free of *D. viresens* per 10,000 sheets calculated by Table G.4.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9980.00					9994.00		9997.00		9998.50					10,000.00
EKE results	9969	9979	9984	9989	9992	9994	9995	9997	9998.1	9998.5	9998.9	9999.2	9999.4	9999.6	9999.7

Note: The EKE results are the fitted values.

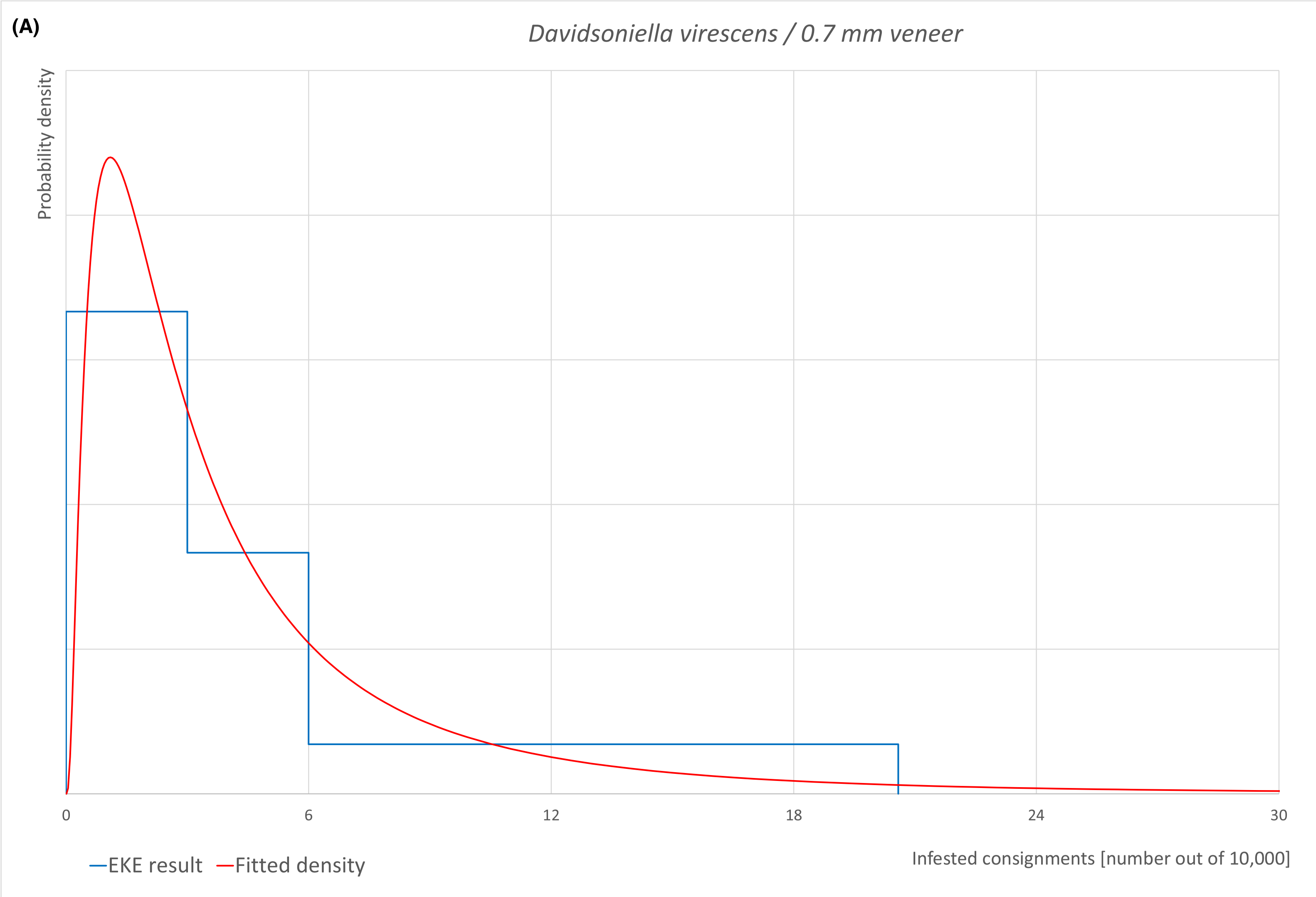


FIGURE G.2 (Continued)

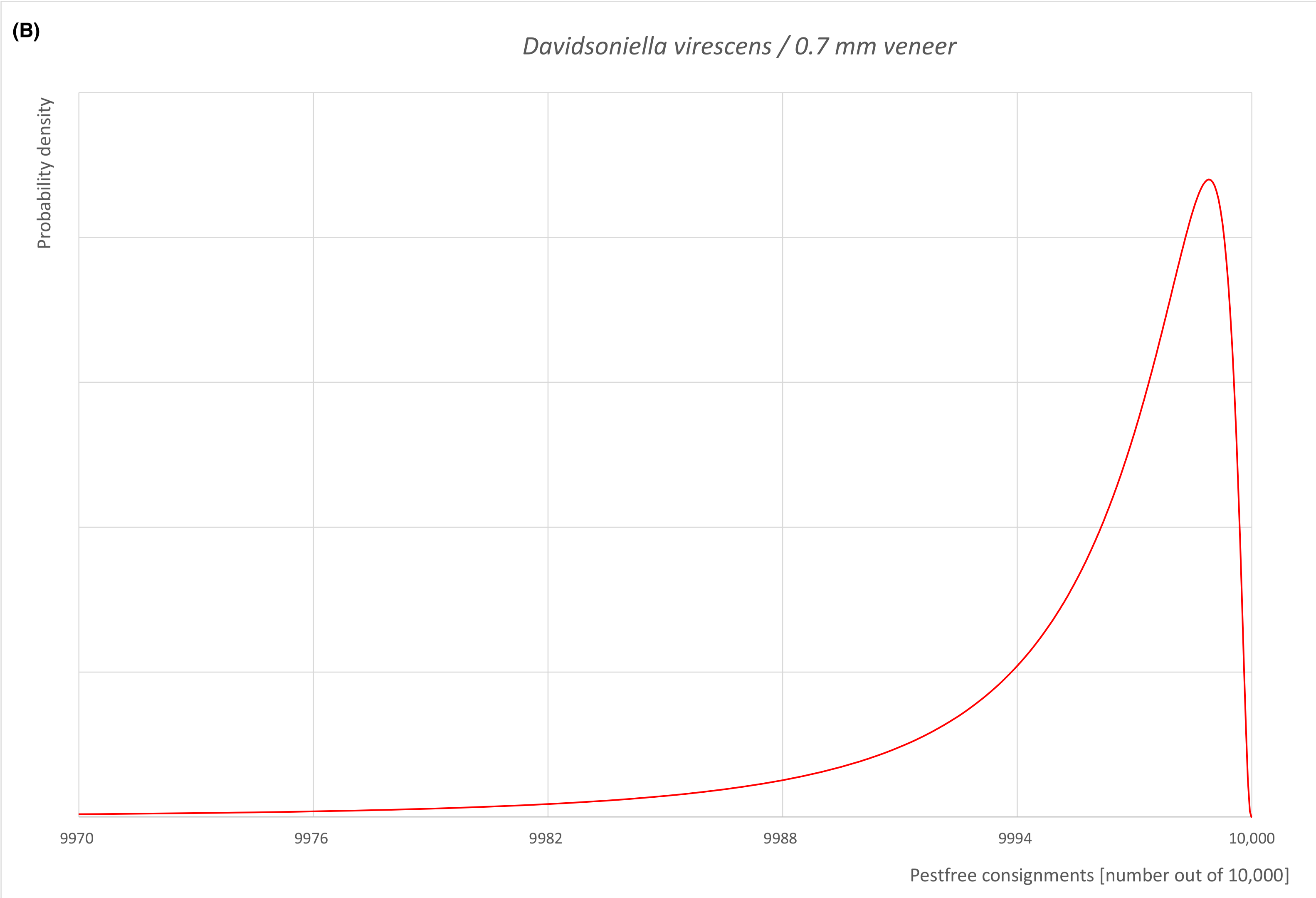


FIGURE G.2 (Continued)

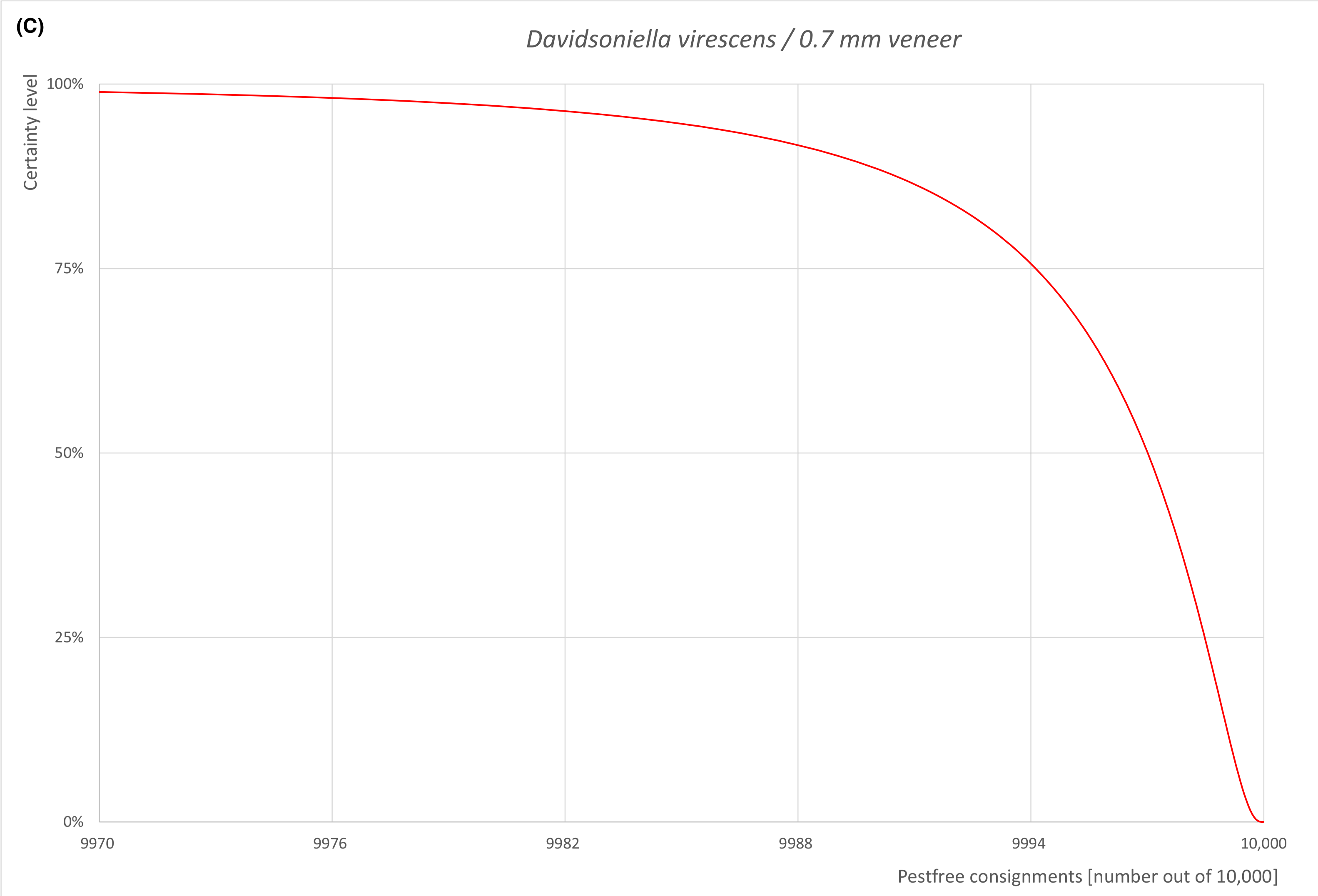


FIGURE G.2 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.3 | OVERALL LIKELIHOOD OF PEST FREEDOM OF *DAVIDSONIELLA VIRESCENS* FOR VENEER THICKNESS OF 6 MM

G.3.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. The range of temperature during the final drying is not so much above the thermotolerance as in the thinner veneer sheets. However, the temperature in the water bath and final drying is still above the temperature limit of the pathogen in the best case scenario. In addition, the other steps in the process are quite efficient to kill the pathogen or to remove infested trees/sheets with stain.

G.3.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer

D. virescens is probably widespread in the area where *Acer* is grown, and *Acer* is a major host of *D. virescens*. Asymptomatic plants may be present and infected logs can enter the production. The biology of the pest is not well known and knowledge gaps on the biology exist. The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). In the worst-case scenario, the temperature during the processing may not be sufficient to kill the pathogen. Quality checks may not be efficient enough to remove infected sheets during or after the production.

G.3.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer (Median)

The most likely situation is that infected logs originating from eastern Canada are present and some could enter the production chain, but the process of veneer production is considered as highly effective to reduce the risk of live *D. virescens* being present on the veneers. There are some knowledge gaps on the biology of the pest and it may be that some inoculum may survive. An infection will result in staining which will result in rejection of infected sheets during the quality check.

G.3.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is low and the uncertainties around the median estimate are low but knowledge gaps in the biology of *D. virescens* lead to slightly greater uncertainties compared to other pests for which an EKE was performed. The uncertainties are slightly higher regarding overestimating the real value, and hence, the upper quartile is moved slightly further away from the median estimate.

