SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 22 March 2018

doi: 10.2903/j.efsa.2018.5245

Pest categorisation of *Anthonomus quadrigibbus*

EFSA Panel on Plant Health (EFSA PLH Panel),
Michael Jeger, Claude Bragard, David Caffier, Thierry Candresse, Elisavet Chatzivassiliou, Katharina Dehnen-Schmutz, Gianni Gilioli, Jean-Claude Grégoire, Josep Anton Jaques Miret, Maria Navajas Navarro, Björn Niere, Stephen Parnell, Roel Potting, Trond Rafoss, Vittorio Rossi, Gregor Urek, Ariena Van Bruggen, Wopke Van der Werf, Jonathan West, Stephan Winter, Ciro Gardi and Alan MacLeod

Abstract

The Panel on Plant Health performed a pest categorisation of the weevil *Anthonomus quadrigibbus* Say, (Coleoptera: Curculionidae), for the EU. *A. quadrigibbus* is a well-defined and distinguishable species, recognised as an occasional pest of apples, pears and sour cherries in North America where it also feeds on a range of wild rosaceous plants such as *Crataegus* and *Amelanchier*. Adults feed on leaves, flowers and fruit. Feeding damage to fruit reduces quality. Females oviposit into young fruit, causing surface blemishes and resulting in distortion as the fruit develops. Marketability is subsequently reduced. Larvae and pupae develop within host fruit. Most infested fruit fall prematurely, reducing yield. *A. quadrigibbus* was regarded as a more serious pest in the early 20th century. *A. quadrigibbus* is not known to occur in the EU and is listed in Annex IIAI of Council Directive 2000/29/EC under the synonym *Tachypterellus quadrigibbus*. Host plants for planting and infested fruit could potentially provide a pathway into the EU. Considering the climatic similarities between North America and Europe, and that wild and commercial hosts occur widely within the EU, *A. quadrigibbus* has the potential to establish within the EU. There would be one generation per year, as in North America. Impacts could be expected in apple, pear and perhaps sour cherry orchards. The level of impacts would be uncertain. There is also uncertainty regarding whether *A. quadrigibbus* would extend its host range to include other Rosaceae within the EU. Phytosanitary measures are available to reduce the likelihood of introduction of *A. quadrigibbus*. All criteria assessed by EFSA for consideration as a potential Union quarantine pest are met. As *A. quadrigibbus* is not known to occur in the EU, this criterion assessed by EFSA to consider it as a Union regulated non-quarantine pest is not met.

Keywords: Apple curculio, Curculionidae, European Union, pest risk, plant health, plant pest, quarantine

Requestor: European Commission

Question number: EFSA-Q-2017-00365

Correspondence: alpha@efsa.europa.eu

Panel members: Claude Bragard, David Caffier, Thierry Candresse, Elisavet Chatzivassiliou, Katharina Dehnen-Schmutz, Gianni Gilioli, Jean-Claude Grégoire, Josep Anton Jaques Miret, Michael Jeger, Alan MacLeod, Maria Navajas Navarro, Björn Niere, Stephen Parnell, Roel Potting, Trond Rafoss, Vittorio Rossi, Gregor Urek, Ariena Van Bruggen, Wopke Van der Werf, Jonathan West and Stephan Winter.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Jeger M, Bragard C, Caffier D, Candresse T, Chatzivassiliou E, Dehnen-Schmutz K, Gilioli G, Grégoire J-C, Jaques Miret JA, Navarro MN, Niere B, Parnell S, Potting R, Rafoss T, Rossi V, Urek G, Van Bruggen A, Van der Werf W, West J, Winter S, Gardi C and MacLeod A, 2018. Scientific Opinion on the pest categorisation of *Anthonomus quadrigibbus*. EFSA Journal 2018;16(4):5245, 24 pp. https://doi.org/10.2903/j.efsa.2018.5245

ISSN: 1831-4732

The EFSA Journal is a publication of the European Food Safety Authority, an agency of the European Union.

Table of contents

1. Introduction

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

1.1.1. Background

Council Directive 2000/29/EC[1] 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) 2016/2031[2] 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 178/2002[3], 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

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

(b) Bacteria

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

(c) Fungi

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

(d) Virus and virus-like organisms

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

Annex IIB

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

Anthonomus grandis (Boh.)
Cephalcia lariciphila (Klug)
Dendroctonus micans Kugelan
Gilphinia hercyniae (Hartig)
Gonipterus scutellatus Gyll.
Ips amitinus Eichhof
Ips cembrae Heer
Ips duplicatus Sahlberg
Ips sexdentatus Börner
Ips typographus Heer
Sternochetus mangiferae Fabricius

(b) Bacteria

Curtobacterium flaccumfaciens pv. flaccumfaciens (Hedges) Collins and Jones

(c) Fungi

Glomerella gossypii Edgerton

Gremmeniella abietina (Lag.) Morelet

Hypoxylon mammatum (Wahl.) J. Miller

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) *Carneocephala fulgida* Nottingham
2) *Draeculacephala minerva* Ball
3) *Graphocephala atropunctata* (Signoret)

Group of Tephritidae (non-EU) such as:

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

(c) Viruses and virus-like organisms

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

1) Andean potato latent virus
2) Andean potato mottle virus
3) Arracacha virus B, oca strain
4) Potato black ringspot virus
5) Potato virus T
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
2) Cherry rasp leaf virus (American)
3) Peach mosaic virus (American)
4) Peach phony rickettsia
5) Peach rosette mosaic virus
6) Peach rosette mycoplasm
7) Peach X-disease mycoplasm
8) Peach yellows mycoplasm
9) Plum line pattern virus (American)
10) Raspberry leaf curl virus (American)
11) Strawberry witches' broom mycoplasma
12) Non-EU viruses and virus-like organisms of *Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L.* and *Vitis L.*

