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Pest categorisation of *Botryosphaeria kuwatsukai*

EFSA Panel on Plant Health (PLH),

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Abstract

The Panel on Plant Health performed a pest categorisation of *Botryosphaeria kuwatsukai*, the causal agent of fruit rot and wart bark on apple and pear, for the EU. The pathogen, which was recently characterised, is a well-defined fungal species affecting mainly *Pyrus pyrifolia* (Japanese pear), although *Pyrus communis* (European pear) and apples (*Malus domestica*) can also be affected. The host status of other plant species reported in the literature, i.e. *Cydonia oblonga*, *Chaenomeles japonica*, *Malus micromalus*, *Vitis vinifera* and *Prunus* spp., is unclear. *B. kuwatsukai* is currently present in Japan, China, Korea, Taiwan and the USA, and uncertainty exists about its presence in other areas, where the disease has been associated with other *Botryosphaeria* spp. The pathogen is not known to occur in the EU and is listed in Annex IIAI of Directive 2000/29/EC. It could potentially enter the EU on host plants for planting and fruit originated in infested countries. Climatic conditions in the EU are suitable for the establishment and spread of the pathogen, as its epidemiology is similar to that of other *Botryosphaeria* spp. present in the EU. Pears and apples are widely distributed in the EU. In the infested areas, *B. kuwatsukai* causes branch dieback and fruit rot resulting in yield/quality losses. Its introduction and spread in the EU could impact pear and apple production, although the magnitude is unknown. Cultural practices and chemical measures may reduce the inoculum sources but cannot eliminate the pathogen. Phytosanitary measures are available to mitigate the risk of introduction and spread of the pathogen in the EU. *B. kuwatsukai* meets all criteria assessed by EFSA for consideration as a potential Union quarantine pest. As *B. kuwatsukai* is not known to occur in the EU, this criterion to consider it as a Union regulated non-quarantine pest is not met.

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1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

Council Directive 2000/29/EC¹ on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community establishes the present European Union plant health regime. The Directive lays down the phytosanitary provisions and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union. In the Directive's 2000/29/EC annexes, the list of harmful organisms (pests) whose introduction into or spread within the Union is prohibited, is detailed together with specific requirements for import or internal movement.

Following the evaluation of the plant health regime, the new basic plant health law, Regulation (EU) 2016/2031² on protective measures against pests of plants, was adopted on 26 October 2016 and will apply from 14 December 2019 onwards, repealing Directive 2000/29/EC. In line with the principles of the above mentioned legislation and the follow-up work of the secondary legislation for the listing of EU regulated pests, EFSA is requested to provide pest categorizations of the harmful organisms included in the annexes of Directive 2000/29/EC, in the cases where recent pest risk assessment/ pest categorisation is not available.

1.1.2. Terms of reference

EFSA is requested, pursuant to Article 22(5.b) and Article 29(1) of Regulation (EC) No 178/2002³, to provide scientific opinion in the field of plant health.

EFSA is requested to prepare and deliver a pest categorisation (step 1 analysis) for each of the regulated pests included in the appendices of the annex to this mandate. The methodology and template of pest categorisation have already been developed in past mandates for the organisms listed in Annex II Part A Section II of Directive 2000/29/EC. The same methodology and outcome is expected for this work as well.

The list of the harmful organisms included in the annex to this mandate comprises 133 harmful organisms or groups. A pest categorisation is expected for these 133 pests or groups and the delivery of the work would be stepwise at regular intervals through the year as detailed below. First priority covers the harmful organisms included in Appendix 1, comprising pests from Annex II Part A Section I and Annex II Part B of Directive 2000/29/EC. The delivery of all pest categorisations for the pests included in Appendix 1 is June 2018. The second priority is the pests included in Appendix 2, comprising the group of *Cicadellidae* (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), the group of *Tephritidae* (non-EU), the group of potato viruses and virus-like organisms, the group of viruses and virus-like organisms of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L. and the group of *Margarodes* (non-EU species). The delivery of all pest categorisations for the pests included in Appendix 2 is end 2019. The pests included in Appendix 3 cover pests of Annex I part A Section I and all pests categorisations should be delivered by end 2020.

For the above mentioned groups, each covering a large number of pests, the pest categorisation will be performed for the group and not the individual harmful organisms listed under "such as" notation in the Annexes of the Directive 2000/29/EC. The criteria to be taken particularly under consideration for these cases, is the analysis of host pest combination, investigation of pathways, the damages occurring and the relevant impact.

Finally, as indicated in the text above, all references to 'non-European' should be avoided and replaced by 'non-EU' and refer to all territories with exception of the Union territories as defined in Article 1 point 3 of Regulation (EU) 2016/2031.

¹ Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community. OJ L 169/1, 10.7.2000, p. 1–112.

² Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants. OJ L 317, 23.11.2016, p. 4–104.

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, 1.2.2002, p. 1–24.

1.1.2.1. Terms of Reference: Appendix 1

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

<i>Aleurocantus</i> spp.	<i>Numonia pyrivorella</i> (Matsumura)
<i>Anthonomus bisignifer</i> (Schenkling)	<i>Oligonychus perditus</i> Pritchard and Baker
<i>Anthonomus signatus</i> (Say)	<i>Pissodes</i> spp. (non-EU)
<i>Aschistonyx eppoi</i> Inouye	<i>Scirtothrips aurantii</i> Faure
<i>Carposina niponensis</i> Walsingham	<i>Scirtothrips citri</i> (Moultex)
<i>Enarmonia packardi</i> (Zeller)	<i>Scolytidae</i> spp. (non-EU)
<i>Enarmonia prunivora</i> Walsh	<i>Scrobipalopsis solanivora</i> Povolny
<i>Grapholita inopinata</i> Heinrich	<i>Tachypterellus quadrigibbus</i> Say
<i>Hishomonus phycitis</i>	<i>Toxoptera citricida</i> Kirk.
<i>Leucaspis japonica</i> Ckll.	<i>Unaspis citri</i> Comstock
<i>Listronotus bonariensis</i> (Kuschel)	

(b) Bacteria

Citrus variegated chlorosis	<i>Xanthomonas campestris</i> pv. <i>oryzae</i> (Ishiyama)
<i>Erwinia stewartii</i> (Smith) Dye	Dye and pv. <i>oryzicola</i> (Fang. et al.) Dye

(c) Fungi

<i>Alternaria alternata</i> (Fr.) Keissler (non-EU pathogenic isolates)	<i>Elsinoe</i> spp. Bitanc. and Jenk. Mendes
<i>Anisogramma anomala</i> (Peck) E. Müller	<i>Fusarium oxysporum</i> f. sp. <i>albedinis</i> (Kilian and Maire) Gordon
<i>Apiosporina morbosa</i> (Schwein.) v. Arx	<i>Guignardia piricola</i> (Nosa) Yamamoto
<i>Ceratocystis virescens</i> (Davidson) Moreau	<i>Puccinia pittieriana</i> Hennings
<i>Cercoseptoria pini-densiflorae</i> (Hori and Nambu) Deighton	<i>Stegophora ulmea</i> (Schweinitz: Fries) Sydow & Sydow
<i>Cercospora angolensis</i> Carv. and Mendes	<i>Venturia nashicola</i> Tanaka and Yamamoto

(d) Virus and virus-like organisms

Beet curly top virus (non-EU isolates)	Little cherry pathogen (non- EU isolates)
Black raspberry latent virus	Naturally spreading psorosis
Blight and blight-like	Palm lethal yellowing mycoplasma
Cadang-Cadang viroid	Satsuma dwarf virus
Citrus tristeza virus (non-EU isolates)	Tatter leaf virus
Leprosis	Witches' broom (MLO)

Annex IIB

(a) Insect mites and nematodes, at all stages of their development

1 <i>Anthonomus grandis</i> (Boh.)	7 <i>Ips cembrae</i> Heer
2 <i>Cephalcia lariciphila</i> (Klug)	8 <i>Ips duplicatus</i> Sahlberg
3 <i>Dendroctonus micans</i> Kugelán	9 <i>Ips sexdentatus</i> Börner
4 <i>Gilpinia hercyniae</i> (Hartig)	10 <i>Ips typographus</i> Heer
5 <i>Gonipterus scutellatus</i> Gyll.	11 <i>Sternochetus mangiferae</i> Fabricius
6 <i>Ips amitinus</i> Eichhof	

(b) Bacteria

Curtobacterium flaccumfaciens pv. *flaccumfaciens*
(Hedges) Collins and Jones

(c) Fungi

Glomerella gossypii Edgerton

Hypoxyylon mammatum (Wahl.) J. Miller

Gremmeniella abietina (Lag.) Morelet

1.1.2.2. Terms of Reference: Appendix 2

List of harmful organisms for which pest categorisation is requested per group. The list below follows the categorisation included in the annexes of Directive 2000/29/EC.