G.3.5 | Elicitation outcomes of the assessment of the pest freedom for *Davidsoniella virescens* on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.6) and pest freedom (Table G.7).

TABLE G.6 Elicited and fitted values of the uncertainty distribution of pest infestation by *D. viresens* per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					5		10		25					60
EKE	0.0613	0.201	0.494	1.23	2.42	4.20	6.28	11.5	18.8	23.7	30.1	37.3	45.8	52.7	60.1

Note: The EKE results are the BetaGeneral (0.77366, 3.3283, 0, 84) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.7.

TABLE G.7 The uncertainty distribution of sheets free of *D. viresens* per 10,000 sheets calculated by Table G.6.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9940					9975		9990		9995					10,000
EKE results	9940	9947	9954	9963	9970	9976	9981	9988	9994	9996	9997.6	9998.8	9999.5	9999.8	9999.9

Note: The EKE results are the fitted values.

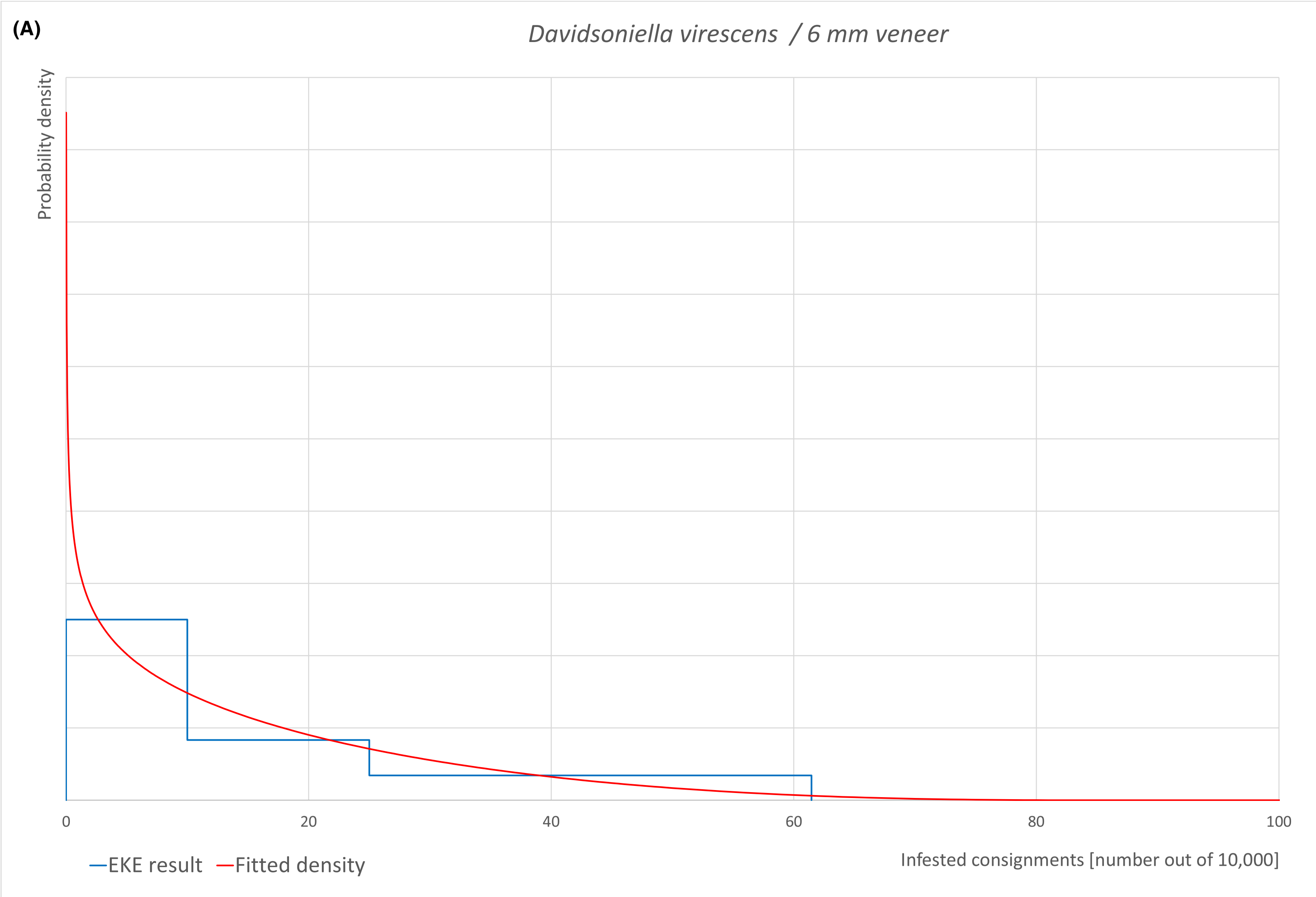


FIGURE G.3 (Continued)

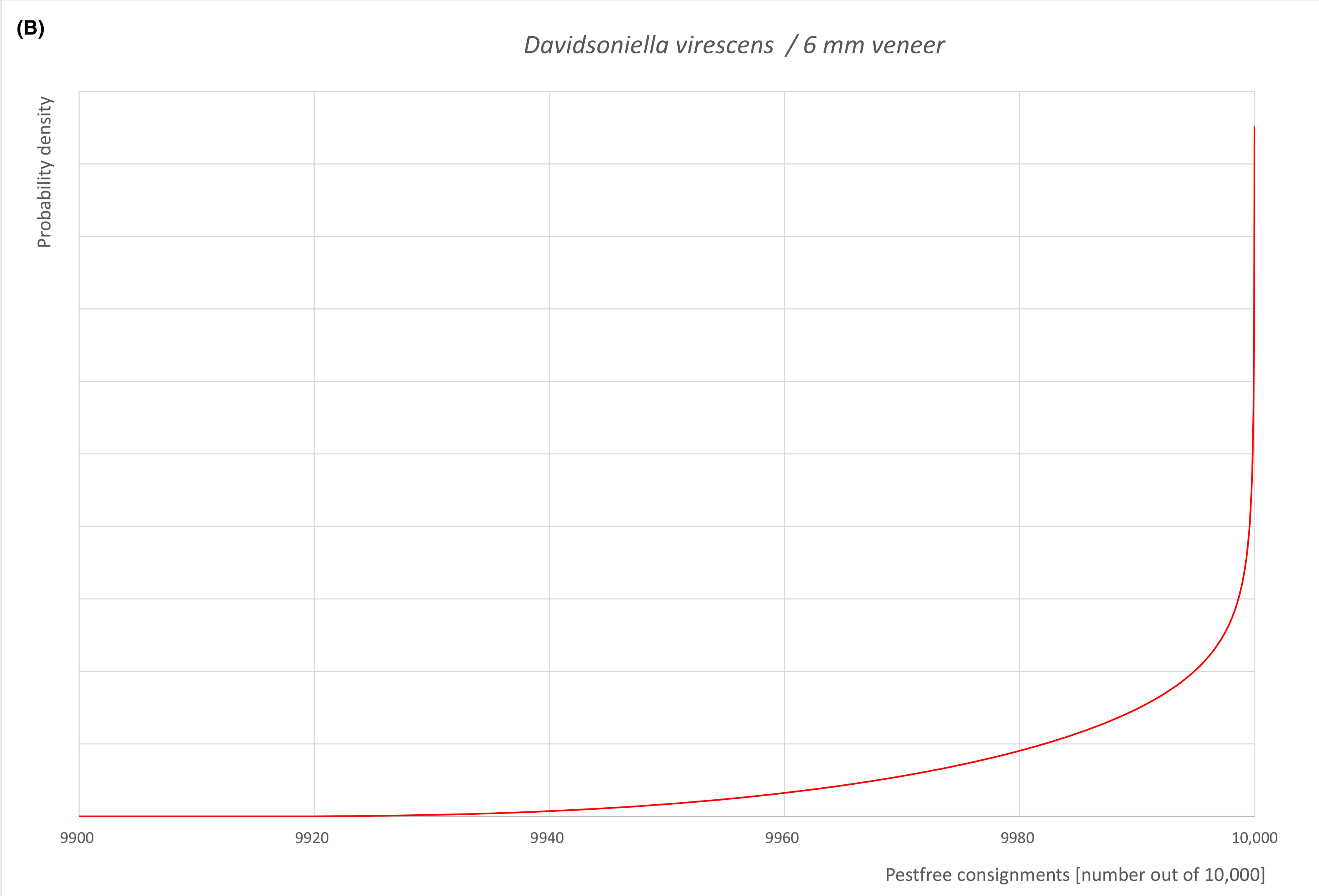


FIGURE G.3 (Continued)

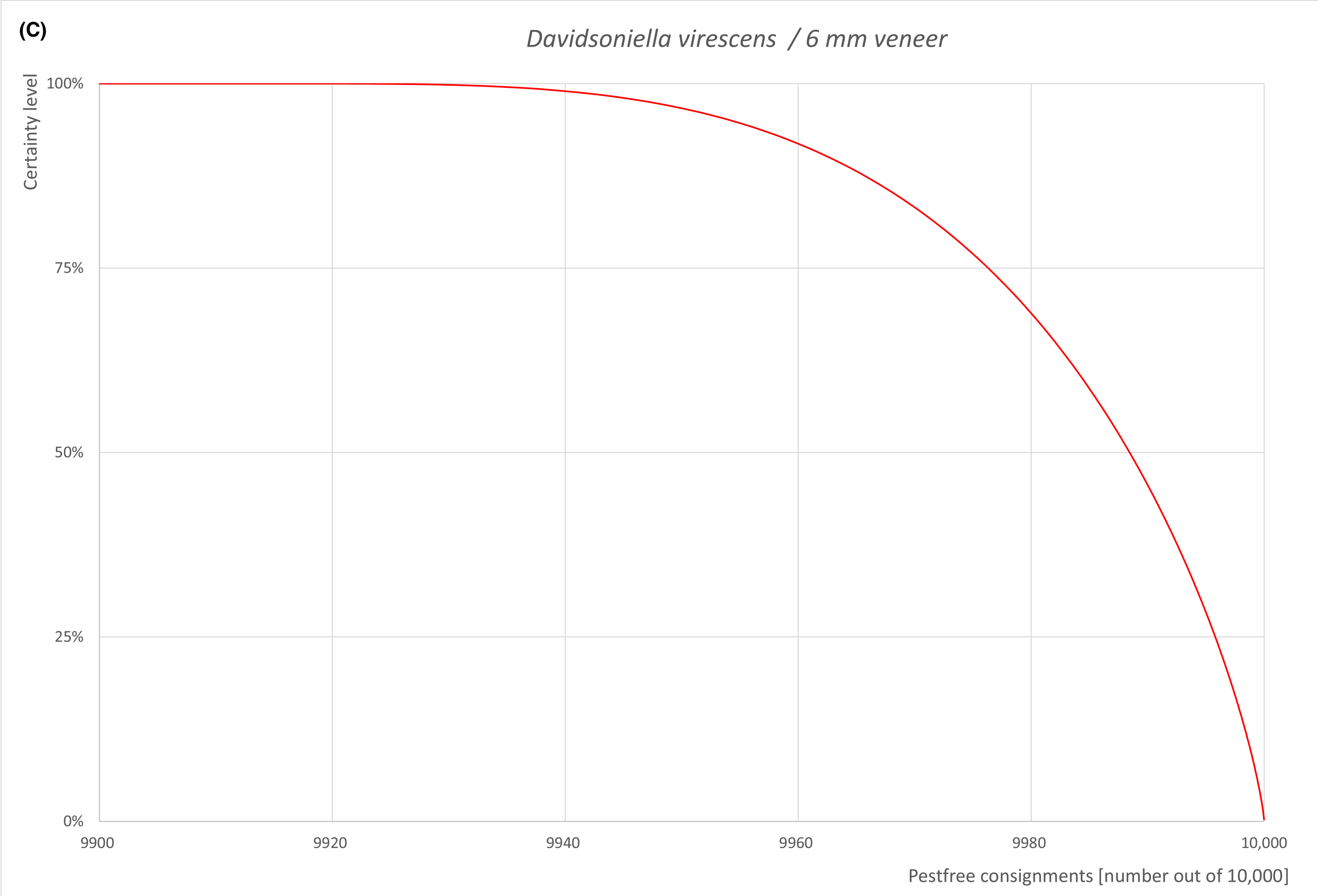


FIGURE G.3 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. =1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.4 | OVERALL LIKELIHOOD OF PEST FREEDOM OF CANKER FUNGI FOR VENEER THICKNESS OF 0.7 MM

G.4.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. The pest cannot survive the heat treatments during the production.

G.4.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Asymptomatic infested logs could enter the production system. The heat treatments in the water bath and during the final drying are not fully sufficient to kill the fungus. If logs are asymptomatic, then they are unlikely to be detected during the quality check.

G.4.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

The heat treatments in the production make it very unlikely for the pest to survive. Therefore, the distribution curve should be moved to the left. However, some uncertainties remain and it cannot be ruled out that an infected tree enters the production and that the pest could survive the production process.

G.4.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is low and the uncertainties around the median estimate are generally low and considered as evenly distributed around the median estimate.

G.4.5. | Elicitation outcomes of the assessment of the pest freedom for canker fungi on veneer sheets thickness of 0.7 mm

The following tables show the elicited and fitted values for pest infestation (Table G.8) and pest freedom (Table G.9).