Annex IIAI

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

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

1) *Margarodes vitis* (Phillipi)
2) *Margarodes vredendalensis* de Klerk
3) *Margarodes prieskaensis* Jakubski

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

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

(b) Fungi

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

(c) Viruses and virus-like organisms

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

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex IAII

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

The subject of this pest categorisation is listed in Appendix 1 of the terms of reference (ToR) as *Tachypterellus quadrigibbus* Say. It also appears in Annex II AI of 2000/29 EC in this format. We assume that the ToR and Annex II AI have mistakenly not used brackets around the name of the authority, and what was intended should appear as *Tachypterellus quadrigibbus* (Say). Furthermore, what is listed in ToR as *Tachypterellus quadrigibbus* Say, is assumed to be the organism which was originally described and named *Anthonomus quadrigibbus* by Thomas Say in 1831 (Crandal, 1905). Later it was placed in a new genus, *Tachypterellus,* by Dietz to become *Tachypterellus quadrigibbus* (Say). However, the revision was not sustained (e.g. Burke and Anderson, 1989) and the original classification by Say remains valid. For the purposes of this pest categorisation, the valid name *Anthonomus quadrigibbus* Say will be used. It is 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 (RNQP) for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States (MS) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search in the ISI Web of Science bibliographic database, using the names *Anthonomus quadrigibbus* and *Tachypterellus quadrigibbus* as search terms was conducted at the beginning of the categorisation. Relevant papers were reviewed and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plan Protection Organization (EPPO) Global Database (EPPO, 2017) and relevant publications.

Data about the 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 (Statistical Office of the European Communities).

The Europhyt database was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission, 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 MS and the phytosanitary measures taken to eradicate or avoid their spread.

2.2. Methodologies

The Panel performed the pest categorisation for *A. quadrigibbus* 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 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 RNQP in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required in accordance with the specific terms of reference 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 RNQP. If one of the criteria is not met, the pest will not qualify. A pest that does not qualify as a quarantine pest may still qualify as a RNQP that 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, whereas 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 or No)

Yes, the identity of the pest is established.

Anthonomus quadrigibbus Say is an insect in the Order Coleoptera (beetles) and the family Curculionidae (weevils).

Keys to identify the genus in North America are available (e.g. Kissinger, 1964; Anderson, 2002; Hernández et al., 2013). Clark (1991) provides a key to the *Anthonomus–Curvirostris* species group. List (1932) provides a key and a detailed description of the species under the synonym *T. quadrigibbus*.

A description of eggs, larva, pupa and adults is provided in Smith et al. (1997) and CABI (2017).

3.1.2. Biology of the pest

Anthonomus quadrigibbus has one generation per year. Adults emerge in the spring from their overwintering sites, such as leaf litter and orchard debris, and from within the soil beneath previously infested host trees (Ritcher, 1936; Hahn, 2007). In Iowa and New York State, adult emergence takes place from late April to mid-May when the temperature at ground level is at or above approximately 16°C (List, 1932; Hammer, 1933). On warm spring days, adults can fly and readily disperse to feed on hosts. Adults first feed on leaf petioles and shoot tips, flower buds then flowers, and finally on the developing small fruits (Smith et al., 1997). Adults mate, then females oviposit in host fruit. A female will puncture a host fruit and create a cavity with her rostrum. One egg is laid per fruit. The cavity is sealed with frass to protect the egg (Buckell, 1930; St. Pierre and Lehmkuhl, 1990). Crandal (1905) reported females laid eggs over a period of approximately 35 days, the average number of eggs laid per female was 66 (range 4–122). In Wisconsin, Ritcher (1936) reported most adult feeding activity and egg laying occurred in late May and early June. Depending on temperature, eggs usually hatch four or five days after oviposition, depending on temperature (Crandal, 1905). Larvae eat the flesh of infested fruit creating irregular tunnels, eventually reaching the core where larvae eat the ovules (Campbell et al., 1989). Larval development takes 20–30 days. There are three larval instars (Smith et al., 1997). Larvae remain within their host fruit and develop into pupae. Infested fruit generally drop prematurely (Campbell et al., 1989). If infested fruit do not drop, pressure on larvae and pupae caused by the continued growth and swelling of the fruit causes significant mortality to the immature stages, although some specimens will develop successfully (Smith et al., 1997). The likelihood of infested fruit being harvested is therefore reduced but not eliminated (Biosecurity Australia, 2009). Pupae develop over four to eight days (Ritcher, 1936) after which adults eat their way out of the fruit. In Maine (USA), the majority of adults emerge by mid-August; in New York State, adults can emerge up to mid-September (Smith et al., 1997). Once free from the host in which it developed, the adult may also feed on other host fruit. These activities last from mid to late summer until adults make their way to leaf litter to find an overwintering site (St. Pierre and Lehmkuhl, 1990).

3.1.3. Intraspecific diversity

List (1932) reported variation in the size of a number of morphological features within *T. quadrigibbus* and also variation in the number of setae on sternum VIII. He used the variation to distinguish two subspecies, *T. quadrigibbus magna* and *T. quadrigibbus quadrigibbus*. However, Burke and Anderson (1989) concluded that variation in the size of structural features is dependent on the size of host plant fruit within which development takes place, and that the variation in the number of setae overlapped between proposed subspecies. Overall such variation did not provide any justification for the recognition of subspecies.