Annex IAI**(a) Insects, mites and nematodes, at all stages of their development**

Group of Cicadellidae (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), such as:

- | | |
|--|---|
| 1) <i>Carneocephala fulgida</i> Nottingham | 3) <i>Graphocephala atropunctata</i> (Signoret) |
| 2) <i>Draeculacephala minerva</i> Ball | |

Group of Tephritidae (non-EU) such as:

- | | |
|--|---|
| 1) <i>Anastrepha fraterculus</i> (Wiedemann) | 12) <i>Pardalaspis cyanescens</i> Bezzi |
| 2) <i>Anastrepha ludens</i> (Loew) | 13) <i>Pardalaspis quinaria</i> Bezzi |
| 3) <i>Anastrepha obliqua</i> Macquart | 14) <i>Pterandrus rosa</i> (Karsch) |
| 4) <i>Anastrepha suspensa</i> (Loew) | 15) <i>Rhacochlaena japonica</i> Ito |
| 5) <i>Dacus ciliatus</i> Loew | 16) <i>Rhagoletis completa</i> Cresson |
| 6) <i>Dacus curcurbitae</i> Coquillet | 17) <i>Rhagoletis fausta</i> (Osten-Sacken) |
| 7) <i>Dacus dorsalis</i> Hendel | 18) <i>Rhagoletis indifferens</i> Curran |
| 8) <i>Dacus tryoni</i> (Froggatt) | 19) <i>Rhagoletis mendax</i> Curran |
| 9) <i>Dacus tsuneonis</i> Miyake | 20) <i>Rhagoletis pomonella</i> Walsh |
| 10) <i>Dacus zonatus</i> Saund. | 21) <i>Rhagoletis suavis</i> (Loew) |
| 11) <i>Epochra canadensis</i> (Loew) | |

(c) Viruses and virus-like organisms

Group of potato viruses and virus-like organisms such as:

- | | |
|----------------------------------|--|
| 1) Andean potato latent virus | 4) Potato black ringspot virus |
| 2) Andean potato mottle virus | 5) Potato virus T |
| 3) Arracacha virus B, oca strain | 6) non-EU isolates of potato viruses A, M, S, V, X and Y (including Yo, Yn and Yc) and Potato leafroll virus |

Group of viruses and virus-like organisms of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L., such as:

- | | |
|--------------------------------------|--|
| 1) Blueberry leaf mottle virus | 8) Peach yellows mycoplasma |
| 2) Cherry rasp leaf virus (American) | 9) Plum line pattern virus (American) |
| 3) Peach mosaic virus (American) | 10) Raspberry leaf curl virus (American) |
| 4) Peach phony rickettsia | 11) Strawberry witches' broom mycoplasma |
| 5) Peach rosette mosaic virus | 12) Non-EU viruses and virus-like organisms of <i>Cydonia</i> Mill., <i>Fragaria</i> L., <i>Malus</i> Mill., <i>Prunus</i> L., <i>Pyrus</i> L., <i>Ribes</i> L., <i>Rubus</i> L. and <i>Vitis</i> L. |
| 6) Peach rosette mycoplasma | |
| 7) Peach X-disease mycoplasma | |

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

Group of *Margarodes* (non-EU species) such as:

- | | |
|--|--|
| 1) <i>Margarodes vitis</i> (Phillipi) | 3) <i>Margarodes prieskaensis</i> Jakubski |
| 2) <i>Margarodes vredendalensis</i> de Klerk | |

1.1.2.3. Terms of Reference: Appendix 3

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IAI

(a) Insects, mites and nematodes, at all stages of their development

<i>Acleris</i> spp. (non-EU)	<i>Longidorus diadecturus</i> Eveleigh and Allen
<i>Amauromyza maculosa</i> (Malloch)	<i>Monochamus</i> spp. (non-EU)
<i>Anomala orientalis</i> Waterhouse	<i>Myndus crudus</i> Van Duzee
<i>Arrhenodes minutus</i> Drury	<i>Nacobbus aberrans</i> (Thorne) Thorne and Allen
<i>Choristoneura</i> spp. (non-EU)	<i>Naupactus leucoloma</i> Boheman
<i>Conotrachelus nenuphar</i> (Herbst)	<i>Premnotrypes</i> spp. (non-EU)
<i>Dendrolimus sibiricus</i> Tschetverikov	<i>Pseudopityophthorus minutissimus</i> (Zimmermann)
<i>Diabrotica barberi</i> Smith and Lawrence	<i>Pseudopityophthorus pruinosis</i> (Eichhoff)
<i>Diabrotica undecimpunctata howardi</i> Barber	<i>Scaphoideus luteolus</i> (Van Duzee)
<i>Diabrotica undecimpunctata undecimpunctata</i> Mannerheim	<i>Spodoptera eridania</i> (Cramer)
<i>Diabrotica virgifera zea</i> Krysan & Smith	<i>Spodoptera frugiperda</i> (Smith)
<i>Diaphorina citri</i> Kuway	<i>Spodoptera litura</i> (Fabricus)
<i>Heliothis zea</i> (Boddie)	<i>Thrips palmi</i> Karny
<i>Hirschmanniella</i> spp., other than <i>Hirschmanniella</i> <i>gracilis</i> (de Man) Luc and Goodey	<i>Xiphinema americanum</i> Cobb sensu lato (non-EU populations)
<i>Liriomyza sativae</i> Blanchard	<i>Xiphinema californicum</i> Lamberti and Bleve-Zacheo

(b) Fungi

<i>Ceratocystis fagacearum</i> (Bretz) Hunt	<i>Mycosphaerella larici-leptolepis</i> Ito et al.
<i>Chrysomyxa arctostaphyli</i> Dietel	<i>Mycosphaerella populorum</i> G. E. Thompson
<i>Cronartium</i> spp. (non-EU)	<i>Phoma andina</i> Turkensteen
<i>Endocronartium</i> spp. (non-EU)	<i>Phyllosticta solitaria</i> Ell. and Ev.
<i>Guignardia laricina</i> (Saw.) Yamamoto and Ito	<i>Septoria lycopersici</i> Speg. var. <i>malagutii</i> Ciccarone and Boerema
<i>Gymnosporangium</i> spp. (non-EU)	<i>Thecaphora solani</i> Barrus
<i>Inonotus weirii</i> (Murril) Kotlaba and Pouzar	<i>Trechispora brinkmannii</i> (Bresad.) Rogers
<i>Melampsora farlowii</i> (Arthur) Davis	

(c) Viruses and virus-like organisms

Tobacco ringspot virus	Pepper mild tigré virus
Tomato ringspot virus	Squash leaf curl virus
Bean golden mosaic virus	Euphorbia mosaic virus
Cowpea mild mottle virus	Florida tomato virus
Lettuce infectious yellows virus	

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex I A II**(a) Insects, mites and nematodes, at all stages of their development**

Meloidogyne fallax Karssen

Rhizoecus hibisci Kawai and Takagi

Popillia japonica Newman

(b) Bacteria

Clavibacter michiganensis (Smith) Davis et al. ssp. *Ralstonia solanacearum* (Smith) Yabuuchi et al. *sepedonicus* (Spieckermann and Kotthoff) Davis et al.

(c) Fungi

Melampsora medusae Thümen

Synchytrium endobioticum (Schilbersky) Percival

Annex I B**(a) Insects, mites and nematodes, at all stages of their development**

Leptinotarsa decemlineata Say

Liriomyza bryoniae (Kaltenbach)

(b) Viruses and virus-like organisms

Beet necrotic yellow vein virus

1.2. Interpretation of the Terms of Reference

Guignardia piricola is one of a number of pests listed in the Appendices to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a quarantine pest or those of a regulated non-quarantine pest for the area of the European Union (EU) excluding Ceuta, Melilla and the outermost regions of Member States (MSs) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores. The pathogen has recently been reclassified as a new species, *Botryosphaeria kuwatsukai* (see Section 3.1.1).