TABLE G.8 Elicited and fitted values of the uncertainty distribution of pest infestation by fungi per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0.0					3.0		6.0		12.0					28.0
EKE	0.113	0.275	0.542	1.08	1.83	2.81	3.88	6.35	9.57	11.7	14.4	17.5	21.3	24.5	28.1

Note: The EKE results are the BetaGeneral (1.0366, 4.7703, 0, 45) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.9.

TABLE G.9 The uncertainty distribution of sheets free of fungi per 10,000 sheets calculated by Table G.8.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9972					9988		9994		9997					10,000
EKE results	9972	9975	9979	9982	9986	9988	9990	9994	9996	9997	9998.2	9998.9	9999.5	9999.7	9999.9

Note: The EKE results are the fitted values.

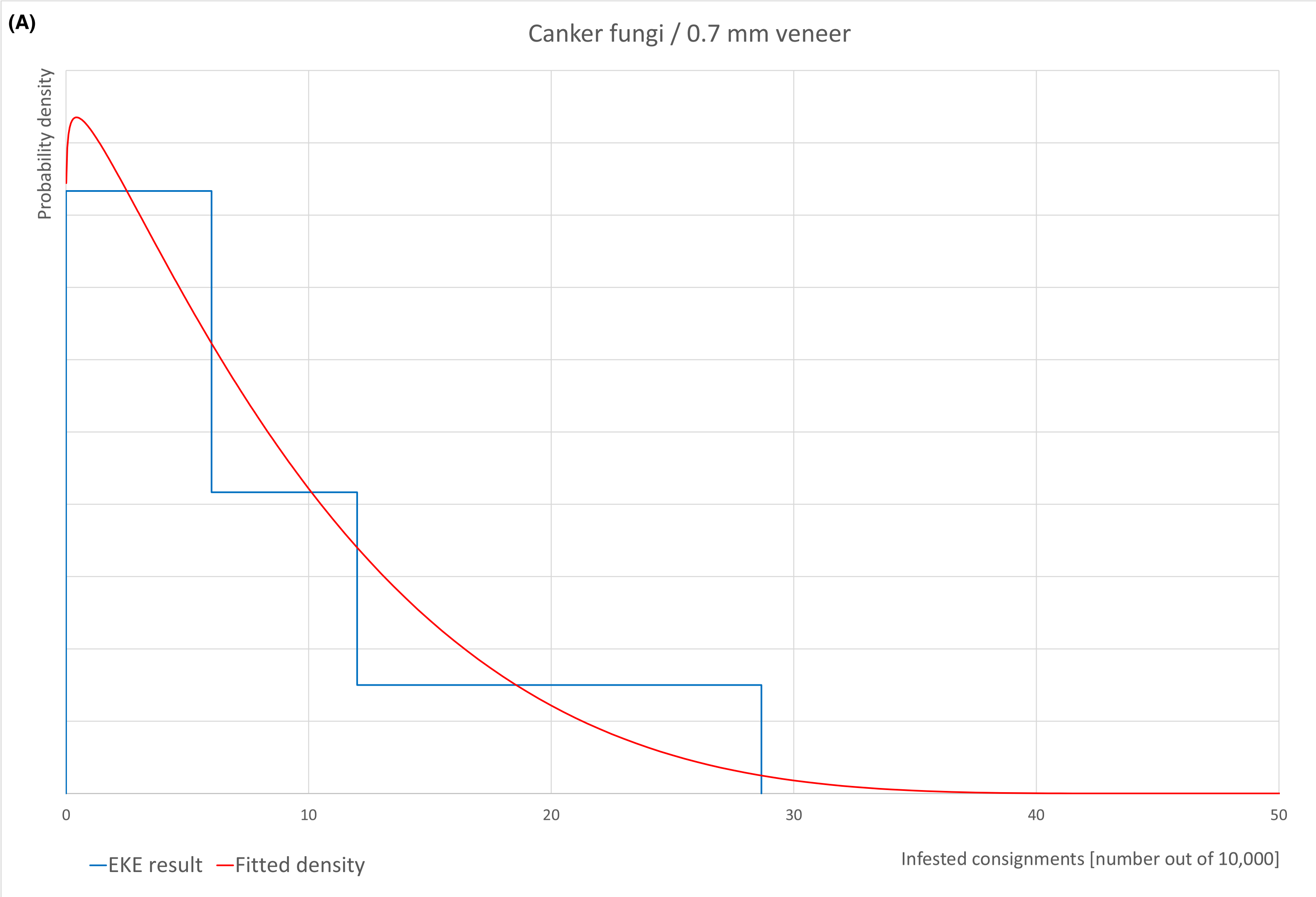


FIGURE G.4 (Continued)

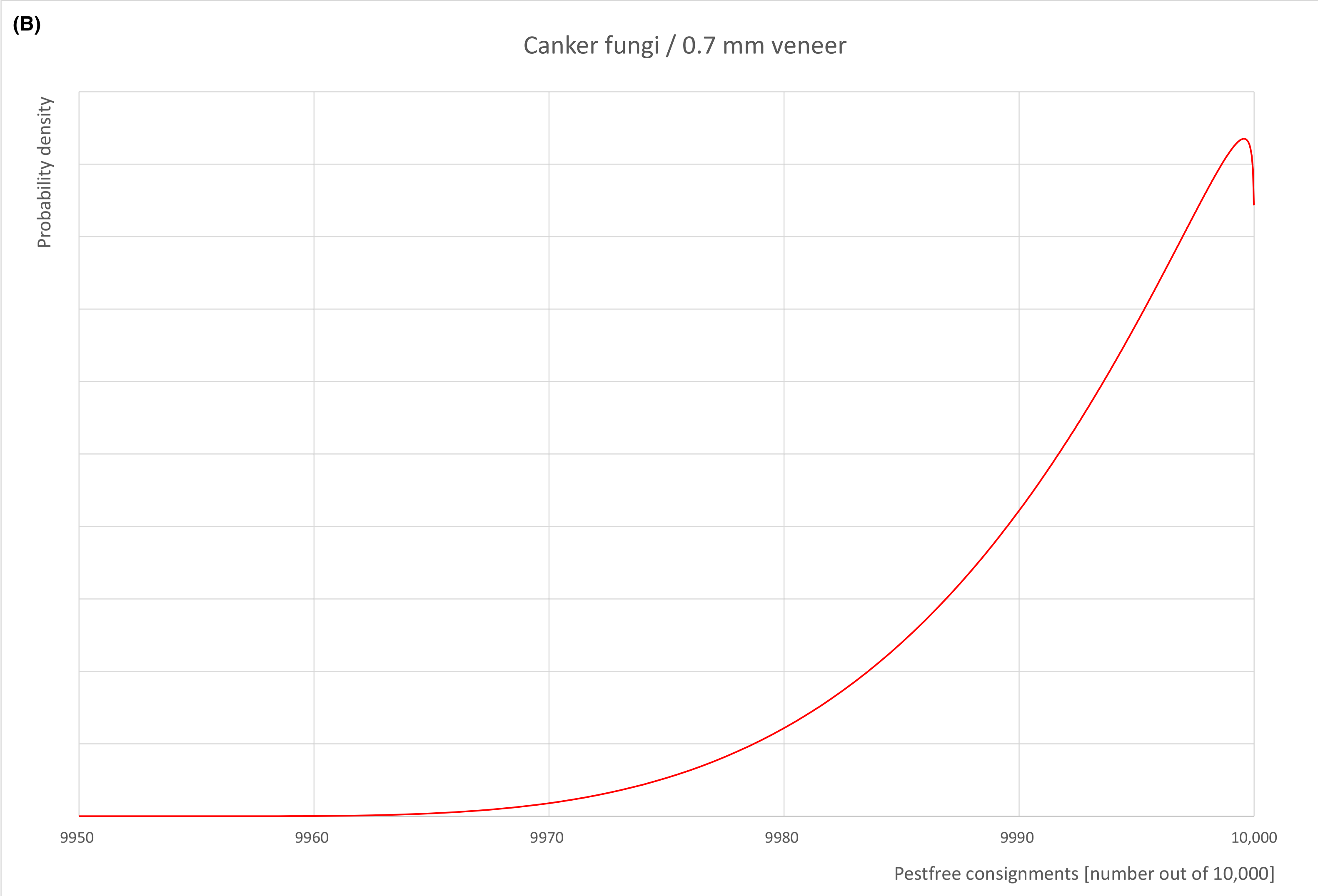


FIGURE G.4 (Continued)

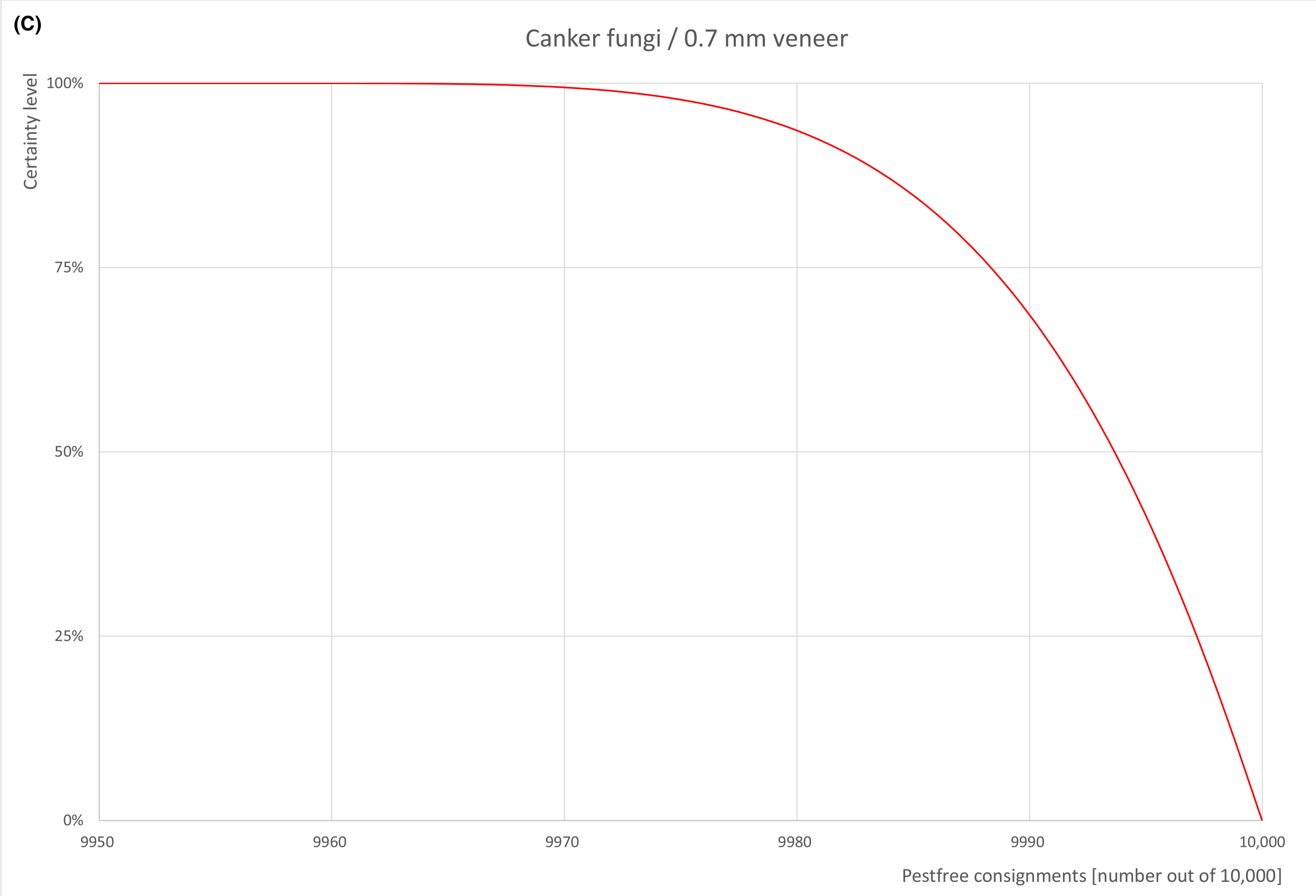


FIGURE G.4 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. =1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.5 | OVERALL LIKELIHOOD OF PEST FREEDOM OF CANKER FUNGI FOR VENEER THICKNESS OF 6 MM

G.5.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix H Table G.1). Only a small proportion of infested trees enter the production. The pest cannot survive the heat treatments during the production.

G.5.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied are applied (see scenario description in Appendix G Table G.1). Asymptomatic infested logs could enter the production system. The heat treatments are not fully effective against the pest. If logs are asymptomatic, then they are unlikely to be detected during the quality check.

G.5.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

The heat treatments in the production make it very unlikely for the pest to survive. Therefore, the distribution curve should be moved to the left. However, the efficacy of killing the fungus is lower compared to thinner sheets as the heat in the core of the thicker sheets will be lower. Some uncertainties remain and it cannot be ruled out that an infected tree enters the production and that the pest could survive the production process.

G.5.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is very low and the uncertainties around the median estimate are generally low, but they are slightly higher regarding overestimating the real value, and hence, the upper quartile is moved slightly further away from the median estimate.

G.5.5 | Elicitation outcomes of the assessment of the pest freedom for canker fungi on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.10) and pest freedom (Table G.11).