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, *A. quadrigibbus* can be detected in the field. Yellow sticky traps can be used to capture flying adults. Visual inspection of host fruit can detect damage symptoms and fruit suspected of being infested can be cut open to find immature stages. The species can be identified by examining morphological features, for which keys exist.

Visual inspection of host fruit can detect damage symptoms e.g. small, round oviposition punctures (Hahn, 2007). Fruit suspected of being infested can be cut open to find immature stages (British Colombia MAF, 2016).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU (Table 2)

Table 2: Distribution of *Anthonomus quadrigibbus* outside the EU

Region	Country	Sub-national distribution (e.g. States/Provinces)	Occurrence
North America	Canada		Present, restricted distribution
		Alberta	Present, no details
		British Columbia	Present, no details
		Manitoba	Present, no details
		New Brunswick	Present, no details
		Nova Scotia	Present, no details
		Ontario	Present, no details
		Québec	Present, no details
		Saskatchewan	Present, no details
	Mexico		Present, restricted distribution
	USA		Present, widespread
		Alabama	Present, no details
		Arizona	Present, no details
		Arkansas	Present, no details
		California	Present, no details
		Colorado	Present, no details
		Connecticut	Present, no details
		Delaware	Present, no details
		Florida	Present, no details
		Georgia	Present, no details
		Idaho	Present, no details
		Illinois	Present, no details
		Indiana	Present, no details
		Iowa	Present, no details
		Kansas	Present, no details
		Kentucky	Present, no details
		Louisiana	Present, no details
		Maine	Present, no details
		Maryland	Present, no details
		Massachusetts	Present, no details
		Michigan	Present, no details
		Minnesota	Present, no details
		Mississippi	Present, no details

Region	Country	Sub-national distribution (e.g. States/Provinces)	Occurrence
		Missouri	Present, no details
		Montana	Present, no details
		Nebraska	Present, no details
		New Hampshire	Present, no details
		New Jersey	Present, no details
		New Mexico	Present, no details
		New York	Present, no details
		North Carolina	Present, no details
		North Dakota	Present, no details
		Ohio	Present, no details
		Oklahoma	Present, no details
		Oregon	Present, no details
		Pennsylvania	Present, no details
		Rhode Island	Present, no details
		South Carolina	Present, no details
		South Dakota	Present, no details
		Tennessee	Present, no details
		Texas	Present, no details
		Utah	Present, no details
		Vermont	Present, no details
		Virginia	Present, no details
		Washington	Present, no details
		West Virginia	Present, no details
		Wisconsin	Present, no details

Sources: EPPO Global database (2017); Bousquet (1991).

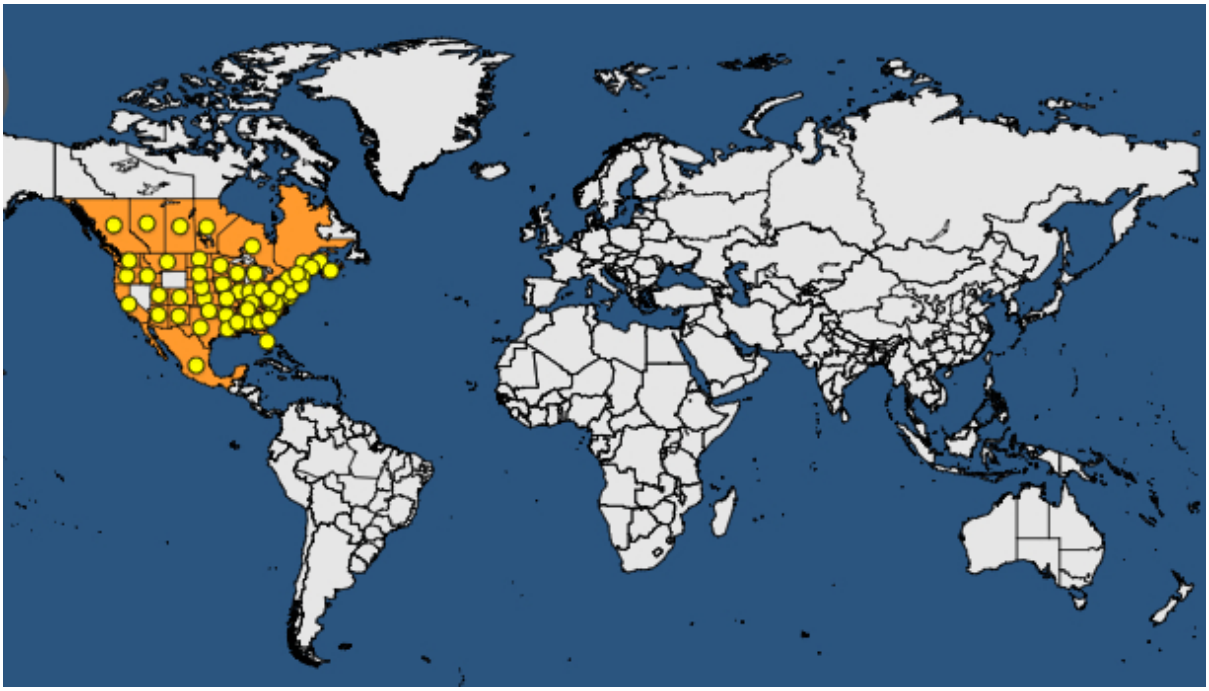

Figure 1: Global distribution of Anthonomus quadrigibbus (EPPO Global Database, Feb. 2017)

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 pest is not known to occur in the EU.