2. Data and methodologies**2.1. Data****2.1.1. Literature search**

A literature search on *B. kuwatsukai* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the following search terms (TS) and combinations: TS = ("Botryosphaeria kuwatsukai" OR "Botryosphaeria berengeriana f. sp. pyricola" OR "Botryosphaeria berengeriana f. sp. piricola" OR "Guignardia pyricola" OR "Guignardia piricola" OR "fruit ring rot" OR "wart bark") AND TS=(geograph* OR distribution OR "life cycle" OR lifecycle OR apple OR pear OR plant* OR damag*). Relevant papers were reviewed, and further references and information were obtained from experts, from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database (EPPO, 2017).

Data about import of commodity types that could potentially provide a pathway for the pest to enter the EU and about the area of hosts grown in the EU were obtained from EUROSTAT (online).

The Europhyt database (Europhyt, online) was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network launched by the Directorate General for Health and Consumers (DG SANCO) and is a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. The Europhyt database manages notifications of interceptions of plants or plant products that do not comply with EU legislation as well as notifications of plant pests detected in the territory of the MSs and the phytosanitary measures taken to eradicate or avoid their spread.

2.2. Methodologies

The Panel performed the pest categorisation for *B. kuwatsukai*, following guiding principles and steps presented in the EFSA guidance on the harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

In accordance with the guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was initiated following an evaluation of the EU’s plant health regime. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a Union quarantine pest and for a Union regulated non-quarantine pest in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants and includes additional information required as per the specific ToR received by the European Commission. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. All relevant criteria have to be met for the pest to potentially qualify either as a quarantine pest or as a regulated non-quarantine pest. If one of the criteria is not met, the pest will not qualify. Note that a pest that does not qualify as a quarantine pest may still qualify as a regulated non-quarantine pest which needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone; thus, the criteria refer to the protected zone instead of the EU territory.

It should be noted that the Panel’s conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, while addressing social impacts is outside the remit of the Panel, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

Table 1: Pest categorisation criteria under evaluation, as defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Identity of the pest (Section 3.1)	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?
Absence/ presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly!	Is the pest present in the EU territory? If not, it cannot be a protected zone quarantine organism.	Is the pest present in the EU territory? If not, it cannot be a regulated non-quarantine pest. (A regulated non-quarantine pest must be present in the risk assessment area).

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future.	The protected zone system aligns with the pest-free area system under the International Plant Protection Convention (IPPC). The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone).	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in and spread within the EU territory? If yes, briefly list the pathways!	Is the pest able to enter into, become established in and spread within the protected zone areas? Is entry by natural spread from EU areas where the pest is present possible?	Is spread mainly via specific plants for planting rather than via natural spread or via movement of plant products or other objects? Clearly state if plants for planting is the main pathway!
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?	Would the pests' introduction have an economic or environmental impact on the protected zone areas?	Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?	Are there measures available to prevent the entry into, establishment within or spread of the pest within the protected zone areas such that the risk becomes mitigated? Is it possible to eradicate the pest in a restricted area within 24 months (or a period longer than 24 months where the biology of the organism so justifies) after the presence of the pest was confirmed in the protected zone?	Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met.	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met.	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential regulated non-quarantine pest were met, and (2) if not, which one(s) were not met.

The Panel will not indicate in its conclusions of the pest categorisation whether to continue the risk assessment process, but, following the agreed two-step approach, will continue only if requested by the risk managers. However, during the categorisation process, experts may identify key elements and knowledge gaps that could contribute significant uncertainty to a future assessment of risk. It would be useful to identify and highlight such gaps so that potential future requests can specifically target the major elements of uncertainty, perhaps suggesting specific scenarios to examine.

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?

YES, *Botryosphaeria kuwatsukai* is a well-established fungal pathogen.

Botryosphaeria kuwatsukai is the causal agent of fruit rot and wart bark on apple and pear. The pathogen was recently characterised. It was first reported in Japan in 1933 as *Physalospora pyricola* (Nose, 1933), while the name *Guignardia pyricola*, used in Council Directive 2000/29/EC, was proposed by Yamamoto (1961). Koganezawa and Sakuma (1980, 1984) compared isolates of *P. pyricola* with isolates of *Botryosphaeria berengeriana*, another fungus causing fruit rot in Japan and concluded that the two fungi were identical morphologically. However, the Japanese isolates of *B. berengeriana* caused different symptoms (wart bark) from those (cankers) caused by the typical *B. berengeriana* isolates. Therefore, Koganezawa and Sakuma (1984) proposed the name *B. berengeriana* f. sp. *pyricola* for the causal agent of apple wart bark to separate it from *B. berengeriana*, the causal agent of cankers on apple and pear. In other areas of Asia, the agent of apple ring rot was called *Botryosphaeria dothidea* (Kim and Kim, 1989) or sometimes *B. berengeriana* (Lee and Yang, 1984) or *P. pyricola*. *B. berengeriana* has also been reported in Brazil (Melzer and Berton, 1986), but it is more likely that in this case, the name has been used as a synonym of *B. dothidea*. Jones and Aldwinkle (1990) also considered *B. berengeriana* f. sp. *pyricola* as a synonym of *B. dothidea*. Slippers et al. (2004) did not find any morphological differences between *B. berengeriana* and *B. dothidea*.

By comparing the symptomatology, conidial size and nucleotide sequences of nuclear ribosomal DNA internal transcribed spacer (ITS) regions of 27 *Botryosphaeria* isolates obtained from symptomatic twigs and fruit of apple and other deciduous trees in Japan as well as one isolate of *B. dothidea* and one isolate of *Botryosphaeria obtusa* originated in USA from apple orchards showing fruit white rot and black rot symptoms, respectively, Ogata et al. (2000) placed *P. pyricola* and *B. berengeriana* f. sp. *pyricola* isolates in one group that caused ring rot and wart bark diseases of apples and pears in Japan and appeared to be similar to *B. dothidea*, the causal agent of apple white rot in the USA. However, no pathogenicity tests were included in those studies.

Phylogenetic analysis (ITS, β -tubulin and actin) of 57 *Botryosphaeria* isolates collected from apple and pear in China, including a reference isolate of *B. berengeriana* f. sp. *pyricola*, conducted by Tang et al. (2012) showed that the causal agent of fruit ring rot and *Botryosphaeria* canker of apple in China was *B. dothidea*, which has also been reported to be the pathogen of apple ring rot in South Korea (Kim et al., 2005) and Japan (Ogata et al., 2000). Furthermore, pathogenicity tests showed that *B. dothidea* may induce wart or canker symptoms on apple and pear branches depending on the conditions (i.e. wet conditions induced stem wart symptoms, whereas dry conditions induced stem cankers). The results of Tang et al. (2012) studies also suggested that apple ring rot and white rot are the same disease caused by *B. dothidea*.

Based on morphological, pathological and molecular analyses, Zhai et al. (2014) showed that four *Botryosphaeria* species, namely, *B. dothidea*, *B. rhodina*, *B. obtusa* and *B. parva*, were associated with pear stem wart and stem canker in China. Their results indicated that stem wart and stem canker diseases of pear were primarily caused by *B. dothidea*, which agrees with the results of Tang et al. (2012). Zhai et al. (2014) also showed that the geographical distribution of *Botryosphaeria* species from pear trees in China was considerably different among the provinces sampled, except for *B. dothidea*, which predominantly appeared in all the pear-growing regions. Moreover, pathogenicity tests showed that *B. dothidea* could induce under the same experimental conditions either stem wart or stem canker symptoms, depending on the isolate used.

According to CABI database (CABI, 2017), *G. pyricola* is synonymous to *B. berengeriana* f. sp. *pyricola* (<https://gd.eppo.int/taxon/PHYOPI>). CABI provides the following taxonomic identification for *B. berengeriana* f. sp. *pyricola*:

Preferred scientific name: *Botryosphaeria berengeriana* f. sp. *pyricola* Kogan & Sakuma 1984
 Family: Botryosphaeriaceae
 Genus: *Botryosphaeria*
 Species: *berengeriana* f. sp. *pyricola*

Other scientific names: *Guignardia pyricola* (Nose) W. Yamam 1961
Physalospora pyricola Nose, 1933
Macrophoma kuwatsukai Hara
Macrophoma pyrorum Cooke

With respect to the above nomenclature, the Panel notes that it is uncommon to name as a *forma specialis* a fungus that attacks species in more than one plant genera (i.e. *Malus* and *Pyrus*).