TABLE G.10 Elicited and fitted values of the uncertainty distribution of pest infestation by fungi per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					8		15		35					83
EKE	0.132	0.392	0.900	2.08	3.91	6.52	9.51	16.9	26.8	33.4	42.0	51.8	63.3	72.9	83.2

Note: The EKE results are the BetaGeneral (0.84127, 3.6468, 0, 120) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.11.

TABLE G.11 The uncertainty distribution of sheets free of fungi per 10,000 sheets calculated by Table G.10.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9917					9965		9985		9993					10,000
EKE results	9917	9927	9937	9948	9958	9967	9973	9983	9990	9993	9996	9998	9999.1	9999.6	9999.9

Note: The EKE results are the fitted values.

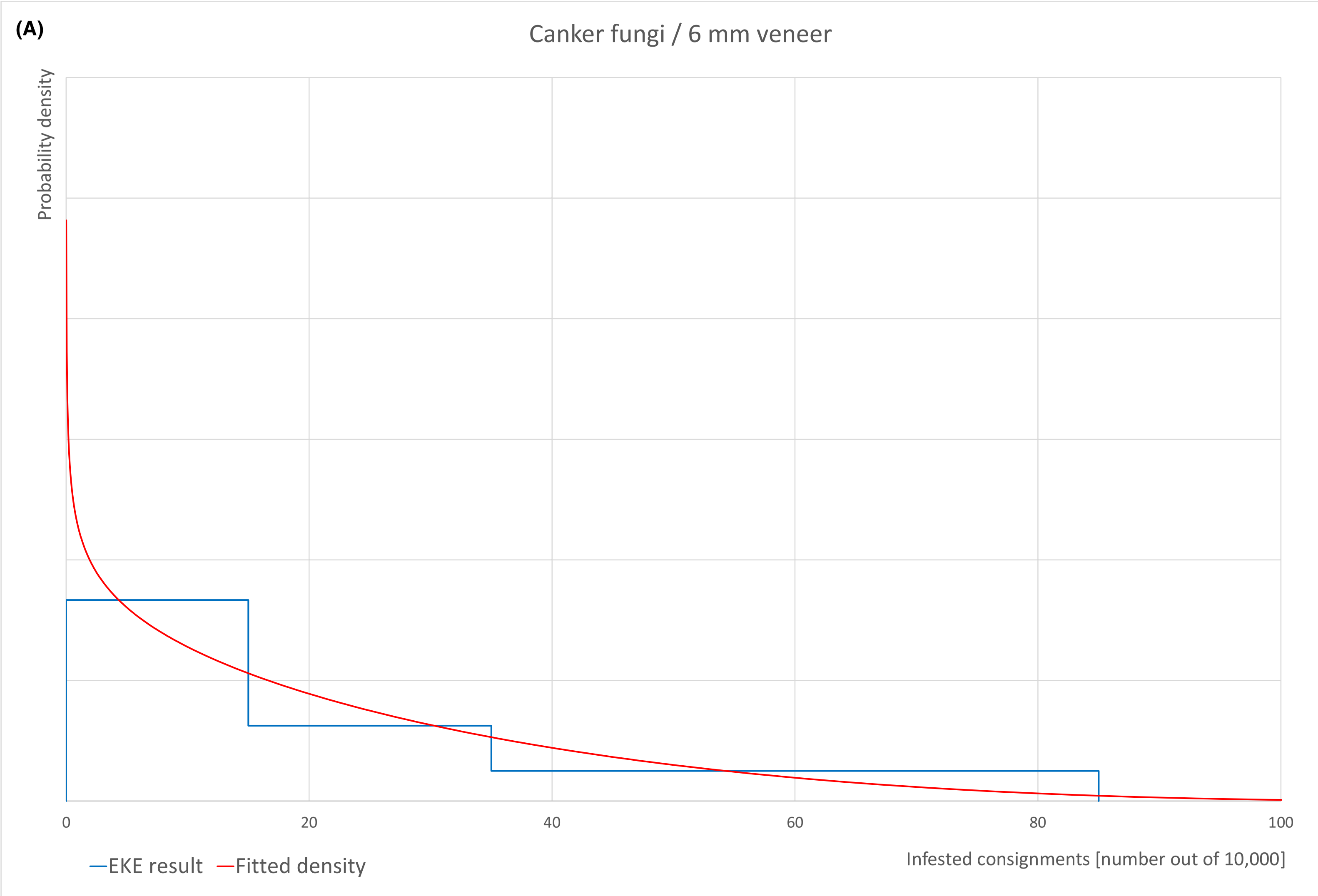


FIGURE G.5 (Continued)

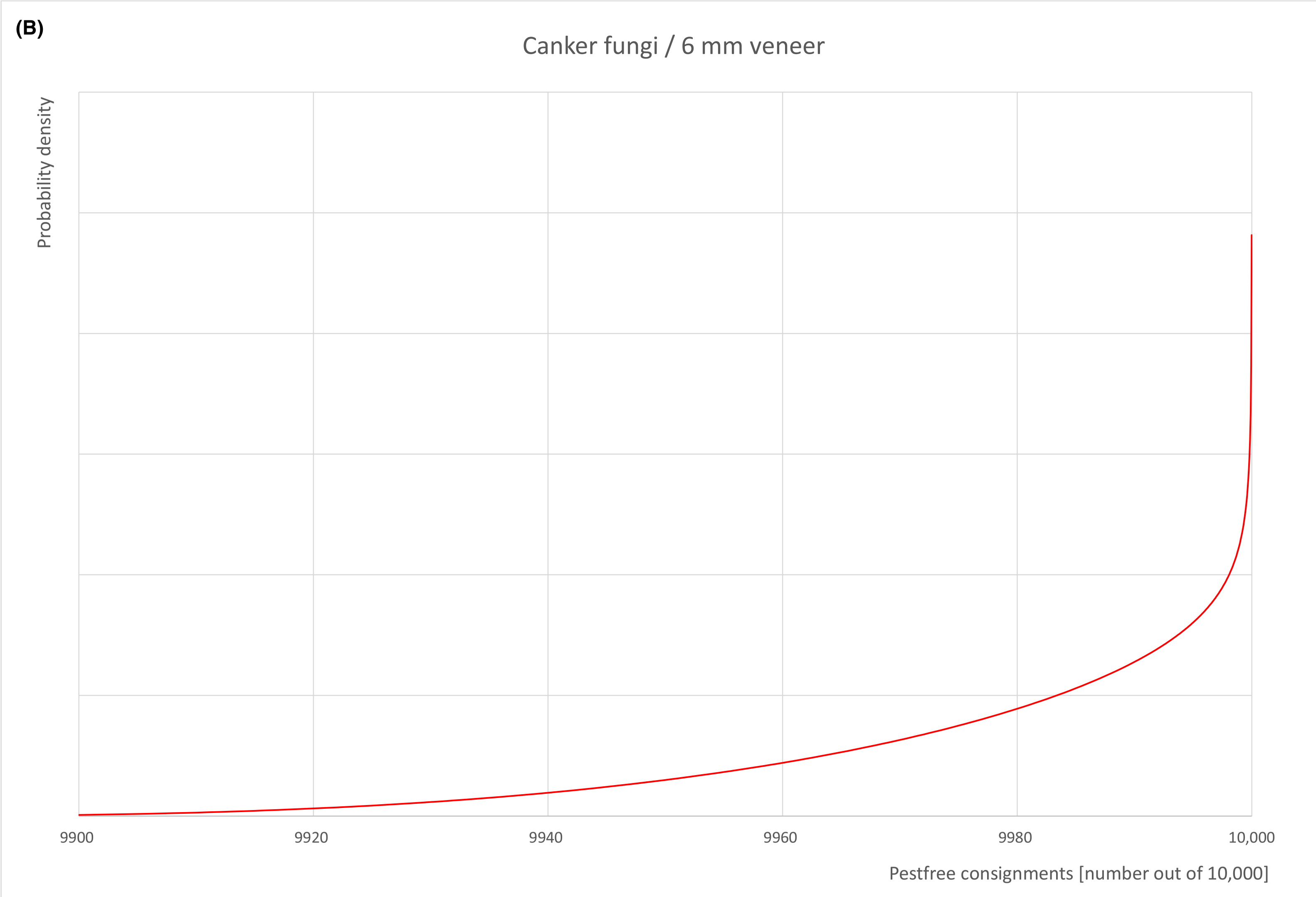


FIGURE G.5 (Continued)

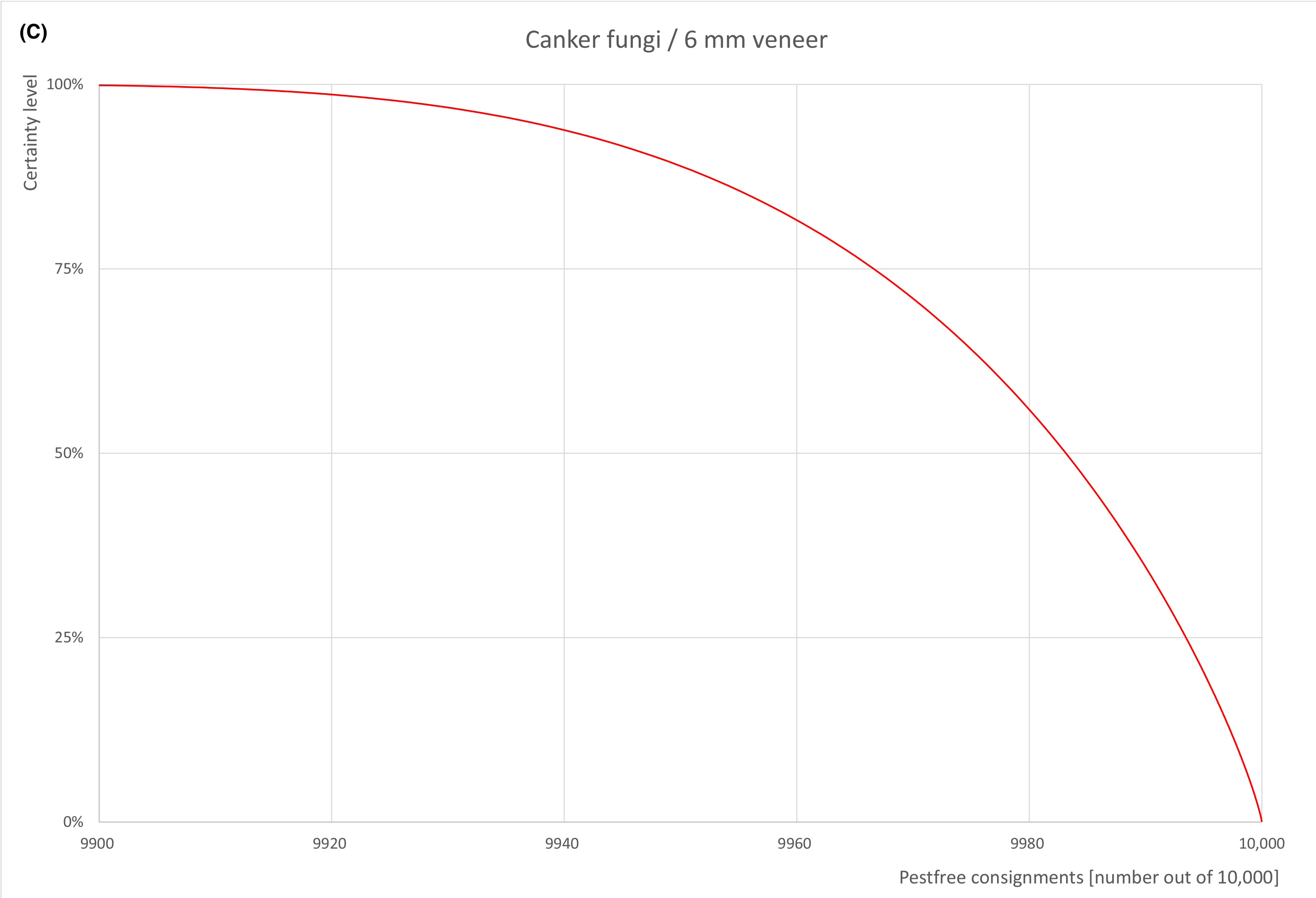


FIGURE G.5 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.6 | Overall likelihood of pest freedom of wood decay fungi for veneer thickness of 0.7 mm

G.6.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. The pest cannot survive the heat treatments during the production.

G.6.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Asymptomatic infested logs could enter the production system. Higher thermotolerance of wood decay fungi compared to other fungi (sapwood inhabiting fungi) was observed. The heat treatment might not be fully effective against the pest in particular in the water bath. If logs are asymptomatic, then they are unlikely to be detected during the quality check.

G.6.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

The heat treatments in the production are expected to kill most of the inoculum. Higher thermotolerance of wood decay fungi compared to other fungi (sapwood inhabiting fungi) was observed and the temperature in the water bath may not be sufficient to kill all fungi. The reality is likely to be closer to the best-case scenario because of exposure to general higher temperatures and hence the median is moved to the left.

G.6.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is low and the uncertainties around the median estimate are considered as evenly distributed.

G.6.5 | Elicitation outcomes of the assessment of the pest freedom for wood decay fungi on veneer sheets thickness of 0.7 mm

The following tables show the elicited and fitted values for pest infestation (Table G.12) and pest freedom (Table G.13).