The pest is not known to occur in the EU. Slovenia declared that *A. quadrigibbus* was absent from its territory on the basis that there were no records of it in the country (EPPO, 2017).

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Tachypterellus (=*Anthonomus*) *quadrigibbus* is listed in Council Directive 2000/29/EC. Details are presented in Tables 3 and 4.

Table 3: *Tachypterellus* (=*Anthonomus*) *quadrigibbus* 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**	
(a)	Insects, mites and nematodes, at all stages of their development	
	Species	Subject of contamination
29	*Tachypterellus quadrigibbus* Say	Plants of *Cydonia* Mill., *Malus* Mill., *Prunus* L. and *Pyrus* L., other than seeds, originating in non-European countries

3.3.2. Legislation addressing the hosts of *Tachypterellus* (=*Anthonomus*) *quadrigibbus*

Table 4: Regulated hosts and commodities that may involve *Tachypterellus* (=*Anthonomus*) *quadrigibbus* 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 . . . *Cydonia* Mill., *Crateagus* L., *Malus* Mill., *Prunus* L., *Pyrus* L.,. . .., intended for planting, other than dormant plants free from leaves, flowers and fruit	Non-European countries
18.	Plants of *Cydonia* Mill., *Malus* Mill., *Prunus* L. and *Pyrus* 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	The special requirements on host plants of *Tachypterellus* (=*Anthonomus*) *quadrigibbus* that are listed in Annex IV do not relate specifically to *A. quadrigibbus* but to other pests of those host plants.	
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	
Part B	Plants, plant products and other objects originating in territories, other than those territories 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, ….*Prunus* L. …. 2) Parts of plants, other than fruits and seeds of : *Prunus* L. originating in non-European countries 3) Fruits of: … *Cydonia* Mill., … *Malus* Mill., … *Prunus* L., …. *Pyrus* L.,… originating in non-European countries

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Anthonomus quadrigibbus has a range of hosts within Rosaceae. The earliest records are from hawthorn (*Crataegus* spp.) and crab apples (*Malus* spp.) (Burke and Anderson, 1989). Apples (*Malus*), pears (*Pyrus*) and sour cherries (*Prunus cerasus*) are hosts of economic importance. Maier (1990) collected adult *A. quadrigibbus* emerging from native wild rosaceous fruits including *Amelanchier arborea* (downy juneberry), *Amelanchier canadensis* (common juneberry), *Amelanchier obovalis* (thicket shadbush), *Crataegus* sp. (hawthorn), *Prunus pensylvanica* (pin cherry) and *Prunus serotina* (black cherry). Maier (1990) noted that *A. quadrigibbus* had expanded its host range to include rosaceous fruits introduced into North America. There is therefore some potential, and uncertainty, that if the pest were introduced into the EU it could further expand its host range to feed on a wider range of plants within the Rosaceae, some of which could be commercially important in the EU.

Malus, Prunus and *Pyrus* plants for planting are largely prohibited from entering the EU from non-European countries; however, dormant plants (free from leaves, flowers and fruit) can be imported from the continental USA. Fortunately, *A. quadrigibbus* are unlikely to be closely associated with dormant hosts.

Wild hosts are not covered by 2000/29 EC in relation to *A. quadrigibbus.* However, no information about trade of wild hosts could be retrieved and so there is high uncertainty if they provide a pathway.

3.4.2. Entry

Is the pest able to enter into the EU territory? (Yes or No) If yes, identify and list the pathways!

Yes, eggs, larvae and pupae could potentially enter via imports of infested fruit, such as apples and pears from the USA and Canada.

Pathways for entry

- Fruit of *Malus, Pyrus, Prunus cerasus*;
- Plants for planting of *Malus, Pyrus, Prunus cerasus* and other rosaceous hosts, particularly if transported as potted plants with soil (e.g. bonsai plants).

EU import data for apples (HS 080810) and pears (HS 080830) from USA and Canada, 2012–2016, are shown in Table 5. There has been a noticeable decline in imports of apples over this period.

Table 5: EU 28 imports of fresh apple and pear fruit from USA and Canada, 2012–2016. (Hundreds of kg)

	2012	2013	2014	2015	2016
Fresh apples USA	104,901	120,811	90,047	62,117	42,906
Canada	8,292	1,250	1,980	2,450	2,354
Fresh pears USA	18,152	13,001	9,190	3,677	437
Canada	–	–	145	–	–

Source: Eurostat

Apples and pears are amongst the fruit from non-European countries that are inspected at import into the EU. There are no records of interception of *A. quadrigibbus* in the Europhyt database.

At harvest, some infested fruits may remain on the trees and some larvae may continue to develop (Smith et al., 1997), therefore fruit is a potential pathway (Biosecurity Australia, 2009).

Eurostat trade data poorly discriminates between species of plants for planting. Fortunately, the Netherlands NPPO kindly provided EFSA with detailed trade inspection data regarding plants for planting from 2012 to 2014 (Table 6). These data show that a number of host genera of plants for planting were imported from Canada and USA over the period 2012–2014, indicating that potential pathways exist for the entry of *A. quadrigibbus*.

Nevertheless, current measures aimed at the import of plants for planting in a dormant stage with no soil/growing medium/debris attached, decreases the likelihood of *A. quadrigibbus* being carried with imports of these plants.