Recent phylogenetic (ITS, EF1- α , HSP and HIS) and morphological studies (Xu et al., 2015) in which reference isolates of *B. berengeriana*, *B. berengeriana* f. sp. *pyricola* and *B. dothidea* from Japan, New Zealand and Switzerland were used and compared with sequences of various *Botryosphaeria* spp. around the world, revealed the existence of two species within *Botryosphaeria* isolates from apple and pear from several locations in China: one species included an ex-epitype isolate of *B. dothidea* and the other an isolate previously designated as *B. berengeriana* f. sp. *pyricola*. The latter taxon was described by the authors as a new species, *B. kuwatsukai*, causing fruit ring rot and extensive cankers and/or warts on branches and trunks of apple and pear in China, Japan and USA (Xu et al., 2015). Xu et al. (2015) also performed on two loci, β -tubulin and actin, phylogenetic analysis to compare their results with those of Tang et al. (2012) and they concluded that these two loci were more inclined to make all tested isolates fall together in the *B. dothidea* clade.

The Panel considers the results of Xu et al. (2015) study more robust compared to those of the previous phylogenetic studies as the former used more loci, including the translation elongation factor 1-a (EF-1-a) and the ITS region locus, which are considered nowadays as the best regions for the characterisation of Botryosphaeriaceae species (Slippers et al., 2017). Xu et al. (2015) study also confirmed that *B. berengeriana* is a synonym of *B. dothidea*, as it was indicated in previous studies (Slippers et al., 2014).

Thus, based on Xu et al. (2015) study and the information provided by CABI (2017), the Panel considers that *G. pyricola*, the organism included in Council Directive 2000/29/EC, is synonymous to *B. berengeriana* f. sp. *pyricola*, which has been recently reclassified as a new species, *B. kuwatsukai*, with the following taxonomic identification:

Preferred scientific name: *Botryosphaeria kuwatsukai* (Hara) G.Y. Sun and E. Tanaka, comb. Nov. et emend
 Family: Botryosphaeriaceae
 Genus: *Botryosphaeria*
 Species: *kuwatsukai*

Other scientific names:

- Botryosphaeria berengeriana* De Notaris f. sp. *pyricola* Koganezawa & Sakuma (previously spelled as ‘*pyricola*’)
- Guignardia pyricola* (Nose) W. Yamamoto (as ‘*pyricola*’)

Based on the above, this pest categorisation is for *Botryosphaeria kuwatsukai*.

Biology of the pest

- Macrophoma kuwatsukai* Hara
- Physalospora pyricola* Nose (as ‘*pyricola*’)

3.1.2. Biology of the pest

The biology of Botryosphaeriales, the most common and widespread pathogens of woody hosts globally, is not well known (Slippers et al., 2017). Virtually, all species that have been studied in detail occur as endophytes in healthy plant tissues of their host plants for extended periods of time. When they cause diseases, these diseases are closely associated with plant stress.

The only available information on the biology of *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) is based on Asian literature and is provided by CABI (2017). More specifically, the pathogen forms stroma with conidiomata on symptomatic withered branches and shoots of its hosts between April and September, but mainly in August and September (Dong and Zhou, 1985; Koga and Ohkubo, 1994). Most abundant sporulation occurs on 2–3-year-old shoots than on older stems and branches. Shutong et al. (2012)

showed that precipitation was the prerequisite for conidia release. A rainfall of at least 2 h was required for the release of a large amount of conidia. The peak of conidial release occurred after 4 h of moisture and was maintained at high level for 12 h. Several sporulation peaks may occur during the growing season with a time interval between two peaks of no less than 10 days. When landed on susceptible host tissue, conidia germinate within 24 h (CABI, 2017). Ascospores are also formed on withered host branches, but ascospores are not considered to play a significant role in disease spread (CABI, 2017).

The pathogen infects the shoots of its hosts most probably via the shoot tips and the young fruit through stomata or lenticels (Kishi and Abiko, 1971; Dong and Zhou, 1985). Infection of young fruit occurs early in the season and up to mid-July. After this period, wounds (e.g. punctures made by the oriental fruit moth, *Grapholita molesta*) are required for the infection of fruit by the pathogen (CABI, 2017). Under experimental conditions, wounding is required for the infection of branches although shoot tips and young leaves can be infected in the absence of wounds.

Infection is favoured by warm, humid conditions with an optimum temperature of 28°C. A minimum period of 5 h wetness is required for infection of young fruit, whereas a longer period is necessary in the case of older fruit. The incubation period on shoots and leaves is 90–120 and about 30 days, respectively.

3.1.3. Detection and identification of the pest

Are detection and identification methods available for the pest?

YES. The pathogen can be detected and identified using multiple locus genealogies in combination with symptomatology, cultural and morphological characteristics

Detection and identification of *B. kuwatsukai* based solely on cultural and morphological characteristics are rather difficult as these characters are similar to those of other *Botryosphaeria* spp. and particularly to *B. dothidea* (Slippers et al., 2017). Moreover, the pathogen cannot be detected based only on symptomatology, as similar symptoms are also caused by other *Botryosphaeria* spp. (e.g. *B. dothidea*).

B. kuwatsukai can only be detected and identified by using multiple locus genealogies (e.g. ITS, EF1-a, HIS and HSP) combined with symptomatology, colony characteristics (e.g. growth of aerial mycelia, mycelial growth rate, etc.) and morphology of its conidia (Xu et al., 2015).

Symptoms

According to CABI (2017), *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) causes on the surface of trunks, branches and twigs of Japanese pears (*Pyrus pyrifolia*) and apples (*Malus* spp.) wart-like protuberances (wart bark) rather than typical *Botryosphaeria* cankers (CABI, 2017). As the infection progresses, the protuberances are surrounded by dark brown spots, crack and part of the periderm around them peels off (Jones, 2014; CABI, 2017). Infected woody plant parts eventually wither and dieback, reducing tree growth and productivity. The pathogen affects also the leaves and fruit causing on the former large contoured, dark brown spots and on the latter small, often circular, slightly sunken spots, which may be surrounded by a red halo (CABI, 2017). As the fruit spots expand, alternating light and dark brown rings develop in the decayed tissue (Jones, 2014).

Similar symptoms were observed during the pathogenicity tests conducted by Xu et al. (2015) on apple (*Malus domestica* cv. Fuji) and pear (*P. pyrifolia* cv. Suli).

Morphology

Xu et al. (2015) provide the following description of the cultural and morphological characteristics of *B. kuwatsukai*: colonies on PDA attaining 52 mm diameter after 4 days at 25°C in the dark. They are initially white with moderately dense, appressed mycelial mat and aerial mycelium without columns, gradually becoming grey to dark grey. Initially, the reverse side of the colonies is white, but after 2–3 days, it is becoming dark green to olive green starting from the centre. This colouration gradually spreads to the edge of the colony and becomes darker from the centre until the entire underside of the colony becomes black. The conidiomata, which are formed after exposure of the colonies for 15–20 days to 12-h interactive black light and fluorescence lamp, are superficial, dark brown to black, globose, mostly solitary and covered by mycelium. The conidia are narrowly fusiform or irregularly fusiform, smooth with granular contents, widest in the middle to upper third, (18.5–) 20–24.5(–26) × 5–7(–8) μm, forming 1–3 septa before germination. Microconidiomata globose is dark brown to black. Microconidiophores are hyaline, cylindrical to subcylindrical, 3–10 × 1–2 μm. Microconidia are unicellular, hyaline, allantoid to rod-shaped, 3–8 × 1–2 μm. The sexual state has not been observed in culture.

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

There is an uncertainty with respect to the current distribution of *B. kuwatsukai*. More specifically, according to EPPO database (EPPO, 2017), *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) is present in China, Japan, Korea and Taiwan (Figure 1; Table 2). However, by examining a great number of isolates of different *Botryosphaeria* spp. originated from several countries around the world (but not from Taiwan or Korea), Xu et al. (2015) showed that the pathogen is present in China, Japan and the USA. The latter finding (i.e. an isolate of *B. kuwatsukai* from the USA that was originally identified as *B. dothidea*) creates an uncertainty about the presence of the pathogen in areas around the world, where the disease symptoms on apples and pears have been associated with other *Botryosphaeria* spp.