TABLE G.12 Elicited and fitted values of the uncertainty distribution of pest infestation by fungi per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0.00					5.00		10.00		20.00					40.00
EKE	0.141	0.374	0.785	1.66	2.92	4.61	6.45	10.7	16.1	19.4	23.5	28.0	32.8	36.5	40.0

Note: The EKE results are the BetaGeneral (0.94432, 2.5871, 0, 48.5) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.13.

TABLE G.13 The uncertainty distribution of sheets free of fungi per 10,000 sheets calculated by Table G.12.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9960					9980		9990		9995					10,000
EKE results	9960	9964	9967	9972	9976	9981	9984	9989	9994	9995	9997	9998	9999.2	9999.6	9999.9

Note: The EKE results are the fitted values.

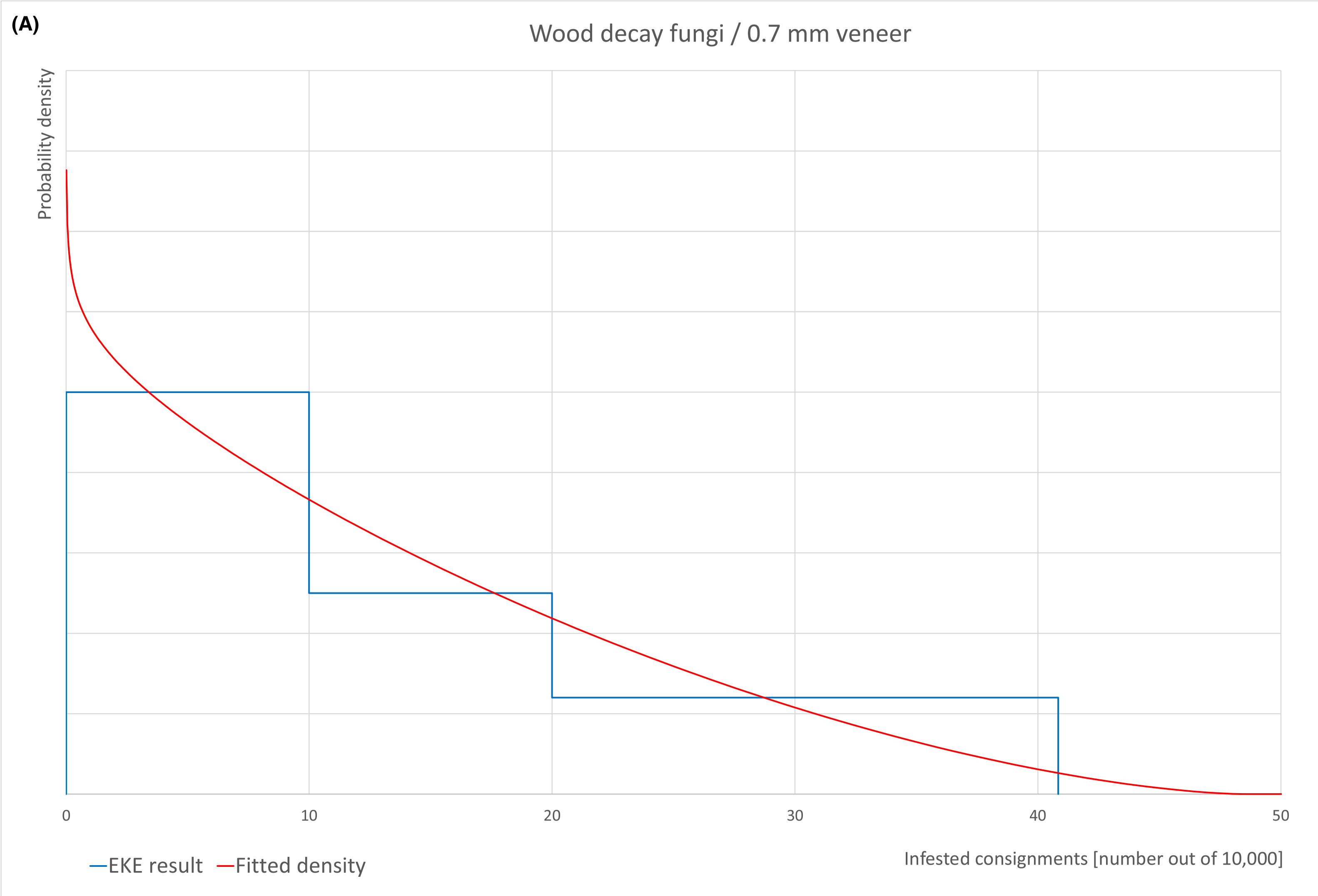


FIGURE G.6 (Continued)

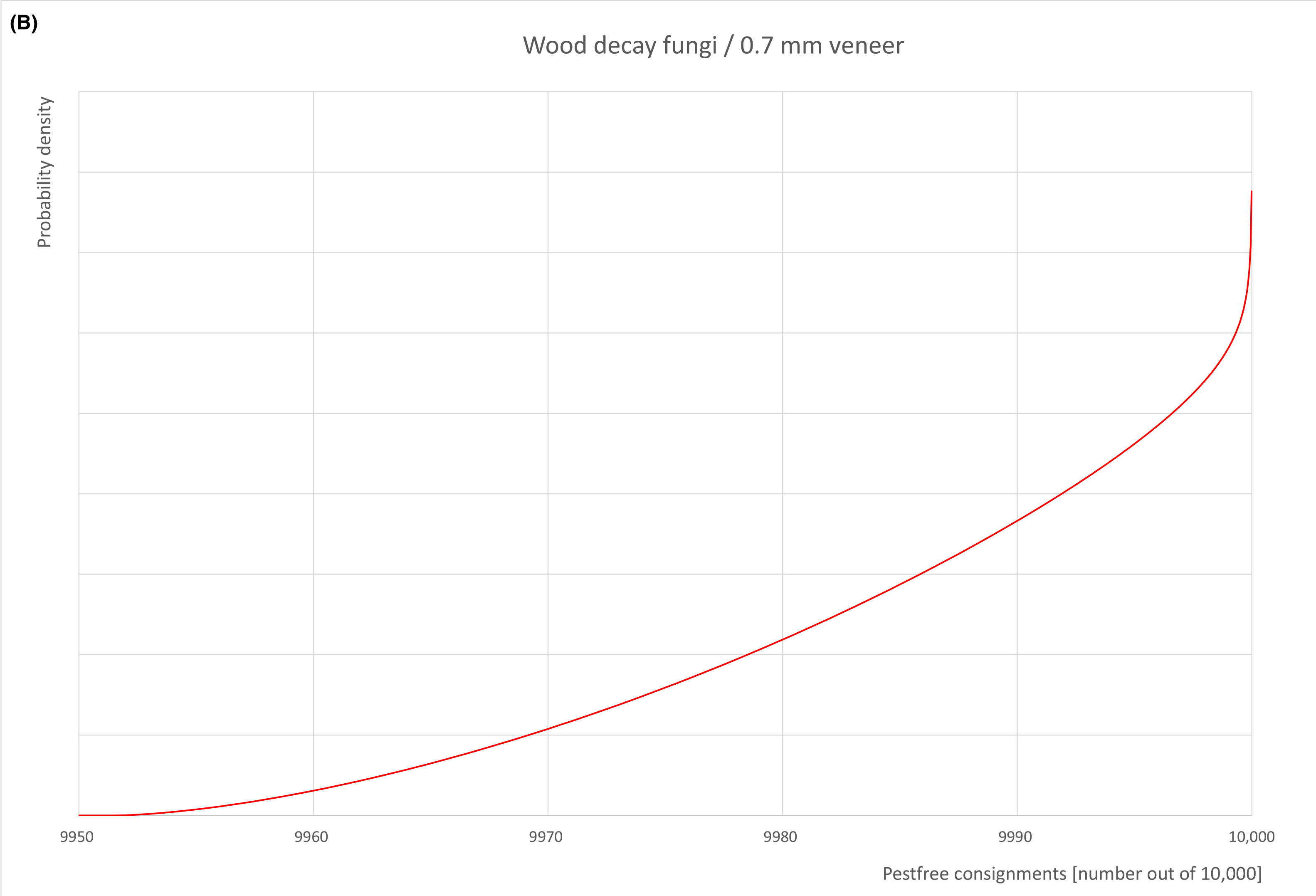


FIGURE G.6 (Continued)

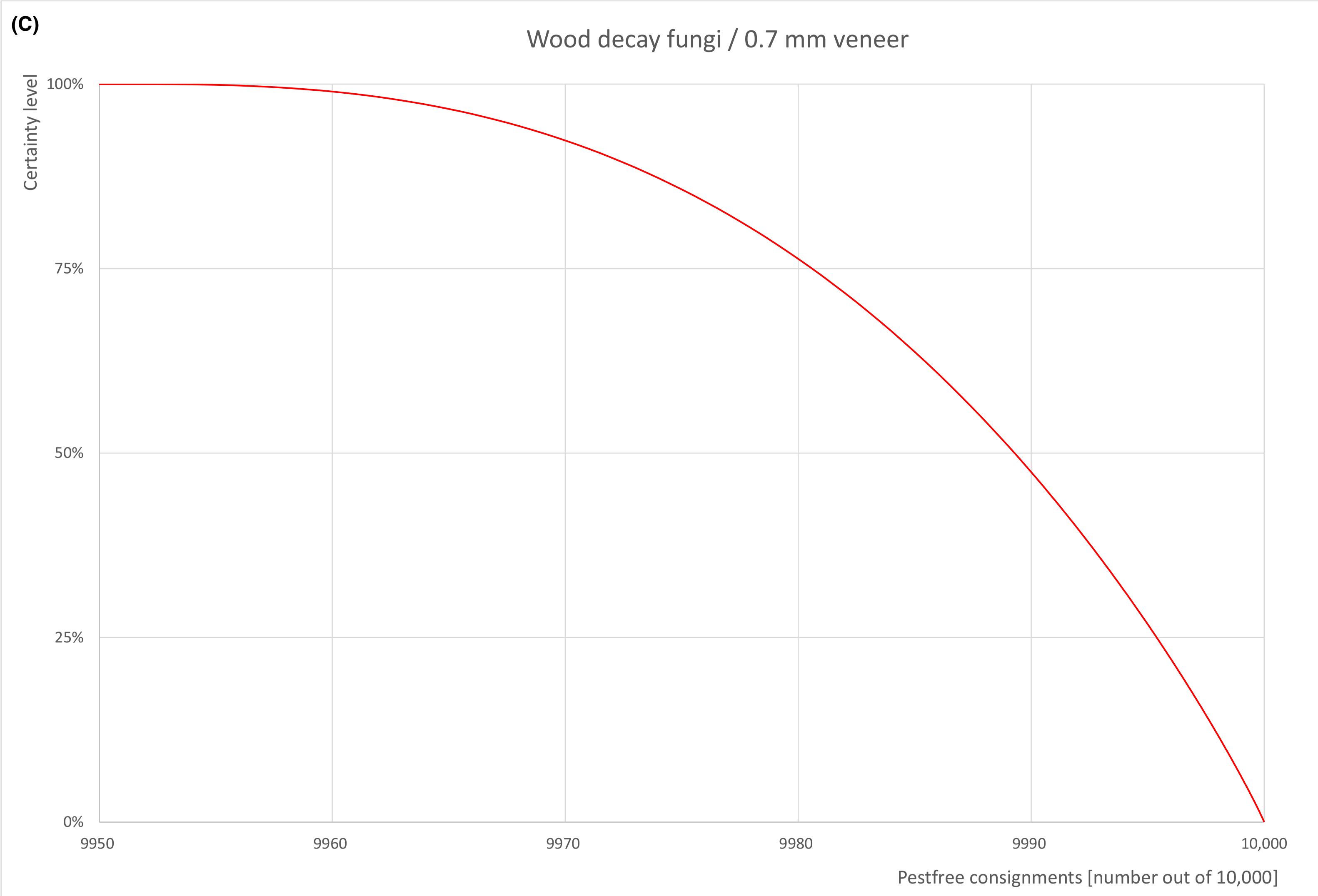


FIGURE G.6 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.7 | OVERALL LIKELIHOOD OF PEST FREEDOM OF WOOD DECAY FUNGI FOR VENEER THICKNESS OF 6 MM

G.7.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. The pest cannot survive the heat treatments during the production.

G.7.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Asymptomatic infested logs could enter the production system. Higher thermotolerance of wood decay fungi compared to other fungi (sapwood inhabiting fungi) was observed. The heat treatment might not be fully effective against the pest in particular in the water bath and also not fully effective in the final drying process. If logs are asymptomatic, then they are unlikely to be detected during the quality check.

G.7.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

The reality is likely to be closer to the best-case scenario because high temperatures are expected to kill most of the inoculum. However, the efficacy of killing the fungus is lower compared to thinner sheets as the heat in the core of the thicker sheets will be lower. Higher thermotolerance of wood decay fungi compared to other fungi (sapwood inhabiting fungi) was observed and the temperature in the water bath may not be sufficient to kill the fungus.

G.7.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is low and the uncertainties around the median estimate are generally low and considered as evenly distributed around the median estimate.

G.7.5 | Elicitation outcomes of the assessment of the pest freedom for wood decay fungi on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.14) and pest freedom (Table G.15).

TABLE G.14 Elicited and fitted values of the uncertainty distribution of pest infestation by fungi per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					15		30		50					120
EKE	1.29	2.52	4.21	7.16	10.8	15.2	19.7	29.6	42.2	50.4	61.1	73.7	89.4	104	121

Note: The EKE results are the BetaGeneral (1.406, 9.5441, 0, 280) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.15.

TABLE G.15 The uncertainty distribution of sheets free of fungi per 10,000 sheets calculated by Table G.14.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9880					9950		9970		9985					10,000
EKE results	9879	9896	9911	9926	9939	9950	9958	9970	9980	9985	9989	9993	9996	9997	9999

Note: The EKE results are the fitted values.

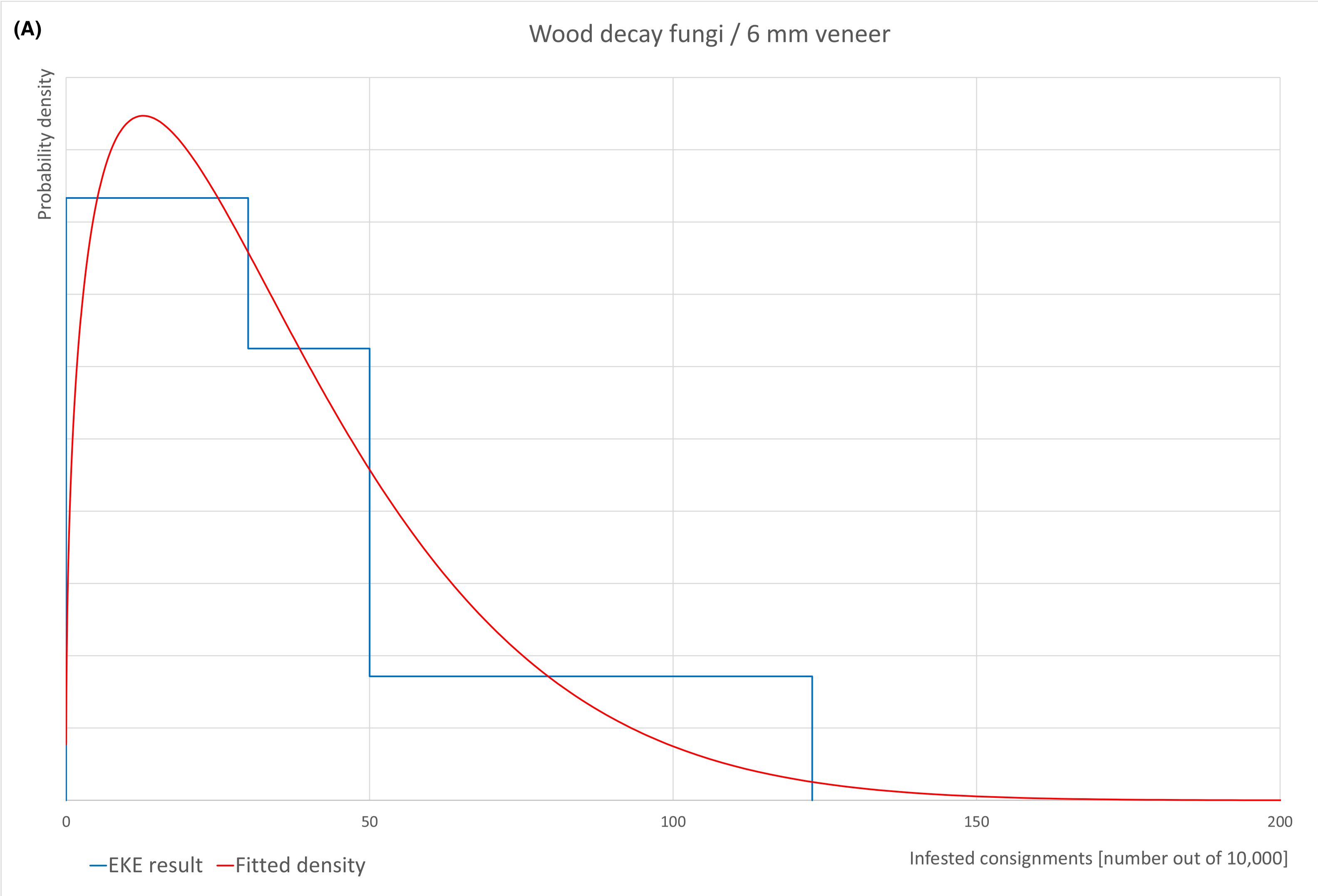


FIGURE G.7 (Continued)

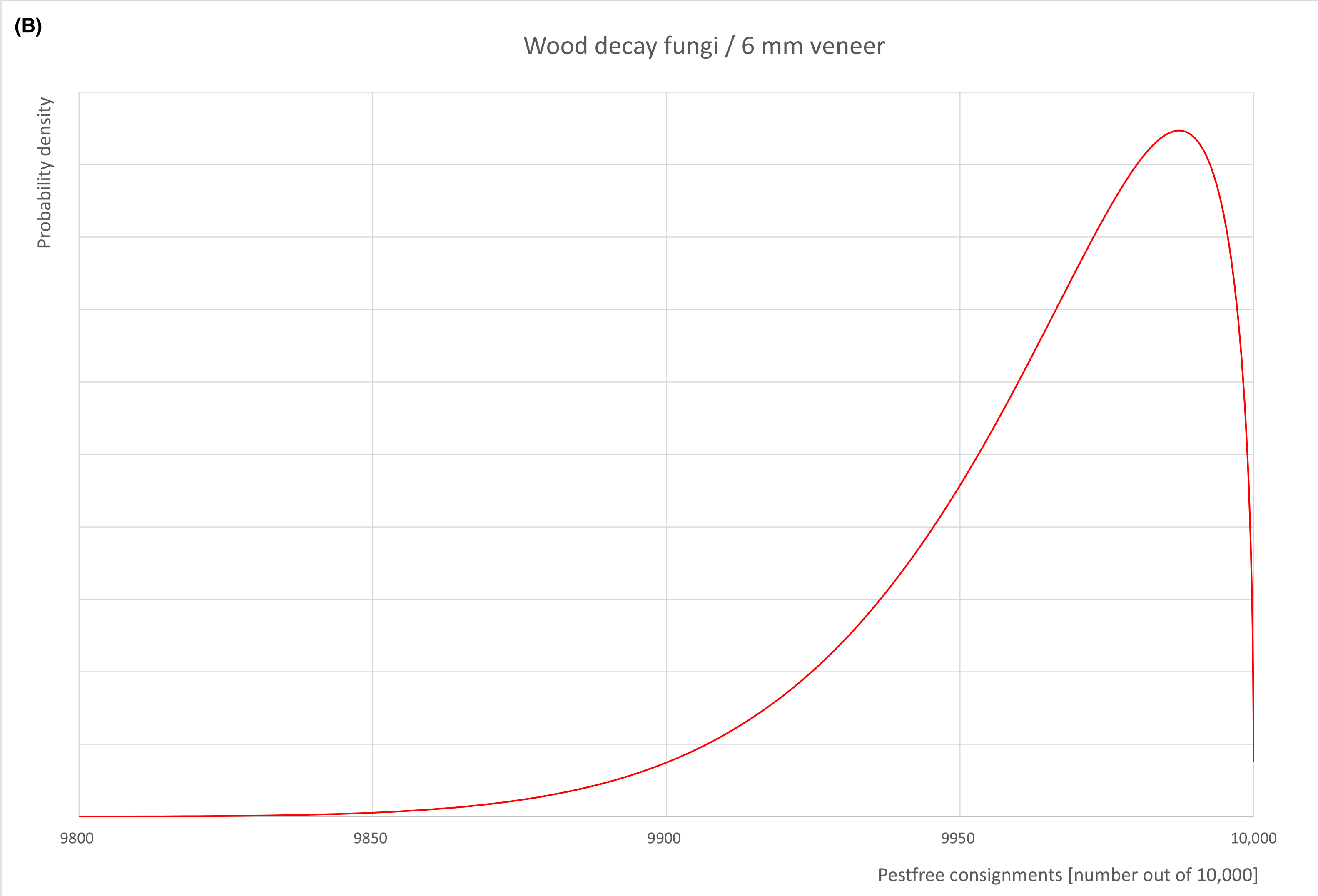


FIGURE G.7 (Continued)

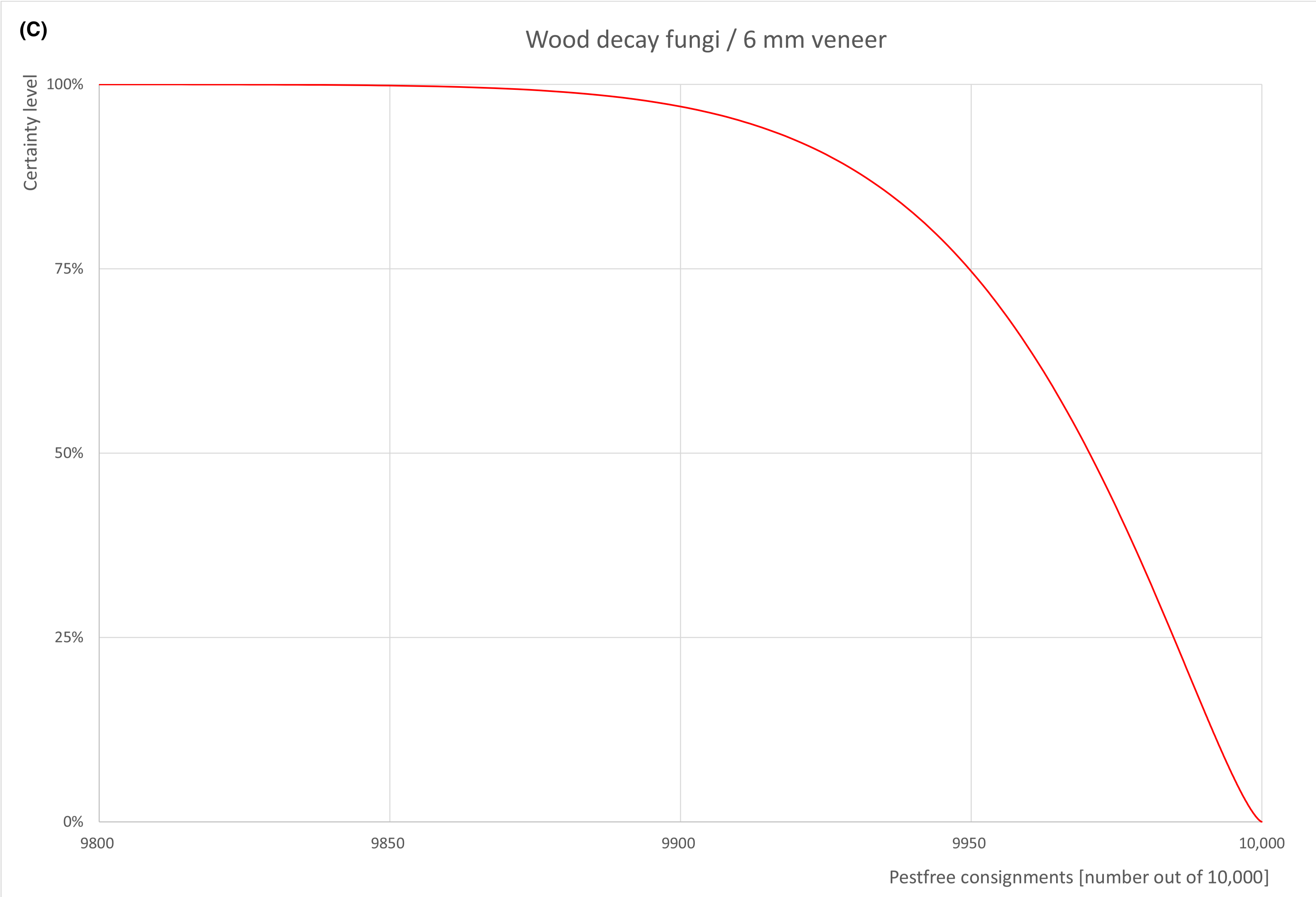


FIGURE G.7 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.8 | OVERALL LIKELIHOOD OF PEST FREEDOM OF AMBROSIA BEETLES FOR VENEER THICKNESS OF 6 MM

Insects are expected to be killed during cutting of thin veneer sheets of a thickness of 0.7 mm. Therefore, the elicitation was conducted only for a veneer sheet thickness of 6 mm.

G.8.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. The high temperatures in the water bath and final drying will kill the insects. Insect larvae could desiccate during the final drying process because of their thin cuticula. High temperature and drying will also eliminate the fungi which are needed for survival of the beetles. During quality control of sheets, the presence of insects can be detected and infested sheets would be sorted out.

G.8.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied are applied (see scenario description in Appendix G Table G.1). High prevalence in Canada. Smaller size beetles may survive slicing, presence of adults which are more resistant to the drying because of thicker cuticula. Heat treatment in the worst-case scenario may not be sufficient to kill the pest.

G.8.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

It may happen that symptoms are overlooked and infested trees enter the production. The production process will be efficient to eliminate Ambrosia beetles. It is considered that the reality is closer to best-case scenario than to the worst-case scenario. However, some beetles may survive and due to their small size they may go undetected.

G.8.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is very low and the uncertainties around the median estimate are considered as evenly distributed.

G.8.5 | Elicitation outcomes of the assessment of the pest freedom for ambrosia beetles on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.16) and pest freedom (Table G.17).

TABLE G.16 Elicited and fitted values of the uncertainty distribution of pest infestation by Ambrosia beetles per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					3		6		10					25
EKE	0.271	0.520	0.861	1.45	2.17	3.04	3.93	5.92	8.44	10.1	12.3	14.9	18.2	21.3	25.0

Note: The EKE results are the BetaGeneral (1.4413, 13.473, 0, 75) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.17.

TABLE G.17 The uncertainty distribution of sheets free of Ambrosia beetles per 10,000 sheets calculated by Table G.16.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9975					9990		9994		9997					10,000
EKE results	9975	9979	9982	9985	9988	9990	9992	9994	9996	9997.0	9997.8	9998.6	9999.1	9999.5	9999.7

Note: The EKE results are the fitted values.

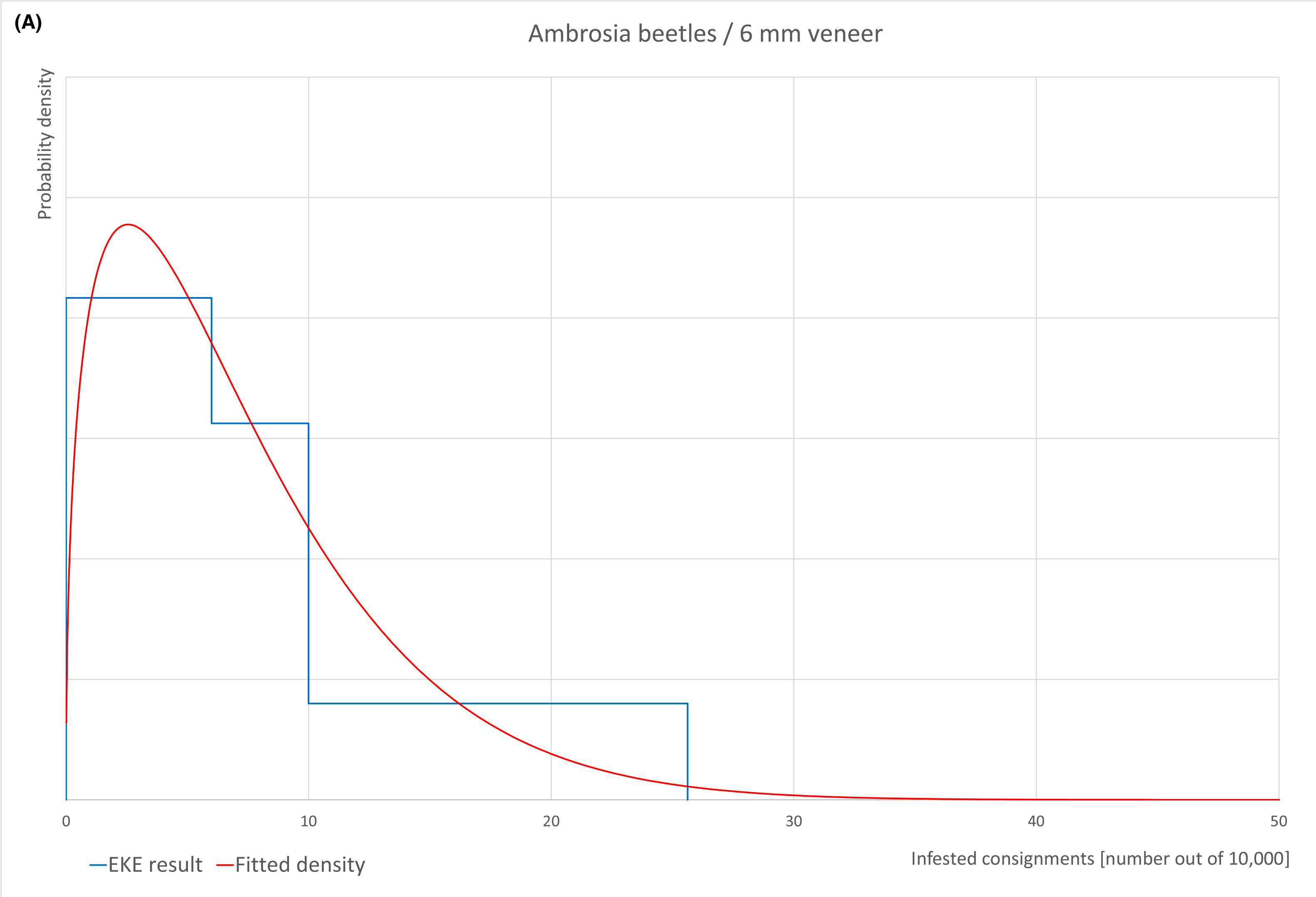


FIGURE G.8 (Continued)

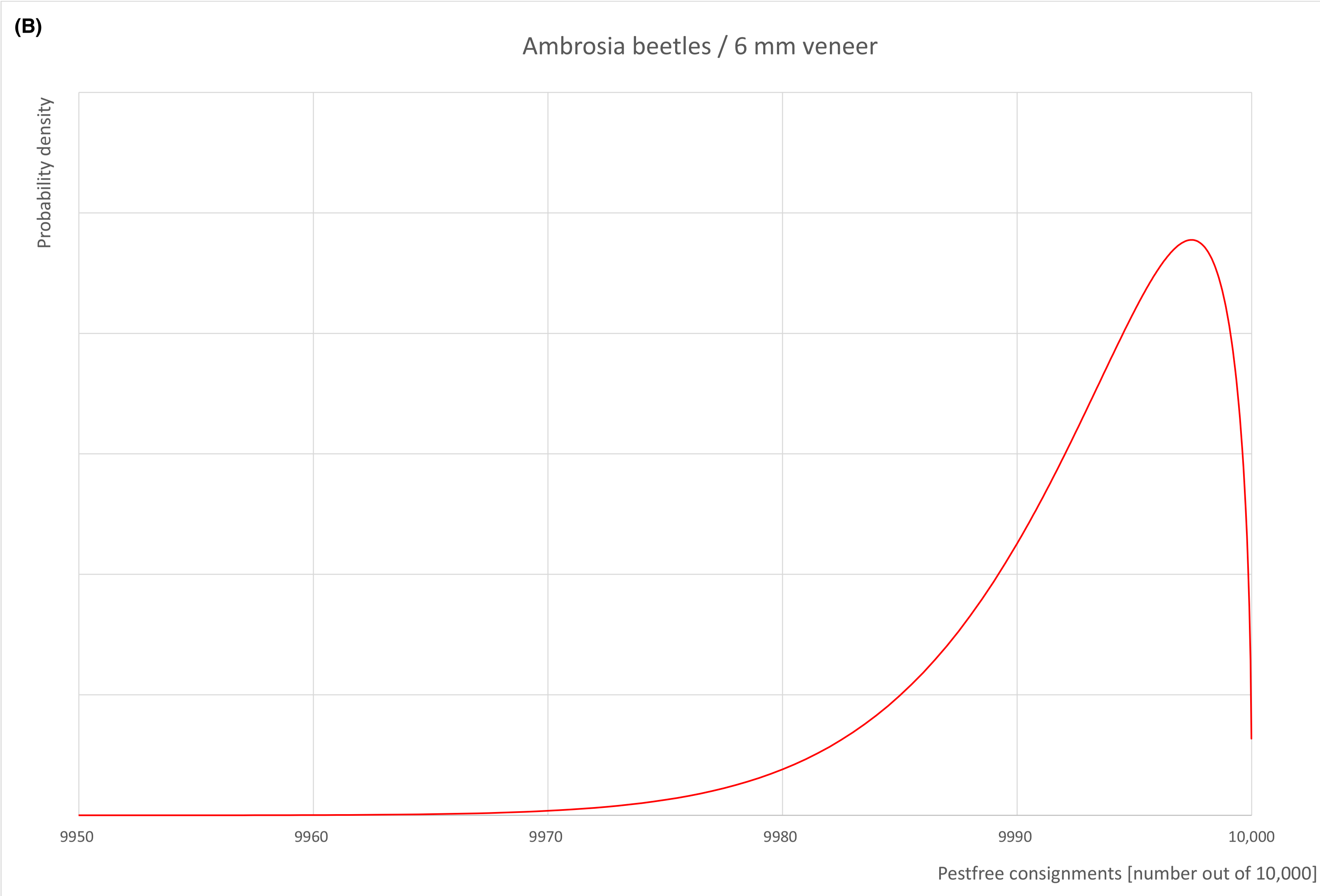


FIGURE G.8 (Continued)

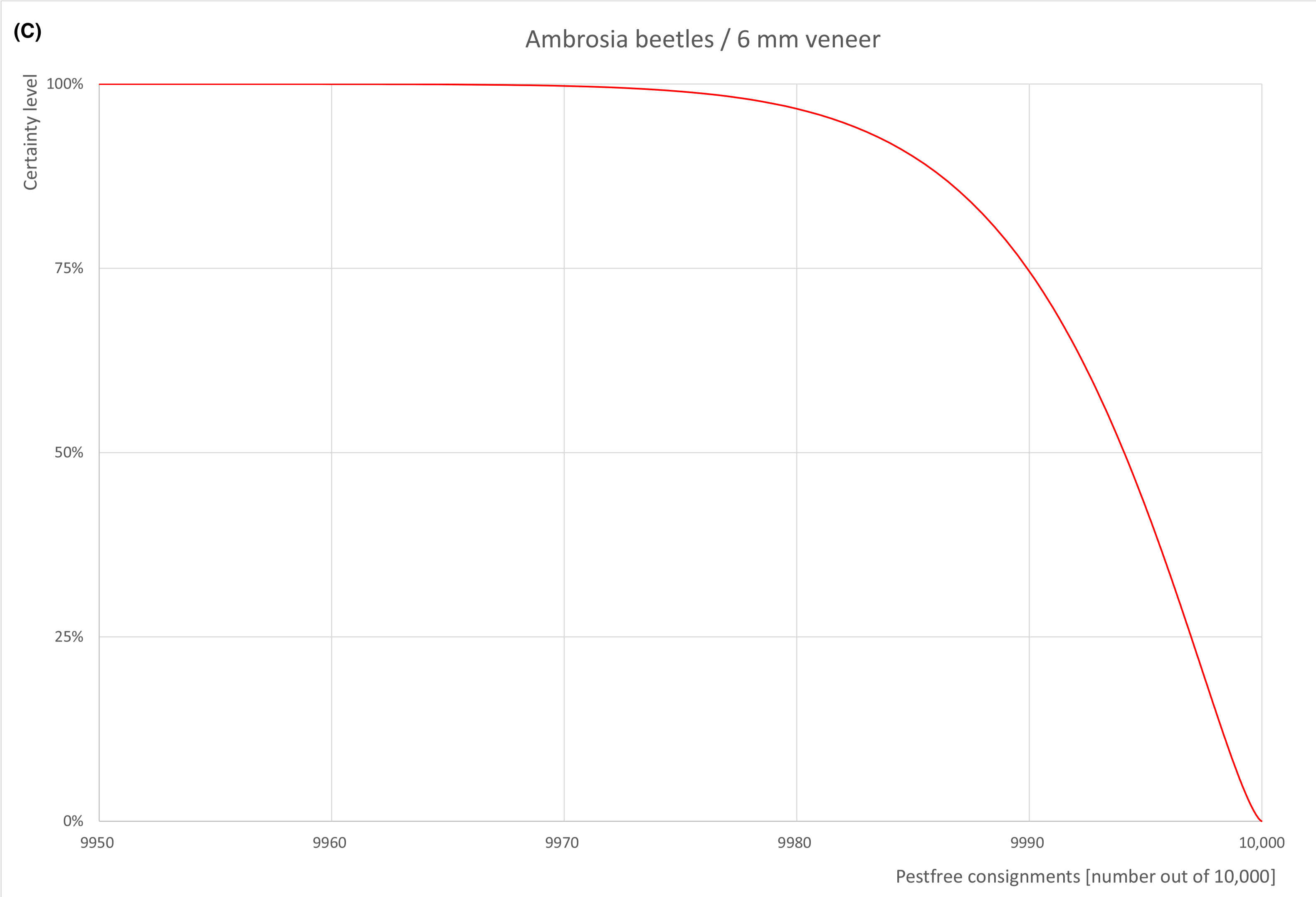


FIGURE G.8 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

G.9 | OVERALL LIKELIHOOD OF PEST FREEDOM OF DIFFERENT WOOD BORING INSECTS FOR VENEER THICKNESS OF 6 MM

Insects are expected to be killed during cutting of thin veneer sheets of a thickness of 0.7 mm. Therefore, the elicitation was conducted only for a veneer sheet thickness of 6 mm.

G.9.1 | Reasoning for a scenario which would lead to a reasonably low number of infested veneer sheets

The assumptions of the best-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied (see scenario description in Appendix G Table G.1). Only a small proportion of infested trees enter the production. Debarking and rounding will most likely remove all larvae and eggs. Slicing of veneers and the high temperatures in the water bath and final drying will limit the survival of insects. Insect larvae could desiccate during the final drying process because of their thin cuticula. During quality control of sheets, the presence of insects can be detected and infested sheets would be sorted out.

G.9.2 | Reasoning for a scenario which would lead to a reasonably high number of infested veneer sheets

The assumptions described in the worst-case scenario with regard to pest abundance, visible symptoms, temperature during water bath, removal of sapwood and temperature at final drying are applied are applied (see scenario description in Appendix G, Table G.1). Infested sheets could be overlooked in the quality control since frass is very compact and has the same colour as the wood. Although unlikely, some individuals may survive the production process in the worst-case scenario.

G.9.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested veneer sheets (Median)

It is extremely unlikely that insects survive and that infested sheets would remain undetected. However, there is still some uncertainty and it cannot be completely ruled out that living insects could remain in the sheets, and therefore, the median is not 0.

G.9.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The median estimate is very low and the uncertainties around the median estimate are considered as evenly distributed.

G.9.5 | Elicitation outcomes of the assessment of the pest freedom for different wood boring insects on veneer sheets thickness of 6 mm

The following tables show the elicited and fitted values for pest infestation (Table G.18) and pest freedom (Table G.19).

TABLE G.18 Elicited and fitted values of the uncertainty distribution of pest infestation by insects per 10,000 sheets.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					1		1		3					7
EKE	0.0080	0.0244	0.0567	0.133	0.253	0.427	0.630	1.14	1.87	2.37	3.05	3.88	4.92	5.87	7.00

Note: The EKE results are the BetaGeneral (0.8284, 6.7561, 0, 15) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infested sheets, the pest freedom was calculated (i.e. = 10,000 – number of infested sheets per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table G.19.

TABLE G.19 The uncertainty distribution of sheets free of insects per 10,000 sheets calculated by Table G.18.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9993					9998		9999		10,000					10,000
EKE results	9993	9994	9995	9996.1	9996.9	9997.6	9998.1	9998.9	9999.37	9999.57	9999.75	9999.87	9999.94	9999.98	9999.99

Note: The EKE results are the fitted values.

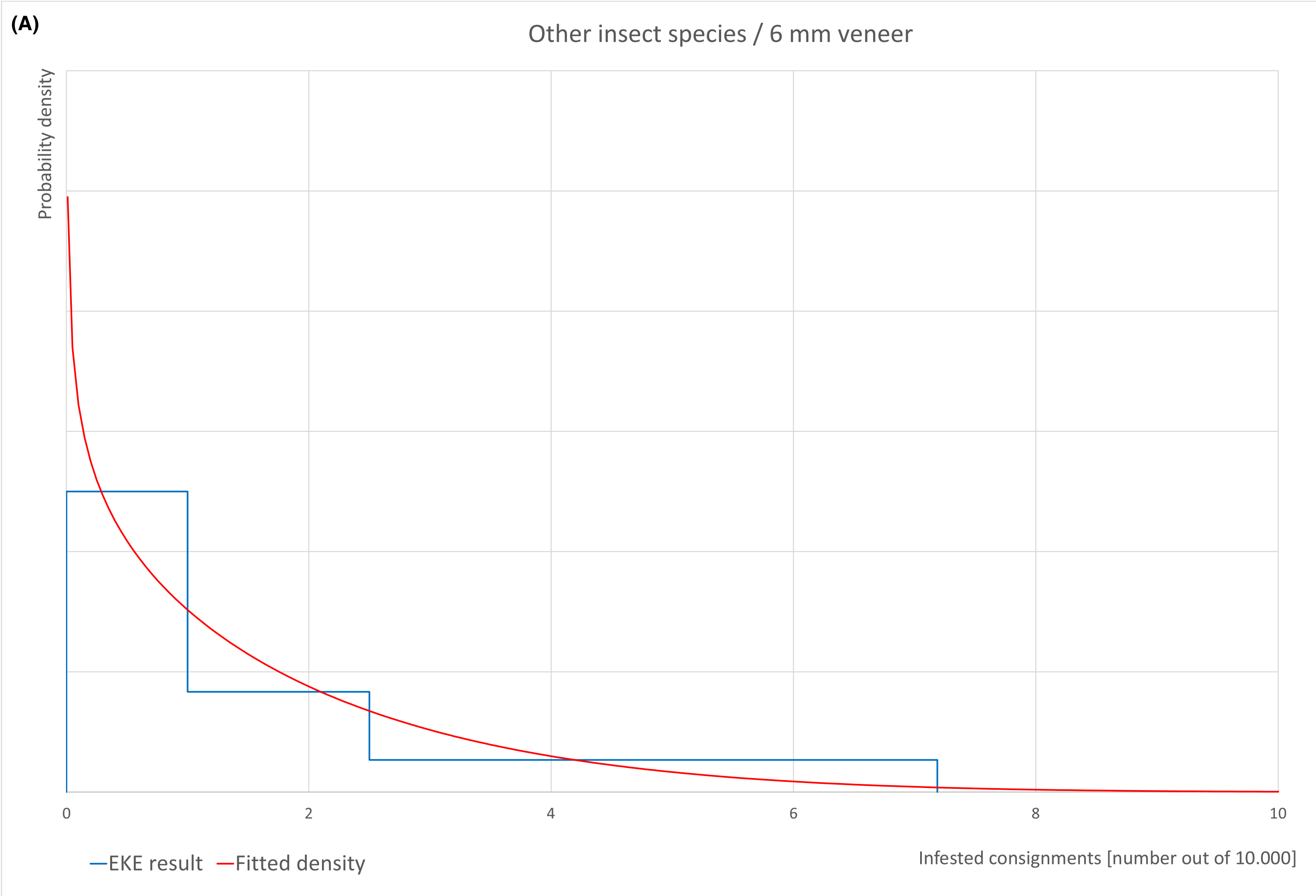


FIGURE G.9 (Continued)

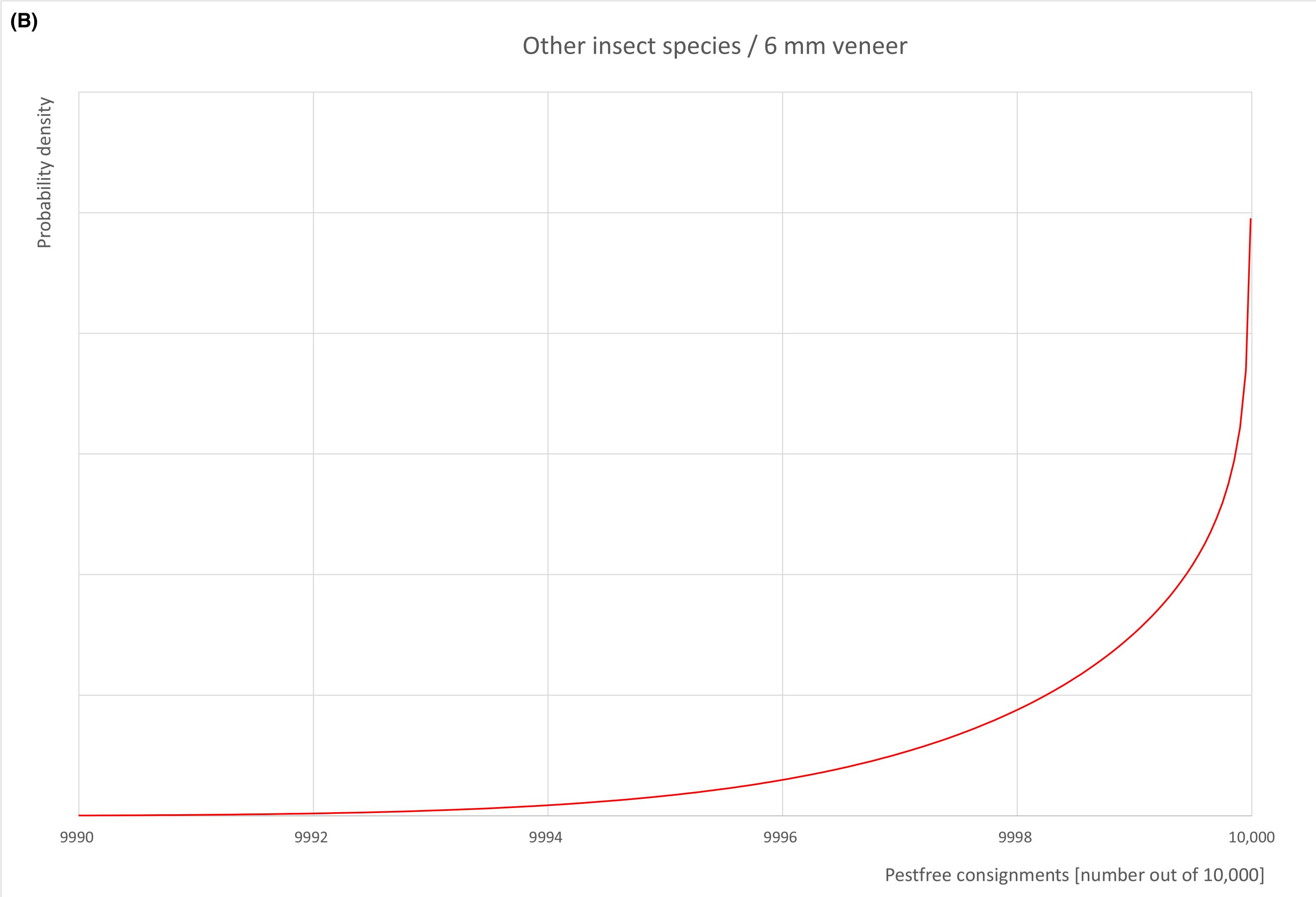


FIGURE G.9 (Continued)

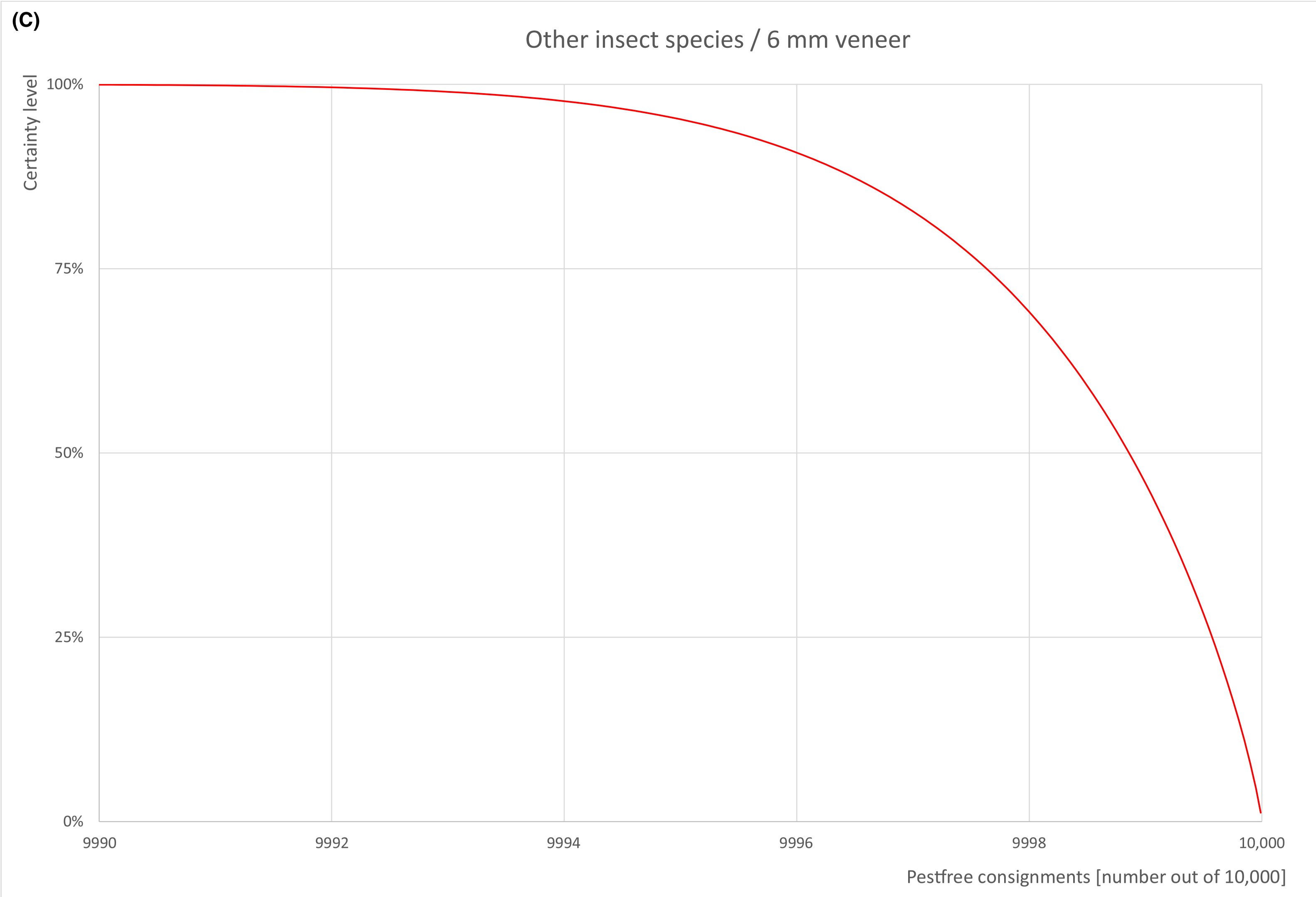


FIGURE G.9 (A) Elicited uncertainty of pest infestation per 10,000 sheets (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free sheets per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (C) descending uncertainty distribution function of pest infestation per 10,000 sheets.

APPENDIX H

Excel file with the pest list of *Acer*

Appendix H is available under the Supporting Information section on the online version of the scientific output.