Table 6: Imports of *Anthonomus quadrigibbus* host genera of plants for planting from Canada and USA into the Netherlands 2012–2014

Host genus	Canada			USA		
	2012	2013	2014	2012	2013	2014
Amelanchier	✓	✓	✓	–	–	✓
Malus	–	–	–	–	–	✓
Prunus	–	–	–	–	–	✓
Pyrus	–	–	–	–	–	✓

3.4.3. Establishment

Is the pest able to become established in the EU territory? (Yes or No)

Yes, host plants are available throughout the EU and host distribution overlaps with suitable climatic regions to support long term survival of *A. quadrigibbus* within the EU.

3.4.3.1. EU distribution of main host plants

Anthonomus quadrigibbus hosts such as *Malus* and *Pyrus* occur widely over the EU growing as commercial crops and in small orchards and home-gardens (de Rougemont, 1989). Hosts also occur as wild plants (e.g. *Crataegus, Prunus, Sorbus*). Figure 2 illustrates the agricultural area used to produce dessert apples in the EU. Note that the two NUT 1 areas in northern Italy that are shaded grey, indicating no data were available when the map was produced by EUROSTAT in 2012, are known to be regions with a large amount of apple production, e.g. Trentino Alto-Adige and Emilia-Romagna. Appendix 1 details the area of dessert apples and pears grown in individual EU Member States.

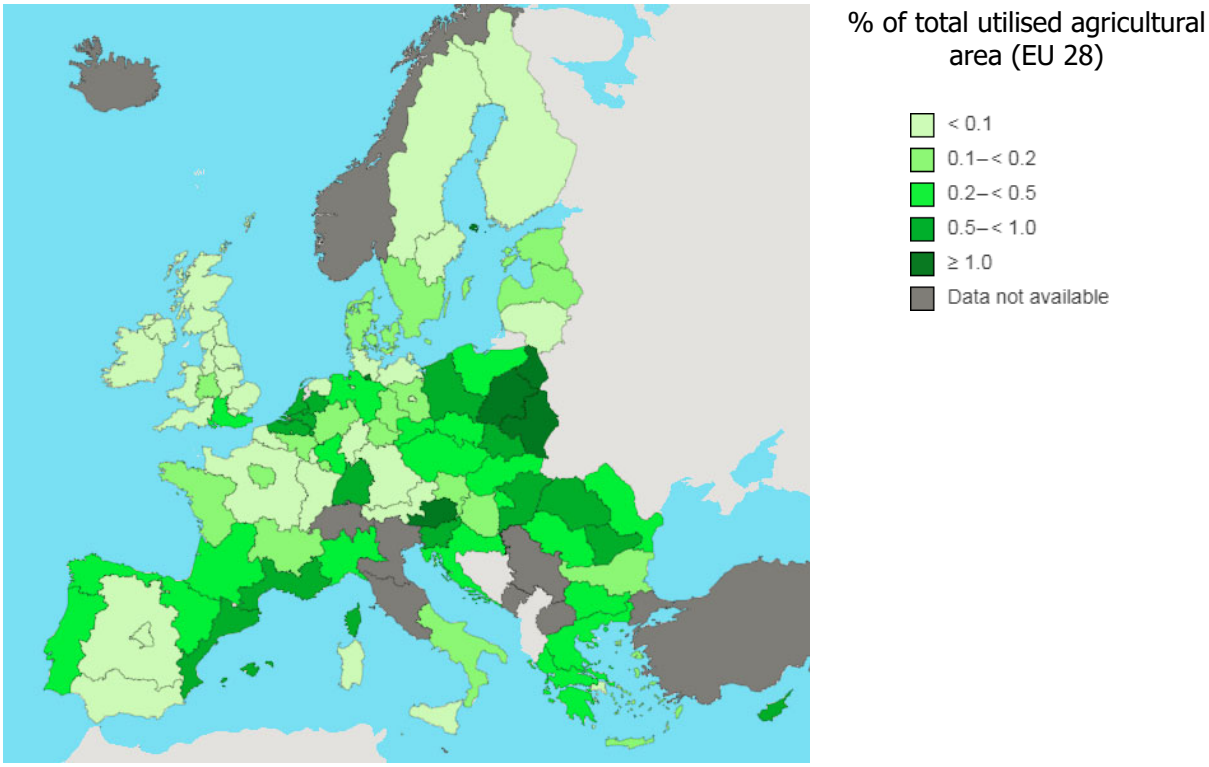

Figure 2: Production area for dessert apples within EU NUTS 1 regions (2012) (Source: Eurostat)

3.4.3.2. Climatic conditions affecting establishment

Anthonomus quadrigibbus is distributed across North America (see Figure 1) within a variety of Köppen–Geiger climate zones. The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern). In North America, *A. quadrigibbus* occurs in a number of zones such as Cfa (warm temperate, fully humid, hot summer) and Cfb (warm temperate, fully humid, warm summer), climate zones that also occur in the EU where *Malus*, *Pyrus* and *Prunus* are grown. We assume that climatic conditions in the EU will not limit the ability of *A. quadrigibbus* to establish.

3.4.4. Spread

Is the pest able to spread within the EU territory following establishment? (Yes or No) How?

Yes, *A. quadrigibbus* is a free living organism, adults can walk and will fly in warm conditions. Dispersal is generally localised.

RNQPs: Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects?

Spread would not primarily be via plants for planting. Natural dispersal would be the main mechanism for spread.

Adults are good fliers (Smith et al., 1997). Eggs, larvae and pupae could be carried in infested fruit although most infested fruit drops prematurely. Disposal of fallen fruit could facilitate spread of *A. quadrigibbus* away from orchards. Where there are recent reports of *A. quadrigibbus* causing damage in orchards, it is noted that the damage occurs at the edges of orchards, where wild hosts in hedgerows are nearest to commercial production (British Columbia MAF, 2016). This suggests that adults do not disperse widely throughout orchards.