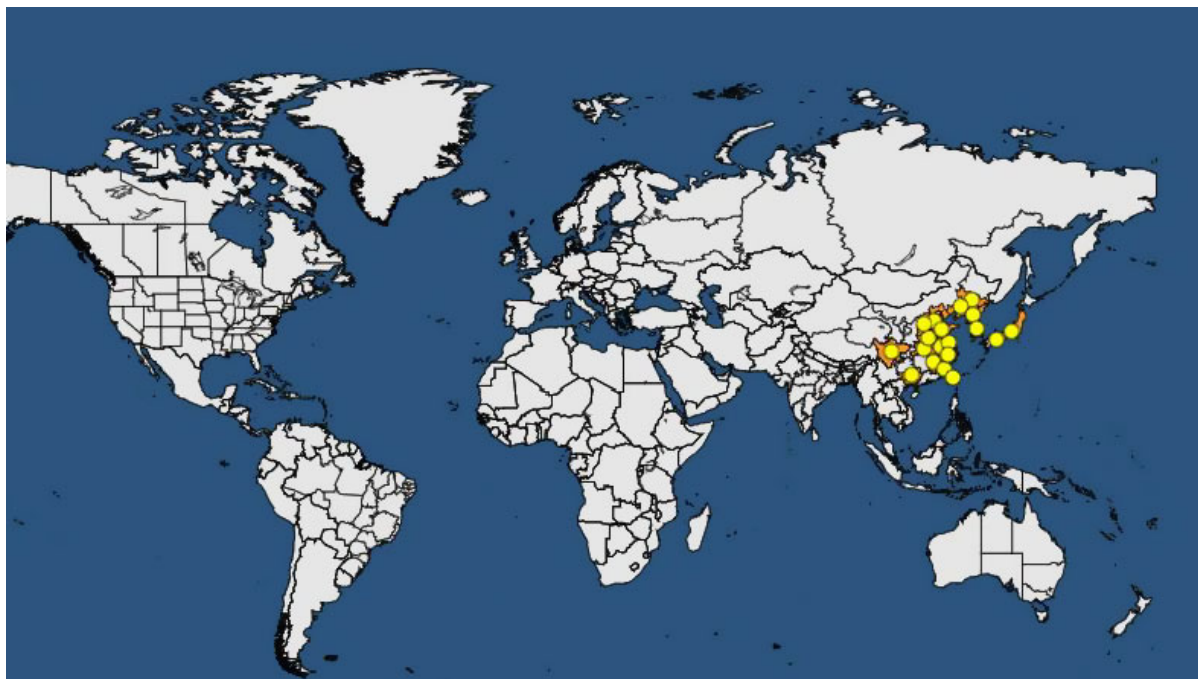


Figure 1: Global distribution map for *Botryosphaeria kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) extracted from EPPO Global Database (last updated: 13/5/2014; last accessed: 20/7/2017). The pathogen is also present in Hokkaido and Kyushu islands of Japan (CABI, 2017) and the USA (Xu et al., 2015)

Table 2: Global distribution of *Botryosphaeria kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) based on information extracted from the EPPO Global Database (last updated: 13/5/2014; last accessed: 20/7/2017), CABI Invasive Species Compendium (last updated: 28/3/2017; last accessed: 30/7/2017) and Xu et al. (2015)

Continent	Country	Status	Source
Asia	China	Present, widespread	EPPO
	Japan	Present ^(a)	EPPO, CABI
	Korea Dem. People’s Republic	Present, no details	EPPO
	Korea, Republic	Present, no details	EPPO
	Taiwan	Present, no details	EPPO
America	USA	Present, no details	Xu et al., 2015

(a): CABI database reports two additional infested regions (Hokkaido and Kyushu islands) compared to EPPO.

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest widely distributed within the EU?

NO. The pathogen is not known to occur in the risk assessment area

The pathogen is not known to be present in the EU (EPPO Global Database, last updated 13/5/2014; last accessed: 30/7/2017).

However, the finding of Xu et al. (2015) studies (i.e. an isolate of *B. kuwatsukai* from the USA that was originally identified as *B. dothidea*) creates an uncertainty about the presence of the pathogen in the risk assessment area, where the disease symptoms on apples and pears have been associated with other *Botryosphaeria* species.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Botryosphaeria kuwatsukai is regulated as a harmful organism in the EU and is listed as *Guignardia piricola* in Council Directive 2000/29/EC. Details are presented in Tables 3 and 4.

Table 3: *Botryosphaeria kuwatsukai* (as *Guignardia piricola*) in Council Directive 2000/29/EC

Annex II, Part A	Harmful organisms whose introduction into, and spread within, all member states shall be banned if they are present on certain plants or plant products	
Section I	Harmful organisms not known to occur in the community and relevant for the entire community	
(c)	Fungi	
	Species	Subject of contamination
12.	<i>Guignardia piricola</i> (Nosa) Yamamoto	Plants of <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L., other than seeds, originating in non-European countries

3.3.2. Legislation addressing the hosts of *Botryosphaeria kuwatsukai* (as *Guignardia piricola*)

Table 4: Regulated hosts and commodities that may involve *Botryosphaeria kuwatsukai* (as *Guignardia piricola*) in Annexes III, IV and V of Council Directive 2000/29/EC

Annex III, Part A	Plants, plant products and other objects the introduction of which shall be prohibited in all Member States	
	Description	Country of origin
9	Plants of <i>Cydonia</i> Mill., <i>Crateagus</i> L., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L. intended for planting, other than dormant plants free from leaves, flowers and fruit	Non-European countries
18	Plants of <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L. and their hybrids, intended for planting, other than seeds	Without prejudice to the prohibitions applicable to the plants listed in Annex III A (9), where appropriate, non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA
Annex IV, Part A	Special requirements which must be laid down by all Member States for the introduction and movement of plants, plant products and other objects into and within all member statesStates	
Section II	Plants, plant products and other objects originating in the community	
	Plant, plant products and other objects	Special requirements

<p>18.2</p>	<p>Tubers of <i>Solanum tuberosum</i> L., intended for planting, other than tubers of those varieties officially accepted in one or more Member States pursuant to Council Directive 70/457/EEC of 29 September 1970 on the common catalogue of varieties of agricultural plant species</p>	<p>Without prejudice to the special requirements applicable to the tubers listed in Annex IV(A)(II)(18.1), official statement that the tubers:</p> <ul style="list-style-type: none"> — belong to advanced selections such a statement being indicated in an appropriate way on the document accompanying the relevant tubers, — have been produced within the Community, and — have been derived in direct line from material which has been maintained under appropriate conditions and has been subjected within the Community to official quarantine testing in accordance with appropriate methods and has been found, in these tests, free from harmful organisms.
<p>18.3</p>	<p>Plants of stolon or tuber-forming species of <i>Solanum</i> L., or their hybrids, intended for planting, other than those tubers of <i>Solanum tuberosum</i> L. specified in Annex IV(A)(II)(18.1) or (18.2), and other than culture maintenance material being stored in gene banks or genetic stock collections</p>	<p>(a) The plants shall have been held under quarantine conditions and shall have been found free of any harmful organisms in quarantine testing;</p> <p>(b) the quarantine testing referred to in (a) shall:</p> <ul style="list-style-type: none"> (aa) be supervised by the official plant protection organisation of the Member State concerned and executed by scientifically trained staff of that organisation or of any officially approved body; (bb) be executed at a site provided with appropriate facilities sufficient to contain harmful organisms and maintain the material including indicator plants in such a way as to eliminate any risk of spreading harmful organisms; (cc) be executed on each unit of the material, <ul style="list-style-type: none"> — by visual examination at regular intervals during the full length of at least one vegetative cycle, having regard to the type of material and its stage of development during the testing programme, for symptoms caused by any harmful organisms, — by testing, in accordance with appropriate methods to be submitted to the Committee referred to in Article 18: <ul style="list-style-type: none"> — in the case of all potato material at least for <ul style="list-style-type: none"> — Andean potato latent virus, — Arracacha virus B. oca strain, — Potato black ringspot virus, — Potato spindle tuber viroid, — Potato virus T, — Andean potato mottle virus, — common potato viruses A, M, S, V, X and Y (including Y o, Y n und Y c) and Potato leaf roll virus, — <i>Clavibacter michiganensis</i> ssp. <i>sepedonicus</i> (Spieckermann and Kotthoff) Davis et al.,

		<p>— <i>Ralstonia solanacearum</i> (Smith) Yabuuchi et al.,</p> <p>— in the case of true seed potato of least for the viruses and viroid listed above;</p> <p>(dd) by appropriate testing on any other symptom observed in the visual examination in order to identify the harmful organisms having caused such symptoms;</p> <p>(c) any material, which has not been found free, under the testing specified under (b) from harmful organisms as specified under (b) shall be immediately destroyed or subjected to procedures which eliminate the harmful organism(s);</p> <p>(d) each organisation or research body holding this material shall inform their official Member State plant protection service of the material held.</p>
18.4	Plants of stolon, or tuber-forming species of <i>Solanum</i> L., or their hybrids, intended for planting, being stored in gene banks or genetic stock collections	Each organisation or research body holding such material shall inform their official Member State plant protection service of the material held.
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community	
Part A	Plants, plant products and other objects originating in the Community	
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport	
1.1	Plants, intended for planting, other than seeds, of <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L., other than <i>Prunus laurocerasus</i> L. and <i>Prunus lusitanica</i> L., and <i>Pyrus</i> L.	
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community	
Part A	Plants, plant products and other objects originating in the Community	
Section II	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for certain protected zones, and which must be accompanied by a plant passport valid for the appropriate zone when introduced into or moved within that zone Without prejudice to the plants, plant products and other objects listed in Part I.	
1.3	Plants, other than fruit and seeds, of <i>Cydonia</i> Mill., <i>Malus</i> Mill. and <i>Pyrus</i> L.	
1.4	Live pollen for pollination of <i>Cydonia</i> Mill., <i>Malus</i> Mill. and <i>Pyrus</i> L.	
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community	
Part B	Plants, plant products and other objects originating in territories, other than those referred to in Part A	
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community	

1.	Plants, intended for planting, other than seeds but including seeds of Cruciferae, Gramineae, <i>Trifolium</i> spp., originating in Argentina, Australia, Bolivia, Chile, New Zealand and Uruguay, genera <i>Triticum</i> , <i>Secale</i> and <i>X Triticosecale</i> from Afghanistan, India, Iran, Iraq, Mexico, Nepal, Pakistan, South Africa and the USA, <i>Citrus</i> L., <i>Fortunella</i> Swingle and <i>Poncirus</i> Raf., and their hybrids, <i>Capsicum</i> spp., <i>Helianthus annuus</i> L., <i>Solanum lycopersicum</i> L., <i>Medicago sativa</i> L., <i>Prunus</i> L., <i>Rubus</i> L., <i>Oryza</i> spp., <i>Zea mais</i> L., <i>Allium ascalonicum</i> L., <i>Allium cepa</i> L., <i>Allium porrum</i> L., <i>Allium schoenoprasum</i> L. and <i>Phaseolus</i> L.
2.	Parts of plants, other than fruits and seeds, of: — <i>Prunus</i> L., originating in non-European countries
3.	Fruits of: — <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L., originating in non-European countries.
Section II	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for certain protected zones
3.	Live pollen for pollination of <i>Cydonia</i> Mill., <i>Malus</i> Mill. and <i>Pyrus</i> L.
4.	Parts of plants, other than fruit and seeds, of <i>Cydonia</i> Mill., <i>Malus</i> Mill. and <i>Pyrus</i> L.

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

According to CABI (2017) and Xu et al. (2015), the main host of *B. kuwatsukai* is Japanese pear (*P. pyrifolia*). European pear (*Pyrus communis*) and apple (*M. domestica*) can also be affected.

Other hosts reported in the literature (Kato, 1973) are *Chaenomeles japonica* (Japanese quince) and *Malus micromalus*, but this report is not supported by any recent literature. CABI (2017) includes quince (*Cydonia oblonga*) in the list of hosts of *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*). However, as no reference is cited and the Panel could not find any literature to support the host status of *C. oblonga*, there is uncertainty about the inclusion of *C. oblonga* in the host range of *B. kuwatsukai*. Ogata et al. (2000) identified a group of similar pathogenic *Botryosphaeria* isolates that included *B. berengeriana* f. sp. *pyricola* as well as isolates originated from grapevine (*Vitis vinifera*) and peach (*Prunus* spp.). However, the characterisation of these *Botryosphaeria* isolates was based only on the nucleotide sequences of nuclear rDNA ITS regions, symptomatology and conidial morphology, methods which are not considered nowadays sufficient for the identification of *Botryosphaeria* species (Xu et al., 2015; Slippers et al., 2017). Therefore, the Panel considers that there is uncertainty about grapevine and peach being hosts of the pathogen as the work of Ogata et al. (2000) is not adequate to support the inclusion of those two plant species in the host range of *B. kuwatsukai*.

Based on the above, the Panel focusses this pest categorisation on pears and apples as hosts for *B. kuwatsukai*.

3.4.2. Entry

Is the pest able to enter into the EU territory?

YES. Under the current EU legislation, the pathogen could enter the EU territory on the dormant host plants for planting and the fresh fruit pathways

The PLH Panel identified the following pathways for the entry of *B. kuwatsukai* from infested Third countries into the EU territory:

- 1) Host plants for planting, excluding seeds, but including dormant plants and
- 2) Fresh fruit of host plants.

Under the current EU legislation, the host plants for planting at dormant stage (free from leaves, flowers and fruit) and the fresh fruit pathways are relevant for the entry of the pathogen into the risk assessment area.

The volume of *Malus* spp. and *Pyrus* spp. fresh fruit originated in infested countries and imported into the risk assessment area during the period 2011–2015 (source Eurostat, extracted on 30/8/2017) are presented in Tables 5 and 6, respectively.

Table 5: Total volume (in tonnes) of apples imported during the period 2011–2015 into the 28 EU Member States from non-EU countries and from continents where *B. kuwatsukai* is reported as present (Source: Eurostat, extracted on 30/8/2017)

Total EU 28 apple imports (in tonnes)	2011	2012	2013	2014	2015
From non-EU countries	595,914	504,178	668,796	495,034	455,291
From infested North American countries	10,235	10,490	12,081	9,005	6,212
From infested Asian countries	5,644	3,171	7,755	1,646	900

Based on the above data, during the period 2011–2015, 1.6–3% of the total volume of apples imported by the 28 EU Member States from third countries originated in areas where *B. kuwatsukai* is reported as present.

Table 6: Total volume (in tonnes) of pears imported during the period 2012–2015 into the EU Member States from non-EU countries and from continents where *B. kuwatsukai* is reported as present (Source: Eurostat, extracted on 30/8/2017). No import data available for 2011

Total EU 28 pear imports (in tonnes)	2012	2013	2014	2015
From non-EU countries	226,965	284,723	242,205	221,239
From infested North American countries	1,815	1,300	919	368
From infested Asian countries	11,583	10,397	6,418	9,536

Based on the above data, during the period 2011–2015, 3%–6% of the total volume of pears imported by the 28 EU Member States from third countries originated in areas where *B. kuwatsukai* is reported as present.

There is no record of interception of *B. kuwatsukai* (or *G. pyricola* or *B. berengeriana* f. sp. *pyricola*.) in the Europhyt database (search performed on 29 August 2017).

3.4.3. Establishment

Is the pest able to become established in the EU territory?

YES. The pathogen could potentially establish in the risk assessment area, as the hosts are widely distributed and suitable climatic conditions occur in a big part of the EU territory

3.4.3.1. EU distribution of main host plants

Hosts of *B. kuwatsukai* (apples and pears) are widely grown in the risk assessment area (Tables 7 and 8).

Table 7: Area cultivated with apples in the EU between 2011 and 2015 (in 1,000 ha). Source: Eurostat, extracted on 28/8/2017.

EU Member States ^(a)	2011	2012	2013	2014	2015	Mean of EU apple-growing area (in 1,000 ha)
EU28	548.36	558.62	536.75	524.50	537.91	541.23
Poland	183.50	194.70	162.40	163.10	180.40	176.82
Romania	52.72	55.37	60.28	56.13	55.88	56.08
Italy	54.07	54.13	53.01	52.00	52.16	53.07
France	52.80	51.79	50.68	50.17	49.65	51.02
Hungary	33.09	32.04	33.36	33.26	32.80	32.91
Germany	31.76	31.74	31.74	31.74	31.74	31.74
Spain	31.51	30.79	30.79	30.73	30.72	30.91
United Kingdom	16.00	16.00	20.00	16.00	16.00	16.80
Portugal	12.54	12.90	13.66	13.85	14.01	13.39
Greece	13.48	12.47	12.93	12.26	11.76	12.58
Lithuania	10.11	11.83	11.67	11.27	10.68	11.11

(a): Only Member States growing more than 10,000 ha are reported.