3.5. Impacts

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

Yes, the introduction of *A. quadrigibbus* into EU apple and pear orchards could potentially impact on yield and fruit quality.

RNQPs: Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?[4]

A. quadrigibbus is not normally associated with host plants for planting (i.e. dormant fruit plants), instead it feeds on hosts when actively growing.

In the early 20th century, *A. quadrigibbus* was considered a major pest that caused serious injury to apple crops with up to 50% of apples in some Canadian orchards being damaged (Campbell et al., 1989). Most of the damage occurred in uncultivated orchards, presumably where wild hosts were also present. However, since the 1940s and 1950s, the significance of the organism has declined, presumably due to the use of pesticides in fruit orchards, with only occasional outbreaks being reported. Nevertheless, *A. quadrigibbus* still occasionally causes local damage in some parts of North America (Burke, 1976). Steeves et al. (1979) reported *A. quadrigibbus* as an emerging pest of *Amelanchier alnifolia*, a native North American shrub of the prairie regions, bearing fruit known as juneberries. The plant has been brought into cultivation and named varieties are commercially available. A Minnesota extension worker, Hahn (2007) described *A. quadrigibbus* as uncommon and of no general concern in Minnesota. In British Columbia, Canada, *A. quadrigibbus* is considered an occasional pest of apples grown towards the edges of orchards (British Columbia MAF, 2016).

Adults damage fruit by making small punctures as they feed and oviposit. The damage can cause the fruit to become lumpy and misshapen, damage is worst on young fruit (British Columbia MAF, 2016). Infested fruit that drop early result in a loss in yield (British Columbia MAF, 2016).

Newly developed adults emerging in the summer feed on fruit that is larger and more developed. Feeding damage causes shallow excavations over the surface of the fruit. The feeding area can become brown and shrunken as moisture evaporates through the damaged surface (Ritcher, 1936). Wounds close together on a fruit can result in deadened depressions resulting in low fruit quality, reducing marketability (Hahn, 2007; British Columbia MAF, 2016).

CABI (2017) concludes that *A. quadrigibbus* is an occasional, sometimes significant, pest in commercial apple, pear and possibly sour cherry orchards.

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, entry could be inhibited if plants for planting are sourced from pest free areas or checked for pest presence (overwintering adults) in growing media. Existing measures could be applied to all other hosts.

Consignments of fruit that could potentially carry the pest could be inspected.

RNQPs: Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?

A. quadrigibbus does not occur in the EU so RNQP status is not being considered.

3.6.1. Phytosanitary measures

- Existing measures for *Cydonia* Mill., *Crateagus* L., *Malus* Mill., *Prunus* L. and *Pyrus* L., could be applied to other hosts (import only when dormant).

[4] See Section 2.1 on what falls outside EFSA's remit.

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

- Eggs, larvae and pupae develop inside fruit where they are protected from contact insecticides and natural enemies.
- If adults overwinter in the soil/growing media around plants for planting, the overwintering adults could be transported with the dormant plants.

3.6.2. Pest control methods

- Alternative (wild) hosts should be removed from around orchards (Maier, 1990).
- Leaf litter and debris should be cleared from beneath trees to reduce overwintering sites (Spencer and Morton, 2017).
- Chemical control would best be applied in the spring against ovipositing adults or during the summer when newly developed adults are feeding.

3.7. Uncertainty

While there are uncertainties around the seriousness of this pest in North America, it does satisfy the criteria that the EFSA Panel on Plant Health has been asked to consider as regards its potential status as a Union quarantine pest.

Literature describing impacts report the damage in apples and list pears and occasionally sour cherries as other commercial crop hosts. There is uncertainty regarding the significance of *A. quadrigibbus* in pear and sour cherry orchards today.

4. Conclusions

Anthonomus quadrigibbus meets the criteria assessed by the EFSA Plant Health Panel required to satisfy the definition of a Union quarantine pest (Table 7).

Table 7: 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 well established; it can be identified to species using conventional entomological keys.	The identity of the pest is well established; it can be identified to species using conventional entomological keys.	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. (A criterion to satisfy the definition of a regulated non-quarantine pest is that the pest must be present in the risk assessment area)	None
Regulatory status (Section 3.3)	The pest is listed in II AI of 2000/29 EC and is currently regulated on *Cydonia*, *Malus*, *Prunus* and *Pyrus* from non-European countries	The pest is listed in II AI of 2000/29 EC and is currently regulated on *Cydonia*, *Malus*, *Prunus* and *Pyrus* from non-European countries	None

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
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. Pathways include larvae and pupae in infested host fruit and overwintering adults in the soil around the roots of dormant plants for planting. Pathways involving unregulated hosts, represent unmanaged risk	If *A. quadrigibbus* established within the EU, plants for planting would not be the principle mechanism for further spread. As a mobile insect, capable of flight, spread would occur naturally. (A criterion to satisfy the definition of a RNQP is that spread should primarily be via plants for planting – *A. quadrigibbus* does not meet this criterion)	None
Potential for consequences in the EU territory (section 3.5)	The establishment of the pest in the EU could potentially cause yield and quality losses to apples, pears and perhaps sour cherries	*A. quadrigibbus* is not normally associated with host plants for planting (i.e. dormant fruit plants), instead it feeds on hosts when actively growing	Literature focusses on impacts on apples although pears and sour cherries are noted as hosts of commercial importance too. There is uncertainty regarding the significance of yield and quality losses in pears and sour cherries
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry into the EU, e.g. sourcing fruit from pest free areas; sourcing host plants for planting from pest free areas; prohibiting soil from being carried with host plants for planting	Host plants for planting should be imported soil free to minimise the likelihood that overwintering adults are carried with dormant hosts	None
Conclusion on pest categorisation (Section 4)	*Anthonomus quadrigibbus* satisfies all of the criteria assessed by EFSA PLH Panel to satisfy the definition of a Union quarantine pest	*Anthonoimus quadrigibbus* does not meet the criteria of (a) occurring in the EU territory, and (b) plants for planting being the principal means of spread. Hence it does not satisfy all of the criteria that are within the remit of EFSA PLHP to assess to be regarded as a Union RNQP	None
Aspects of assessment to focus on/ scenarios to address in future if appropriate	Any future assessment should focus on likelihood of entry, either via fruit or plants for planting. Smith et al. (1997) noted that measures already in place to protect against other North American fruit pests would adequately protect against the introduction on *A. quadrigibbus*		

References

Anderson RS, 2002. Curculionidae. In: Arnett RHJr, Thomas MC, Skelley P (eds.). American Beetles. Polyphaga: Scarabaeoidea through Curculionoidea. CRC Press LLC, Boca Raton, USA. pp. 722–815.

Biosecurity Australia, 2009. Draft import risk analysis report for fresh apple fruit from the United States of America Pacific Northwest states. Biosecurity Australia, Canberra. Available online: http://www.agriculture.gov.au/SiteCollectionDocuments/ba/plant/ungroupeddocs/2009-26_BAA__Draft_US_Apples_IRA.pdf [Accessed: 10th Feb 2018]

Bousquet Y (ed.), 1991. Checklist of beetles of Canada and Alaska. Ottawa, Canada: Research Branch Agriculture Canada Publication 1861/E.

British Columbia Ministry of Agriculture, 2016. Apple Curculio (*Anthonomus quadrigibbus*) factsheet, March 2016. Available online: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/plant-health/phu-apple-curculio2.pdf [Accessed: 8th November 2017]

Buckell ER, 1930. The apple curculio as a pear pest in British Columbia. The Canadian Entomologist, LXII, 3, 47–49.

Burke HR, 1976. Bionomics of the Anthonomine weevils. Annual Review of Entomology, 21, 283–303.

Burke HR and Anderson RS, 1989. Systematics of species of *Anthonomus* Germar previously assigned to *Tachypterellus* Fall and Cockerell (Coleoptera: Curculionidae). Annals of the Entomological Society of America, 82, 426–437.

CABI, 2017. *Anthonomus quadrigibbus* (apple curculio). CABI Crop Protection Compendium Datasheet 52626, Last updated 10 July 2017. Available online: https://www.cabi.org/cpc/datasheet/52616 [Accessed: 8th November 2017]

Campbell JM, Sarazin MJ and Lyons DB, 1989. Canadian beetles (Coleoptera) injurious to crops, ornamentals, stored products and buildings. Research Branch Agriculture Canada, Publication No. 1826. 491 pp.

Clark WE, 1991. The Anthonomus-Curvirostris species group (Coleoptera, Curculionidae). Transactions of the American Entomological Society, 117, 39–66.

Crandal CS, 1905. The curculio and the apple. University of Illinois Agricultural Experiment Station Bulletin No. 98. 467-557.

EFSA PLH Panel (EFSA Panel on Plant Health), 2010. PLH Guidance on a harmonised framework for pest risk assessment and the identification and evaluation of pest risk management options by EFSA. EFSA Journal 2010;8(2):1495, 66 pp. https://doi.org/10.2903/j.efsa.2010.1495

EPPO (European and Mediterranean Plant Protection Organization), 2017. EPPO Global Database. Available online: https://gd.eppo.int

FAO (Food and Agriculture Organization of the United Nations), 2004. ISPM (International Standards for Phytosanitary Measures) 21—Pest risk analysis of regulated non-quarantine pests. FAO, Rome, 30 pp. Available online: https://www.ippc.int/sites/default/files/documents//1323945746_ISPM_21_2004_En_2011-11-29_Refor.pdf

FAO (Food and Agriculture Organization of the United Nations), 2013. ISPM (International Standards for Phytosanitary Measures) 11—Pest risk analysis for quarantine pests. FAO, Rome, Italy. p. 36.

Hahn J, 2007. Apple curculio. University of Minnesota Extension Service. Information sheet. Available online: https://www.extension.umn.edu/garden/insects/find/apple-curculio/ [Accessed: 8th November 2017]

Hammer OH, 1933. Further studies on the control of the apple curculio in the Champlain Valley. Journal of Economic Entomology, 26, 420–424.

Hernández MS, Jones RW and Castillo PR, 2013. A key to the Mexican and Central America Genera of Anthonomini (Curculionidae, Curculioninae). ZooKeys, 260, 31–47. https://doi.org/10.3897/zookeys.260.3989

Kissinger DG, 1964. Curculionidae of America North of Mexico. A key to the Genera. Taxonomic Publication, South Lancaster, Massachusetts. p. 143.

Kottek M, Grieser J, Beck C, Rudolf B and Rubel F, 2006. World map of Köppen- Geiger climate classification updated. Meteorologische Zeitschrift, 15, 259–263.

List GM, 1932. A cherry pest in Colorado. Bulletin of the Colorado State University Agricultural Experiment Station, 385, 1–106.

Maier CT, 1990. Native and exotic rosaceous hosts of apple, plum, and quince curculio larvae (Coleoptera: Curculionidae) in the Northeastern United States. Journal of Economic Entomology, 83, 1326–1332.

Ritcher PO, 1936. Larger apple curculio in Wisconsin. Journal of Economic Entomology, 29, 697–701.

de Rougemont GM, 1989. A field guide to the crops of Britain and Europe. Collins Sons and Co., Ltd., London, England.

Smith IM, McNamara DG, Scott PR and Holderness M (eds.). 1997. Anthonomus quadrigibbus. In: Quarantine pests for Europe, 2nd Edition., CABI/EPPO, Wallingford, USA, 1425 pp.

Spencer R and Morton D, 2017. Insect of the month, Apple Curculio. Hort Snacks June 2017, p8. http://www1.agric.gov.ab.ca/$department/newslett.nsf/pdf/snack26584/$file/HortSnacks-June2017.pdf?OpenElement [Accessed: 8th November 2017]

St. Pierre RG and Lehmkuhl DM, 1990. Phenology of *Hoplocampa montanicola* Rohwer (Tenthredinidae) and *Anthonomus quadrigibbus* Say (Curculionidae) on their host plant *Amelanchier alnifolia* Nutt. (Rosaceae) in Saskatchewan. The Canadian Entomologist, 122, 901–906.

Steeves TA, Lehmkuhl DM and Bethune TD, 1979. Damage to saskatoons, *Amelanchier alnifolia*, by the apple curculio, *Tachypterellus quadrigibbus* (Coleoptera: Curculionidae). Canadian Entomologist, 111, 641–648.

Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
MS	Member State
PLH	EFSA Panel on Plant Health
RNQP	regulated non-quarantine pest
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

Appendix A – Area of apple and pear orchards in EU Member States 2012–2016

A.1. Dessert apple orchard area (Thousand ha)

	2012	2013	2014	2015	2016
EU (28 countries)	548.36	558.62	536.75	524.50	538.00
Belgium	7.75	7.14	7.06	7.07	6.87
Bulgaria	4.90	4.62	4.81	3.95	4.77
Czech Republic	9.30	9.37	8.98	8.96	8.31
Denmark	1.56	1.43	1.38	1.38	1.39
Germany	31.76	31.74	31.74	31.74	31.74
Estonia	0.90	0.70	0.90	0.90	0.60
Ireland	0.62	0.62	0.62	0.64	0.64
Greece	13.48	12.47	12.93	12.26	11.85
Spain	31.51	30.79	30.79	30.73	30.72
France	52.80	51.79	50.68	50.17	49.65
Croatia	6.55	5.78	5.80	5.94	5.27
Italy	54.07	54.13	53.01	52.00	52.16
Cyprus	0.84	0.86	0.63	0.61	0.61
Latvia	2.80	2.50	2.80	2.70	2.40
Lithuania	10.11	11.83	11.67	11.27	10.68
Luxembourg	0.24	0.24	0.24	0.24	0.24
Hungary	33.09	32.04	33.36	33.26	32.80
Malta	0.00	0.00	0.00	0.00	0.00
Netherlands	8.27	7.95	7.91	7.85	7.60
Austria	6.05	6.05	6.97	6.76	6.62
Poland	183.50	194.70	162.40	163.10	180.40
Portugal	12.54	12.90	13.66	13.85	14.01
Romania	52.72	55.37	60.28	56.13	55.88
Slovenia	2.73	2.70	2.64	2.55	2.47
Slovakia	2.29	2.91	3.65	2.56	2.38
Finland	0.67	0.59	0.59	0.60	0.63
Sweden	1.31	1.41	1.26	1.29	1.33
United Kingdom	16.00	16.00	20.00	16.00	16.00

Source: Eurostat.

A.2. Pear orchard area (Thousand ha)

	2012	2013	2014	2015	2016
EU (28 countries)	124.66	120.38	117.01	117.59	116.76
Belgium	8.58	8.92	9.08	9.34	9.69
Bulgaria	0.44	0.45	0.34	0.53	0.41
Czech Republic	0.93	0.90	0.88	0.79	0.74
Denmark	0.37	0.35	0.36	0.34	0.30
Germany	1.93	1.93	1.93	1.93	1.93
Estonia	0.00	0.00	0.00	0.00	0.00
Ireland	0.00	0.00	0.00	0.00	0.00
Greece	4.91	4.80	4.97	4.95	4.08
Spain	25.48	24.24	23.64	22.88	22.55
France	5.54	5.35	5.36	5.37	5.30
Croatia	1.17	0.80	1.04	0.69	0.94

	2012	2013	2014	2015	2016
Italy	34.24	31.53	30.15	30.86	32.29
Cyprus	0.10	0.09	0.08	0.07	0.07
Latvia	0.20	0.20	0.20	0.20	0.20
Lithuania	0.85	0.86	0.90	0.87	0.80
Luxembourg	0.02	0.02	0.02	0.02	0.02
Hungary	2.79	3.00	2.89	2.88	2.88
Malta	0.00	0.00	0.00	0.00	0.00
Netherlands	8.17	8.51	8.60	9.23	9.40
Austria	0.40	0.48	0.44	0.45	0.46
Poland	10.90	9.50	9.20	9.20	7.49
Portugal	11.23	12.01	12.01	12.12	12.11
Romania	3.90	3.91	3.46	2.91	3.15
Slovenia	0.21	0.22	0.21	0.20	0.20
Slovakia	0.16	0.17	0.13	0.11	0.11
Finland	0.00	0.00	0.00	0.04	0.04
Sweden	0.15	0.14	0.13	0.13	0.12
United Kingdom	2.00	2.00	1.00	1.48	1.50

Source: Eurostat (http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tag00120&language=en).