Apples are also grown, but to a lesser extent, in the Czech Republic, the Netherlands, Belgium, Austria, Croatia, Bulgaria, Slovakia, Latvia, Slovenia, Denmark, Sweden, Estonia, Cyprus, Ireland, Finland and Luxembourg.

Table 8: Area cultivated with pears in the EU between 2011 and 2015 (in 1,000 ha). Source: Eurostat, extracted on 28/8/2017

EU Member States ^(a)	2011	2012	2013	2014	2015	Mean of EU apple-growing area (in 1,000 ha)
EU28	129.42	124.66	120.38	117.01	117.07	121.71
Italy	36.34	34.24	31.53	30.15	30.86	32.62
Spain	27.01	25.48	24.24	23.64	22.88	24.65
Portugal	10.97	11.23	12.01	12.01	12.12	11.67
Poland	11.70	10.90	9.50	9.20	9.20	10.10

(a): Only Member States growing more than 10,000 ha are reported.

Pears are also grown, but to a lesser extent, in Belgium, the Netherlands, France, Greece, Romania, Hungary, Germany, the United Kingdom, Croatia, the Czech Republic, Lithuania, Austria, Bulgaria, Denmark, Slovakia, Slovenia, Latvia, Sweden, Cyprus and Luxembourg.

3.4.3.2. Climatic conditions affecting establishment

In eastern Asia, *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) is present in areas with the following climate types (Figure 2): Cf (warm, temperate climate, wet all year), Cw (warm temperate climate with dry winter), Df (continental climate, wet all year) and Dw (continental climate with dry winter) (CABI, 2017). Given that those climate types also occur in a large part of the EU (Figure 2) and other *Botryosphaeria* spp. are already present in the risk assessment area (Lazzizzera et al., 2008; Garibaldi et al., 2012; Carlucci et al., 2015), the Panel considers that the climatic conditions occurring in the risk assessment area are not a limiting factor for *B. kuwatsukai* to establish in the EU territory, wherever the hosts are present.

The pathogen is also present in the USA (Xu et al., 2015), where a variety of climate types exists (Peel et al., 2007). Nevertheless, there is no information in the Xu et al. (2015) paper about the exact location in the USA from where the isolate of *B. kuwatsukai* (originally identified as *B. dothidea*) originated.

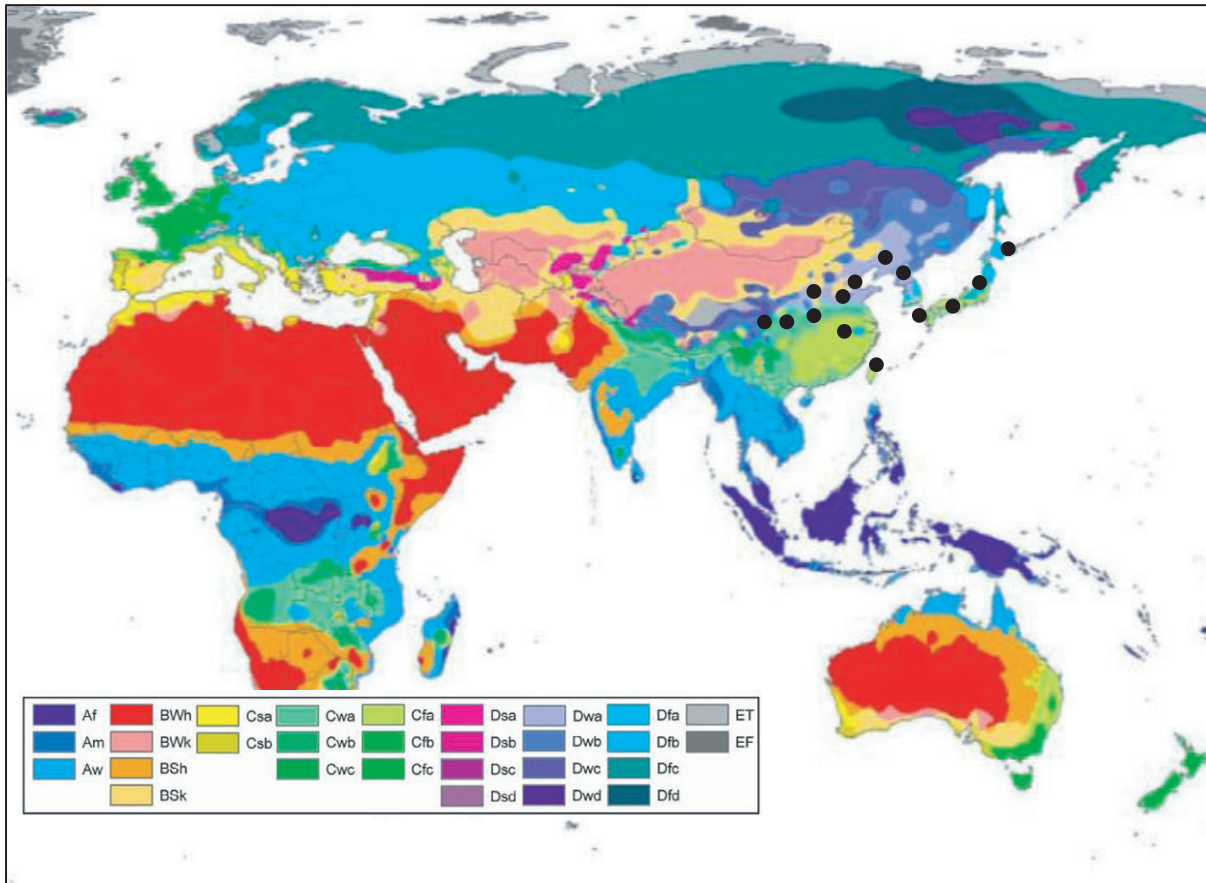


Figure 2: Köppen-Geiger climate type map of Europe, Africa, Asia and Oceania (Peel et al., 2007). Black dots represent the distribution of *Botryosphaeria kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*) according to CABI (2017)

3.4.4. Spread

3.4.4.1. Vectors and their distribution in the EU (if applicable)

Is the pest able to spread within the EU territory following establishment?	YES
How? By natural and human-assisted means	

Following its establishment in the EU territory, the pathogen could potentially spread by both natural and human-assisted means.

Spread by natural means. Similarly to other *Botryosphaeria* spp., the pathogen can spread over relatively short distances by rain-splashed/washed-off conidia and wind-disseminated ascospores (Kishi and Abiko, 1971; Dong and Zhou, 1985; Sutton, 1990). Conidia are mainly dispersed by rain up to a distance of 10 m and by wind-driven rain up to a distance of 20 m (CABI, 2017). Nevertheless, uncertainty exists on the distance over which the ascospores of the pathogen could be wind disseminated because of lack of information

Spread by human assistance. The pathogen could potentially spread over long distances through the movement of infected (symptomatic and asymptomatic) host plants for planting (rootstocks, grafted plants, scions, etc.) and fresh fruit.

The Panel also notes that, as the pathogen, similar to other Botryosphaeriaceae species (Burgess et al., 2016; Slippers et al., 2017), exists as endophyte in healthy plant tissues of its hosts for extended period of time, it could potentially spread freely in healthy plant material, including fruit.

3.5. Impacts

Would the pests' introduction have an economic or environmental impact on the EU territory?

YES. The introduction of *B. kuwatsukai* could cause yield and quality losses to pear and apple production in the risk assessment area.

Species of *Botryosphaeria* have been reported as important pathogens of pome fruit trees worldwide (Slippers et al., 2007, 2017). In Asia, severe damage caused by *Botryosphaeria* spp. has been reported in China, Japan and Korea on apple and Japanese and European pears (Ogata et al., 2000; Tang et al., 2012; Kim et al., 2005; Xu et al., 2015; Zhao et al., 2016). More specifically, regarding *B. berengeriana* f. sp. *pyricola* (as *P. pyricola*), this fungus was listed as one of the economically important pathogens of apples (*Malus* spp.) and pears (*Pyrus* spp.) in Japan (Anon., 1984), being responsible for branch dieback and fruit rot. According to Koganezawa and Sakuma (1984), it became even more important in the 1980s causing apple fruit rot in areas where Bordeaux mixture was less frequently used and where the bagging of fruit was no longer practiced. In China, losses up to 50% were reported in susceptible apple cultivars due to *B. berengeriana* f. sp. *pyricola* (Kexiang et al., 2002). However, uncertainty exists about the contribution of *B. kuwatsukai* on the impact of the diseases caused by Botryosphaeriaceae on apples and pears in Asia because of the confusion that existed in the past with respect of the identity of the pathogen.

In the absence of information, the Panel considers that the introduction and spread of the pathogen in the risk assessment area could cause some impacts to pear and apple production, although their magnitude is unknown.

3.6. Availability and limits of mitigation measures

Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?

YES, the likelihood of pest entry can be mitigated if host plants for planting and fruit are sourced from pest-free areas or pest-free places of production and are inspected both at the place of origin and the EU entry point. In infested areas, sanitation, agricultural practices and fungicide sprays are available for disease management.

Measures for preventing the entry of the pathogen into the risk assessment area include:

- sourcing host plant material, including fruit, from pest-free areas or pest-free places of production;
- phytosanitary certificate for the export of host plants for planting and fruit from infested countries;
- inspection of host plants for planting and fruit prior to export to the EU and at the EU entry point.

Measures for preventing the establishment and spread of the pathogen in the risk assessment area include:

- use of resistant varieties;
- use of sanitary measures (e.g. removal of infected plants or plant parts and pruning residues, disinfection of pruning and grafting tools, etc.);
- application of fungicide sprays;
- crop residue management;
- restrict the movement of infected plant material.

3.6.1. Biological or technical factors limiting the feasibility and effectiveness of measures to prevent the entry, establishment and spread of the pest

The following biological factors could potentially limit the feasibility and effectiveness of measures to prevent the entry into and spread within the risk assessment area of *B. kuwatsukai*:

- The endophytic phase of the pathogen (see Sections 3.1.2 and 3.4.4.1).
- The long incubation period on infected host plant material (see Section 3.1.2).
- Its similarity (i.e. disease symptoms, conidial morphology) with other *Botryosphaeria* spp. affecting pears and apples worldwide.

3.6.2. Control methods

In the infested areas, the following agricultural practices and sanitary and chemical measures are used for the management of the disease caused by *B. kuwatsukai* on pears and apples (CABI, 2017):

- Sanitation measures to reduce inoculum sources in the orchards (e.g. removal of symptomatic and dead plant parts and shaving of warts on shoots) (CABI, 2017).
- Bagging of fruit is practiced in some areas (Kim and Kim, 1989).
- Sprays with copper-based fungicides have proved to be very effective in Japan. Other fungicides used in Japan, China and Korea are benomyl, captan, difolatan, polyoxin, 8-hydroxyquinoline and organic carbendazim (Kishi and Abiko, 1971; Kim and Kim, 1989; Kexiang et al., 2002).
- Field studies conducted in the infested Asian countries have shown that some pear and apple cultivars are resistant to infection by *B. kuwatsukai* (Cho et al., 1986; Kim and Kim, 1989; Li et al., 1997). Although no information was found in the literature, the Panel assumes that resistant host cultivars are used in the infested countries as a measure for disease management.

3.7. Uncertainty

- 1) **Host range:** CABI (2017) included *C. oblonga* in the list of hosts of *B. kuwatsukai* (as *B. berengeriana* f. sp. *pyricola*), without citing any reference, this information could not be confirmed from the literature search conducted by the Panel. CABI (2017) also included grapevine and peach in the host range of the pathogen based on Ogata et al. (2000) study. Nevertheless, there is uncertainty because of the methods that the authors used for the identification of the *Botryosphaeria* species involved in the pathogenicity tests.
- 2) **Pest distribution:** Since *B. kuwatsukai* was recently characterised using four loci, and, one isolate, previously identified as *B. dothidea* in the USA, was reassigned to *B. kuwatsukai*, there is uncertainty about the distribution of *B. kuwatsukai* elsewhere in the world, including the risk assessment area.
- 3) **Spread:** The distance over which ascospores of *B. kuwatsukai* could be disseminated by wind is uncertain due to lack of knowledge
- 4) **Impact:** The contribution of *B. kuwatsukai* on the impact of the diseases caused by Botryosphaeriaceae on apples and pears in Asia is uncertain

The Panel considers that, of the above uncertainties, only uncertainty 2 could affect the conclusion of this pest categorisation.

4. Conclusions

Botryosphaeria kuwatsukai meets the criteria assessed by EFSA for consideration as a potential quarantine pest for the EU territory (see Table 9)

Table 9: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the pest is clearly defined and there are reliable methods for its detection and identification	The identity of the pest is clearly defined and there are reliable methods for its detection and identification	None
Absence/ presence of the pest in the EU territory (Section 3.2)	The pest is not known to occur in the EU	The pest is not known to occur in the EU.	Since <i>B. kuwatsukai</i> was characterised only recently, there is uncertainty about the distribution of <i>B. kuwatsukai</i> in the risk assessment area (Uncertainty 2)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Regulatory status (Section 3.3)	The pest is currently officially regulated on <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L., other than seeds, originating in non-European countries (Dir 2000/29/ EC).	The pest is currently officially regulated as a quarantine pest on <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L., other than seeds, originating in non-European countries (Dir 2000/29/ EC)	Uncertainty on <i>B. kuwatsukai</i> 's host range (Uncertainty 1)
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	The pest could potentially enter, establish and spread in the EU. <u>Pathways of entry:</u> Host plants for planting, excluding seeds but including dormant plants, and Fresh fruit of host plants	The pest could potentially spread in the EU. <u>Pathways:</u> Host plants for planting, excluding seeds but including dormant plants, and Fresh fruit of host plants	Uncertainty on <i>B. kuwatsukai</i> 's host range (Uncertainty 1) The distance over which ascospores of <i>B. kuwatsukai</i> could be disseminated by wind is uncertain (uncertainty 3)
Potential for consequences in the EU territory (Section 3.5)	The introduction and spread of the pest in the EU could cause yield and quality losses in apple and pear production	The spread of the pest in the EU could cause yield and quality losses in apple and pear production	The contribution of <i>B. kuwatsukai</i> on the impact of the diseases caused by Botryosphaeriaceae on apples and pears is unknown (Uncertainty 4)
Available measures (Section 3.6)	Phytosanitary measures are available to prevent the entry of the pathogen into the EU (e.g. sourcing host plants for planting and fruit from pest-free areas or pest-free places of production). In the case of <i>B. kuwatsukai</i> , inspection at the place of origin and the EU entry point is not fully effective to prevent the entry of the pathogen. There are no fully effective measures to prevent establishment and spread.	There are no fully effective measures to prevent the spread of the pathogen in the risk assessment territory.	Uncertainty on <i>B. kuwatsukai</i> 's host range (Uncertainty 1) Since <i>B. kuwatsukai</i> was characterised only recently, there is uncertainty about the distribution of <i>B. kuwatsukai</i> in the risk assessment area (Uncertainty 2) The distance over which ascospores of <i>B. kuwatsukai</i> could be disseminated by wind is uncertain (Uncertainty 3)
Conclusion on pest categorisation (Section 4)	<i>B. kuwatsukai</i> meets all the criteria assessed by EFSA above for consideration as a potential Union quarantine pest.	<i>B. kuwatsukai</i> is not known to occur in the EU. Therefore, it does not meet at least one of the criteria assessed by EFSA for consideration as a Union regulated non-quarantine pest	Since <i>B. kuwatsukai</i> was characterised only recently, there is uncertainty about the distribution of <i>B. kuwatsukai</i> in the risk assessment area (Uncertainty 2)
Aspects of assessment to focus on/ scenarios to address in future if appropriate	Given that all the data available in the literature have been explored, the Panel considers that a full PRA is unlikely to reduce the uncertainty related to the conclusion of this pest categorisation. This uncertainty can only be reduced by carrying out a survey in the risk assessment area, using appropriate identification methods (presently available from Xu et al. (2015)) to confirm that <i>B. kuwatsukai</i> is not present		

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Abbreviations

DG SANCO	Directorate General for Health and Consumers
EPPO	European and Mediterranean Plant Protection Organization
IPPC	International Plant Protection Convention
ITS	internal transcribed spacer
MS	Member State
PLH	EFSA Panel on Plant Health
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference