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Pest categorisation of non-EU *Choristoneura* spp.

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Abstract

The Panel on Plant Health performed a pest categorisation of non-EU *Choristoneura* spp. *Choristoneura* is a well-defined insect genus in the family Tortricidae (Insecta: Lepidoptera). Species can be identified using taxonomic keys and molecular methods. The genus includes 52 species and subspecies colonising conifers and non-conifer trees in many areas in the world, among which five species are present in the EU. The non-EU species are listed in Annex IAI of Council Directive 2000/29/EC as *Choristoneura* spp. (non-European). Some *Choristoneura* species are important defoliators in North America, mainly on conifers but also on several broadleaf tree species and on non-forest crops. Females lay eggs in batches on the needles or the leaves, and overwintering occurs at the larval stage in a silken hibernaculum. Most species are univoltine, some are bivoltine and at least one subspecies has a 2-year life cycle. Pupation occurs on the twigs of conifers or in folded leaves of broadleaf trees. The adults are strong flyers, and the larvae can disperse by ballooning. The main pathways for entry are plants for planting, cut branches, fruits of host plants (including cones), round wood with bark and bark. Suitable host plants and climate would allow the establishment in the EU of the known, North American harmful species. Non-EU *Choristoneura* spp. satisfy all the criteria to be considered as Union quarantine pests. Measures are in place to prevent the introduction of non-EU *Choristoneura* spp. through the pathways described above. As non-EU *Choristoneura* spp. are not present in the EU and plants for planting are not the major pathway for spread, non-EU *Choristoneura* spp. do not meet the criteria to be considered as regulated non-quarantine pests.

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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> (Moultx)
<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) Dye and
<i>Erwinia stewartii</i> (Smith) Dye	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

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

(b) Bacteria

<i>Curtobacterium flaccumfaciens</i> pv. <i>flaccumfaciens</i> (Hedges) Collins and Jones

(c) Fungi*Glomerella gossypii* Edgerton*Hypoxyton 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> Coquillett | 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 pruinosus</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 <i>sensu lato</i> (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 IAI

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

<i>Meloidogyne fallax</i> Karssen	<i>Rhizoecus hibisci</i> Kawai and Takagi
<i>Popillia japonica</i> Newman	

(b) Bacteria

<i>Clavibacter michiganensis</i> (Smith) Davis et al. ssp. <i>sepedonicus</i> (Spieckermann and Kotthoff) Davis et al.	<i>Ralstonia solanacearum</i> (Smith) Yabuuchi et al.
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(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

Choristoneura spp. (non-EU species) are listed in the Appendices to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether they fulfil 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 on *Choristoneura* spp. was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the genus and its species as search terms. 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 Plant Protection Organization (EPPO) Global Database (EPPO, 2019) 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 *Choristoneura* spp., following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018) and in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

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.

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)
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?

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
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, the identity of the genus *Choristoneura* is well established. The different species can be identified using taxonomic keys, and molecular methods based on mitochondrial cytochrome oxidase subunit I and nuclear ribosomal 28S genes. Both genes have been used to construct a phylogeny.

Choristoneura Lederer is an insect genus in the family Tortricidae (Insecta: Lepidoptera). Global reviews of the genus have been proposed by Razowski (1992 in Fagua et al. 2019) and Dang (1992 in Fagua et al. 2018). The Tortricid Net (2019) lists 54 species worldwide, including six European species. Fagua et al. (2018) defined the limits of the genus by reconstructing a phylogeny using DNA sequences for mitochondrial COI and nuclear ribosomal 28S genes collected from 23 *Choristoneura* species. Their conclusions resulted in reducing the total number of *Choristoneura* species as listed in the Tortricid Net (2019) and clarified the nomenclature regarding two major North American pests, *C. occidentalis* and *C. biennis*. A synthesis of these taxonomic issues is provided in Appendix A which lists 47 non-European species and subspecies, and Appendix B, which lists 5 European species. The taxonomic issues described above are reflected in the literature on *Choristoneura* spp. For example, Alfaro et al. (2014) refer to '*C. occidentalis*' in southern British Columbia without specifying the subspecies, or Stark and Borden (1965) refer to *C. lambertiana subretiniana*, a subspecies which does

not exist anymore in the current catalogue. Of particular interest from the standpoint of forest health is the 'spruce budworm (*Choristoneura fumiferana*) species complex' (henceforth SBW), which comprises *C. pinus*, *C. fumiferana*, *C. retiniana*, *C. carnana*, *C. lambertiana*, *C. occidentalis occidentalis*, *C. occidentalis biennis*, and *C. orae* (Dupuis et al., 2017).

3.1.2. Biology of the pest

The genus *Choristoneura* comprises many species attacking many host plants in many different geographic areas. From the information available regarding a relatively small number of species, a general description of the biology of the genus can be attempted, with the possibility however, that some yet poorly described species may behave differently. Nealis (2016) reviewed the natural history of the SBW. Holsten (1988) provided information regarding the species attacking aspen, *C. conflictana*. Chapman et al. (1968) described the bionomics of *C. rosaceana*, a pest of apple trees and other broadleaf hosts. Stuart and Polavarapu (1998) studied the life cycle of *C. parallela*, a pest of cranberry in New Jersey. Stark and Borden (1965) studied the life history of *C. lambertiana subretiniana*, which primarily feeds on the flowers and cones of *Pinus contorta*. The population dynamics of *C. fumiferana* was fully analysed by Royama (1984). The cyclic outbreaks of many species have been studied by many authors (e.g. Royama, 1984; Alfaro et al., 2014; Navarro et al., 2018).

The eggs are laid on leaves (i.e. needles in the case of conifers) (Figures 1 and 2). Egg masses comprise 20–80 eggs (SBW), and female life fecundity is 80–220 eggs (Nealis, 2016). In *C. rosaceana*, more than 250 eggs can be found in an egg mass (Omeg, 2001). The young caterpillars start feeding on the needles but, in some species (e.g. *C. lambertiana subretiniana*, *C. occidentalis*, *C. pinus*) the young first instar larvae quickly turn to flowers or cones (Stark and Borden, 1965; Dewey, 1970; Nealis and Lomic, 1994). The larvae spin a hibernaculum on the twigs, in which they overwinter. There are six to eight larval instars (Stark and Borden, 1965; Nealis, 2016). After the winter, the larvae feed on previous year's needles and then forage sometimes widely, searching for buds of the year (SBW), or feed on leaves. In SBW, pupation occurs in the spring (Figures 3 and 4), and the adults emerge in the summer, except in the 'two year cycle spruce budworm' (Nealis, 2016) which briefly feed in the spring of the first year then, in the summer, establish a second hibernaculum where they stay in diapause until the spring of the second year. *C. parallela* and *C. rosaceana* have two generations per year (Stuart and Polavarapu, 1998; Omeg, 2001).

Cyclic outbreaks are observed in several SBW species. Their periodicity and duration have been analysed using dendrochronological data, sometimes over large periods. Alfaro et al. (2014) studied *C. occidentalis* in southern British Columbia (Canada) over four centuries and found a mean return interval of 28 years, whilst Royama (1984) reported an average period of 35 years for *C. fumiferana* in New Brunswick (Canada) during two hundred years before his publication. A larger review of SBW outbreak periodicity and intensity is provided by Nealis (2016). The biotic and abiotic causes of these fluctuations have been analysed by Royama (1984).

Larvae can disperse in search for food by walking or ballooning (Stuart and Polavarapu, 1998) and adults can fly long distances (see Section 3.4.4). The sex pheromones of the coniferophagous *Choristoneura* spp. have been reviewed by Silk and Kuenen (1988).

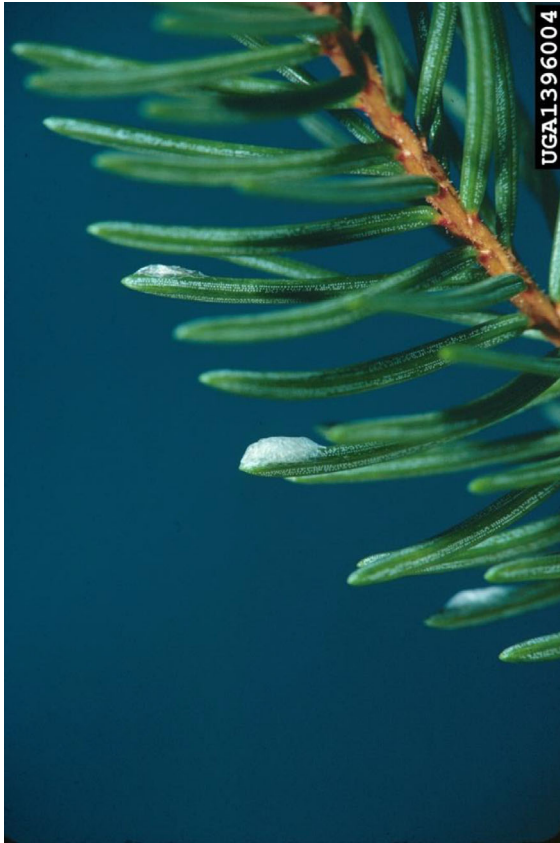


Figure 1: *C. fumiferana*: egg masses on spruce needles. Photo: USDA Forest Service – Northeastern Area, Bugwood.org



Figure 2: *C. conflictana* eggs on *Populus tremuloides* leaves. Photo: Steven Katovich, USDA Forest Service, Bugwood.org



Figure 3: *C. lambertiana*: pupae on a twig. Photo: Bernard J. Raimo, USDA Forest Service, Bugwood.org



Figure 4: *C. conflictana* pupa on *Populus tremuloides*. Photo: William M. Ciesla, Forest Health Management International, Bugwood.org

3.1.3. Intraspecific diversity

The hybrid progeny of 2-year cycle spruce budworm parents (*C. occidentalis biennis*) and univoltine, *C. occidentalis occidentalis* parents can be either univoltine or biennial depending on photoperiod, suggesting that heritable traits and environmental factors both influence voltinism (Nealis, 2005, 2016). Another case of natural hybridisation, between *C. occidentalis* and *C. retiniana*, has been reported in Oregon (USA) by Volney et al. (1984).

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, the pest can be detected visually by its symptoms, and some species can be monitored using pheromone traps. The different species can be identified using taxonomic keys, and molecular methods based on mitochondrial cytochrome oxidase subunit I and nuclear ribosomal 28S genes.

The attacked trees show light to very heavy defoliation. Light defoliation concerns the buds of conifers and the leaves of broadleaf hosts, which are folded by the caterpillars, using silk threads. After heavy defoliation the trees can be completely leafless. Some species mine the cones of conifers. *C. rosaceana* also attacks the fruits of its hosts.

A comprehensive list of *Choristoneura* spp. pheromones can be found in the Pherobase (2019). A review of the pheromones of the coniferophagous *Choristoneura* species has been published by Silk and Kuenen (1988).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

Non-EU *Choristoneura* are present in North America, Asia, Africa (sub-Saharan) and the Canary Islands.⁴ Sixteen species and subspecies have been reported in North America, 17 in Asia, 12 in Africa and one in the Canary Islands. For a complete list of non-EU *Choristoneura*, see Appendix A. The geographic distribution of some important pests of the genus *Choristoneura* is presented in Figures 5–8.

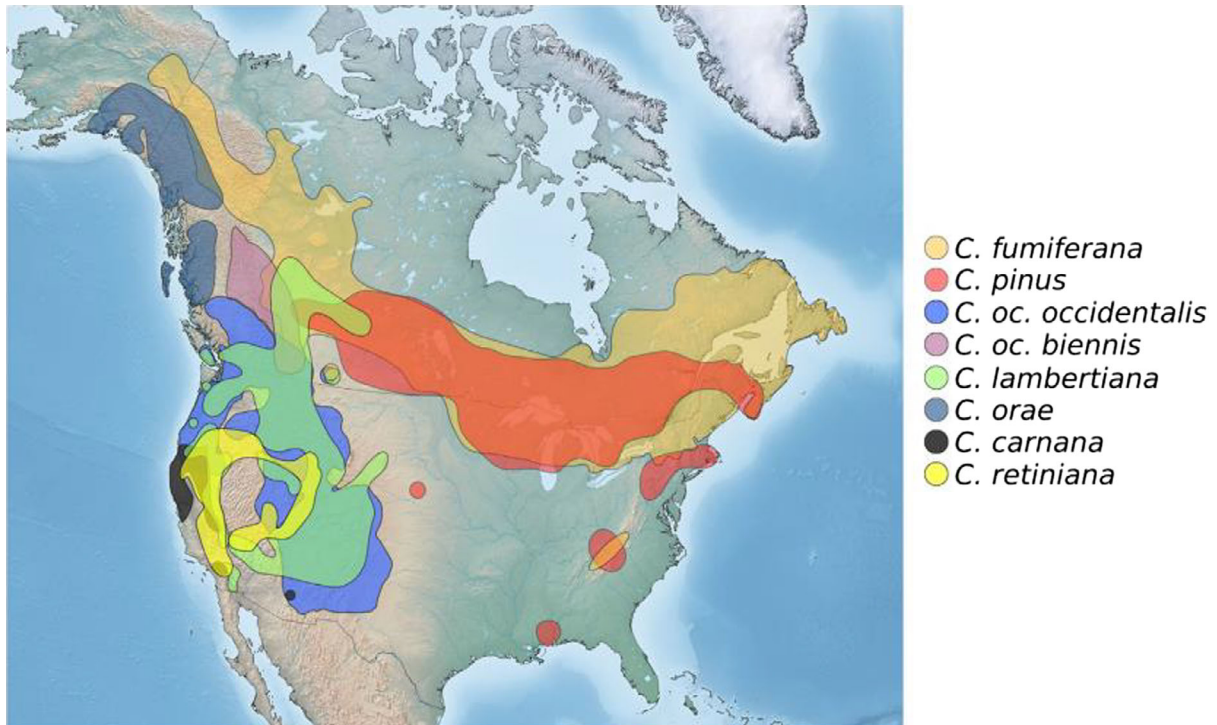


Figure 5: Geographic distribution of the *Choristoneura fumiferana* species complex. Source: Dupuis et al. (2017)

⁴ In the sense of phytosanitary terms, in line with Article 1 point 3 of Regulation (EU) 2016/2031, the Canary Islands are considered as Third Countries though they are part of Spain.

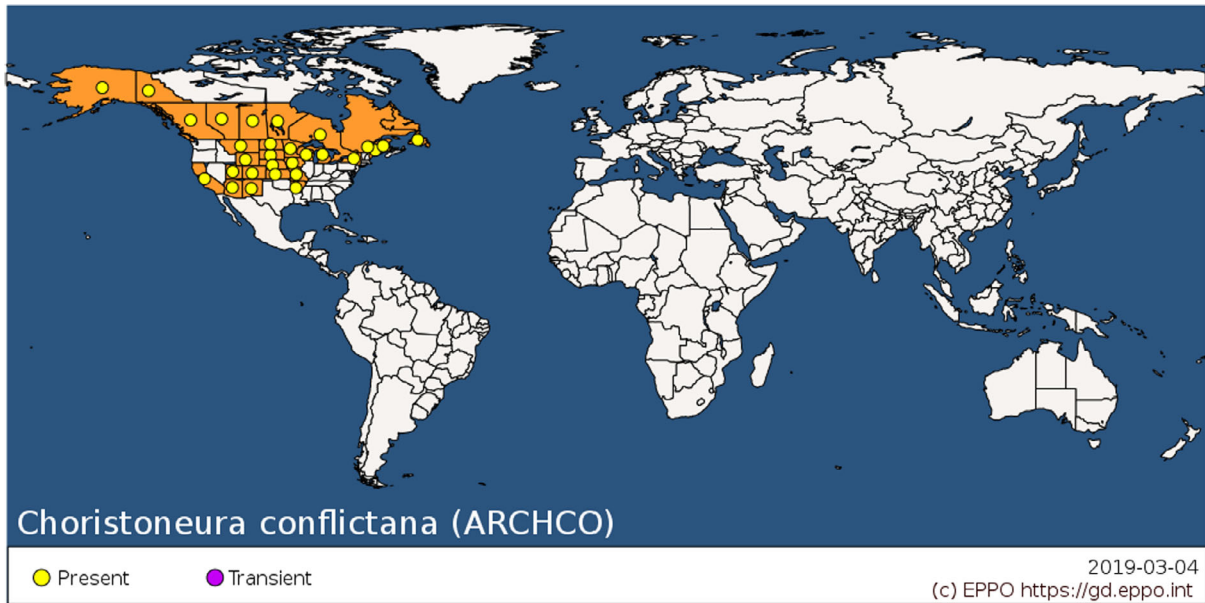


Figure 6: Global distribution map for *Choristoneura conflictana* (extracted from the EPPO Global Database accessed on 4 March 2019)

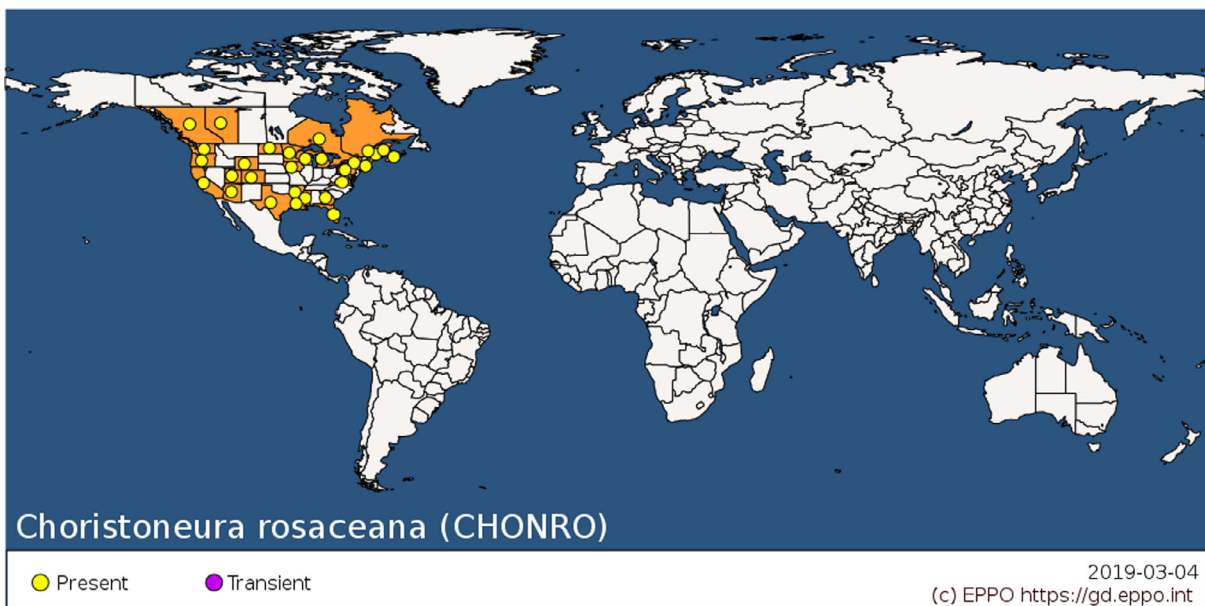


Figure 7: Global distribution map for *Choristoneura rosaceana* (extracted from the EPPO Global Database accessed on 4 March 2019)

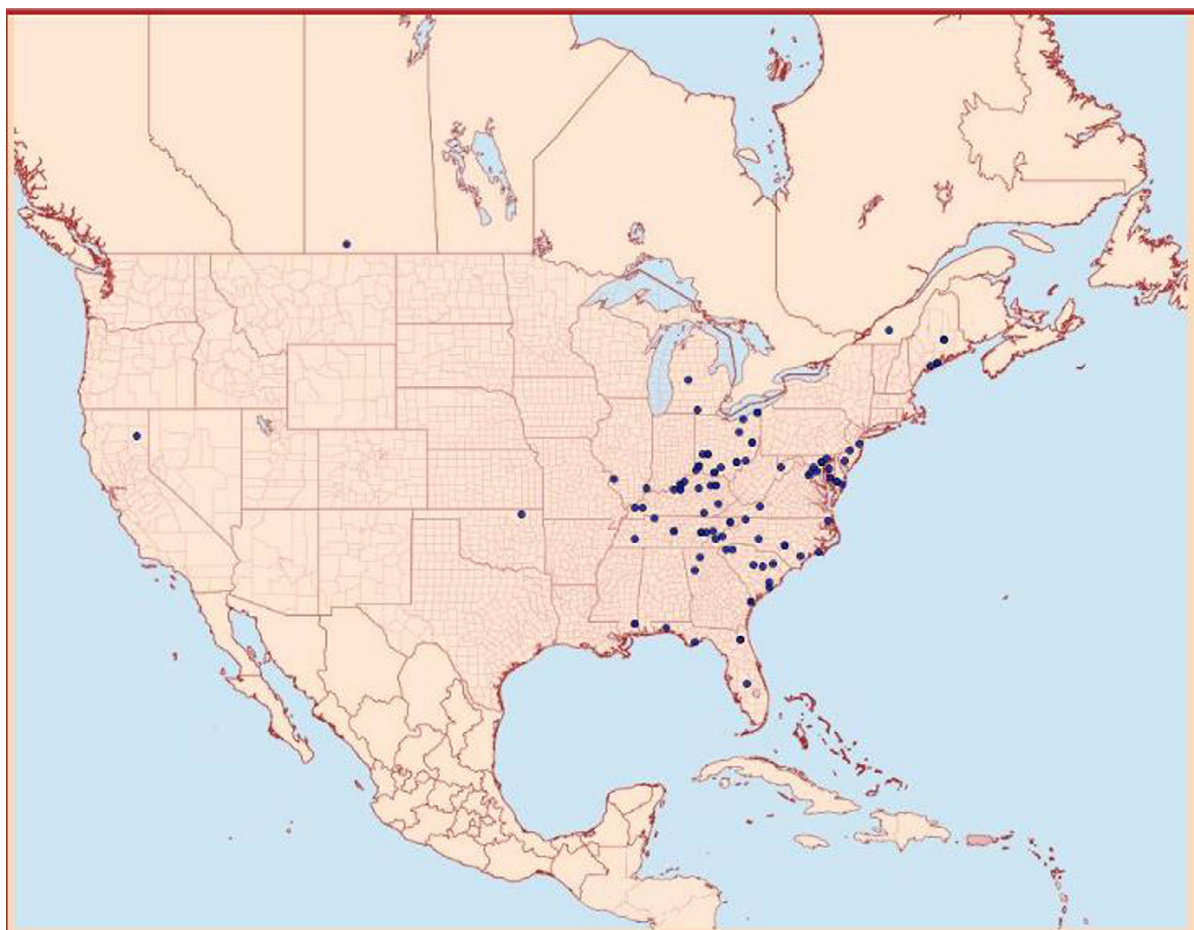


Figure 8: Distribution of *Choristoneura parallela*. Source: Moth Photographers Group. http://mothphotographersgroup.msstate.edu/large_map.php?hodges=3633. Accessed 15 March 2019

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, non-EU species of the genus *Choristoneura* are not present in the EU territory.

For a list of *Choristoneura* species present in the EU, please see Appendix B.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Non-European *Choristoneura* species are listed in Council Directive 2000/29/EC. Details are presented in Table 2.

Table 2: *Choristoneura* spp. in Council Directive 2000/29/EC

Annex I, Part A	Harmful organisms whose introduction into, and spread within, all member states shall be banned
Section I	Harmful organisms not known to occur in any part of the community and relevant for the entire community
(a)	Insects, mites and nematodes, at all stages of their development
	Species
9.	<i>Choristoneura</i> spp. (non-European)

3.3.2. Legislation addressing the hosts of *Choristoneura* spp.

Choristoneura spp. (non-European) are listed on Annex IAI, which indicates that they are regulated for all plant genera and commodities. Some host plants used by *Choristoneura* spp. are listed in the import prohibitions of Annex III or specific requirements in Annex IV of Council Directive 2000/29/EC (see Section 3.4.2).

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

A list with host plants for non-EU *Choristoneura* spp. is provided in Appendix C. They are considered major defoliators of coniferous trees. Species of the genera *Abies*, *Picea*, *Pinus*, *Pseudotsuga* and *Tsuga* are common host plants of several non-EU *Choristoneura* spp. Apart from conifers, many other plant species are also known to be host plants for Non-EU *Choristoneura* spp. *C. rosaceana* is known to attack as many as 83 plant species that belong to 22 families (Gilligan and Epstein, 2012), including several important crops such as apple, pear, apricot, sweet cherry, hazelnut, pistachio and cranberries. Species originating from Asia are reported to feed on deciduous plants from different botanical families (Betulaceae, Fagaceae, Rosaceae). Other polyphagous species are *C. conflictana*, *C. fumiferana* and *C. parallela*. For several species, the host plants are not known as the taxonomic description of the adults without reference to host plants is the only available information in the literature.

3.4.2. Entry

Is the pest able to enter into the EU territory? If yes, identify and list the pathways!

Yes, non-EU *Choristoneura* spp. are able to enter into the EU territory mainly through plants for planting.

The main pathways of entry are:

- plants for planting (including seeds) of the host plants
- cut branches of host plants
- fruits (including cones of conifers) of host plants
- round wood with bark of host plants
- bark of host plants.

For the pathways listed above, the following prohibitions (Annex III) or special requirements (Annex IV) are in place:

Plants for planting

- Plants (other than fruit and seeds) of *Abies*, *Cedrus*, *Chamaecyparis*, *Juniperus*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, *Tsuga* – prohibited from non-European countries (Annex IIIAI 1.)
- Plants with leaves (other than fruit and seeds) of *Populus* – prohibited from North American countries (Annex IIIAI 3.)
- Plants for planting of *Malus*, other than dormant plants free from leaves, flowers and fruit – prohibited from non-European countries (Annex IIIAI 9.)
- Plants for planting of *Malus*, other than seeds – prohibited from non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA (Annex IIIAI 18.).

Wood

- Wood of conifers – special requirements in relation to other pests (Annex IVAI 1.1., 1.5., 1.6.)
- Wood of *Populus* – special requirements (Annex IVAI 6.)
- Wood of *Malus* – special requirements (Annex IVAI 7.4.).

Bark

- Isolated bark of *Populus* – prohibited from countries of the American continent (Annex IIIAI 8.)
- Isolated bark of conifers – special requirements (Annex IVAI 7.3.).

For all other identified pathways (e.g. fruits and cut branches of host plants, dormant *Populus* plants from North America, dormant plants of *Malus* from Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA, etc.), no import requirements are currently specified.

There are no records of interception or outbreak of any *Choristoneura* species in the Europhyt database.

3.4.3. Establishment

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

Yes, the pest can establish as host plants are available and the climate is suitable.

3.4.3.1. EU distribution of main host plants

Choristoneura spp. mostly feed on conifers (*Pinus*, *Abies*, *Larix*, *Picea*, *Tsuga*, *Juniperus*, etc.). These are distributed throughout the EU territory (Figure 9). Apart from conifers several other plant species (*Malus*, *Pyrus*, *Prunus armeniaca*, *Prunus avium*, *Corylus avellana*, *Pistacia vera* and *Vaccinium* sp.) that are present throughout EU are known hosts for non-EU *Choristoneura* spp. Therefore, available hosts are present throughout the EU.

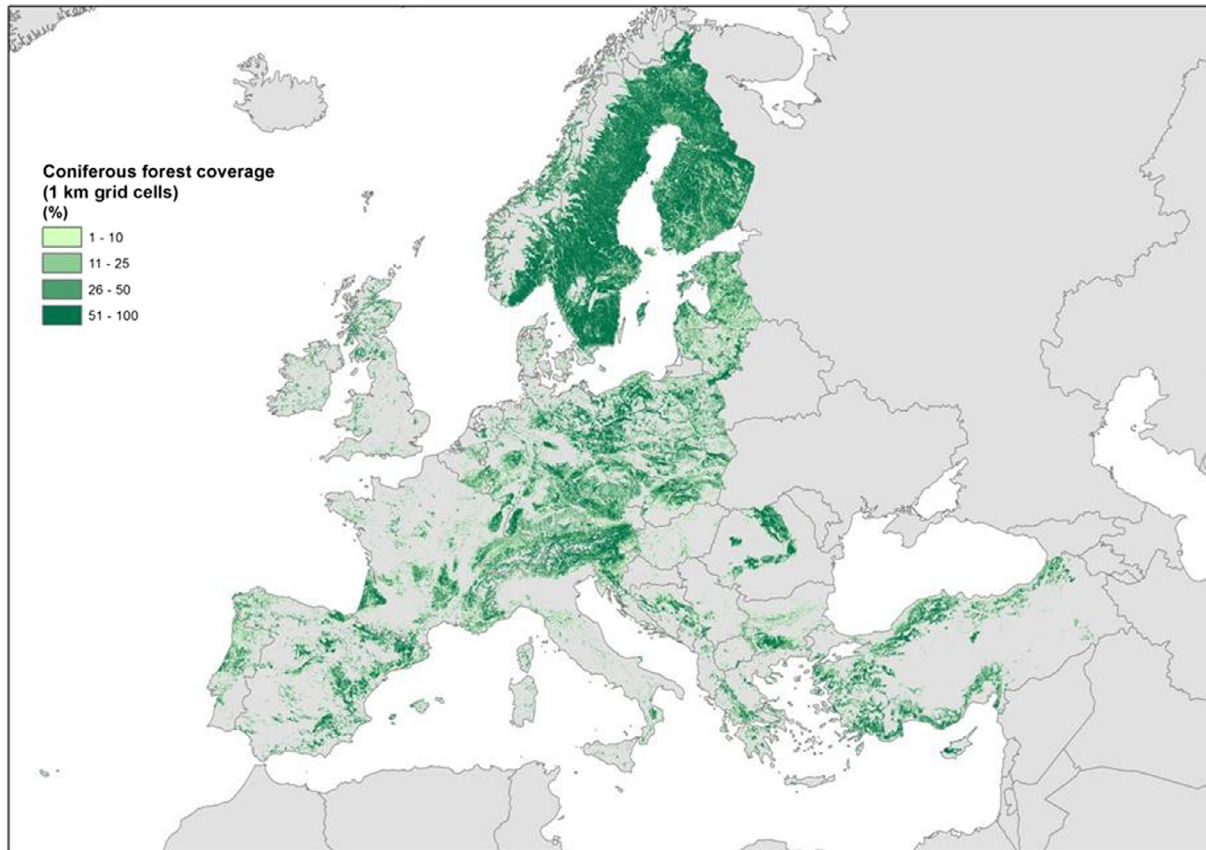


Figure 9: The cover percentage of coniferous forests in Europe with a range of values from 0 to 100 at 1 km resolution (source: Corine Land Cover year 2012 version 18.5 by EEA)

3.4.3.2. Climatic conditions affecting establishment

Non-EU *Choristoneura* spp. have a broad distribution in North America, sub-Saharan Africa and Asia. Climatic categories based on Köppen–Geiger climate classification can be found in these areas that are also present in EU. For instance, Köppen–Geiger climate types Bsk, Cfa, Csa and Dfb which occur in North America also occur in EU.

3.4.4. Spread

Is the pest able to spread within the EU territory following establishment? How?

Yes, *Choristoneura* spp. adults can fly long distances.

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

No, plants for planting are not the main means for spread.

Choristoneura spp. are known for having strong flight capabilities. Based on detailed field observations that were made for consecutive years using a variety of techniques such as night vision telescope, radar systems, doppler-equipped aircraft and aircraft with insect collecting nets, Greenbank et al. (1980) reported that *C. fumiferana* could spread by flight a distance of 20 km with a maximum recorded distance of 450 km using prevailing winds (Anderson and Sturtevant, 2011). Most of the dispersing individuals were mated females that have already laid 50% of their eggs. In a recent study, Sturtevant et al. (2013) found that *C. fumiferana* moths dispersed over a distance of 150 km in Minnesota (USA). *C. conflictana* females were shown in laboratory flight-mill experiments to fly a maximum distance of 26.5 km over 12 h and on average 1,600 m. Mated females are considered as stronger flyers than virgin females (Elliott and Evenden, 2009).

3.5. Impacts

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

Yes, several *Choristoneura* species are well known defoliators and considered as pests in their native area.

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?⁵

Yes, the presence of the pest on plants for planting has an economic impact on its intended use.

Forty-seven non-EU *Choristoneura* species and subspecies have been reported that are distributed in Africa (sub-Saharan), Asia, North America and the Canary Islands. Of these 47 species and subspecies, the group of species known as SBW (*C. pinus*, *C. fumiferana*, *C. retiniana*, *C. carnana*, *C. lambertiana*, *C. occidentalis occidentalis*, *C. occidentalis biennis* and *C. orae*) is known to cause significant damage as pests in North America's boreal forests. Other well-known pest species are the large aspen tortrix, *C. conflictana*, a pest of plants in the Rosaceae family, *C. rosaceana* (Fagua et al. 2019), and *C. parallela* attacking *Vaccinium* sp. For the rest of the non-EU *Choristoneura* species, there are no available data on their impact and importance as pests.

C. rosaceana is considered a major pest of sweet cherries grown in the Mid-Columbia area of northern Oregon (Long and Omeg, 1994). *C. rosaceana* larvae feed primarily on foliage. However, some larvae bore into fruit, especially when populations are high. Direct feeding in the field rarely causes reduction in fruit production. Economic damage occurs as larvae enter collection bins during harvest.

An outbreak of *C. conflictana* may last for 2–3 years causing severe defoliation to its main host *Populus tremuloides* in an area as large as 25,000 km² (Elliott and Evenden, 2009).

The SBW has been reported to occasionally develop extremely high densities causing severe defoliation and tree mortality over extensive areas (Silk and Kuenen, 1988; Nealis, 2016).

C. fumiferana is characterised as the most damaging insect defoliator for North American forests (Dupuis et al., 2017). Outbreaks can last for several years and extend over large areas. Complete defoliation for consecutive years during the outbreak period can lead to tree mortality. In balsam fir (*Abies balsamea*), 1 year of defoliation was enough to cause 20% reduction in volume increment and radial growth was reduced up to 75% after several years of defoliation (Gray and MacKinnon, 2006). Severe outbreaks in the beginning of the twentieth century caused 45% tree mortality in Eastern Canada (Gray and MacKinnon, 2006).

⁵ See Section 2.1 on what falls outside EFSA's remit.

C. parallela causes shoot browning and direct damage to cranberries. It was considered as the most important cranberry pest in New Jersey, and sometimes as a rose pest in greenhouses (EPPO, 2019).

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, see Sections 3.3 and 3.6.1

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

Yes, plants for planting from pest free areas and grown in isolation would mitigate the risk in case the pest entered the EU.

3.6.1. Identification of additional measures

Phytosanitary measures are currently applied to coniferous plants and to several other host plants (see Sections 3.3 and 3.4.2).

3.6.1.1. Additional control measures

Potential additional control measures are listed in Table 3.

Table 3: Selected control measures (a full list is available in EFSA PLH Panel et al., 2018) for pest entry/establishment/spread/impact in relation to currently unregulated hosts and pathways. Control measures are measures that have a direct effect on pest abundance

Information sheet title (with hyperlink to information sheet if available)	Control measure summary	Risk component (entry/establishment/spread/impact)
Growing plants in isolation	Description of possible exclusion conditions that could be implemented to isolate the crop from pests and if applicable relevant vectors. E.g. a dedicated structure such as glass or plastic greenhouses	Entry/spread
Chemical treatments on consignments or during processing	Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage. The treatments addressed in this information sheet are: a) fumigation; b) spraying/dipping pesticides; c) surface disinfectants; d) process additives; e) protective compounds	Entry/spread
Roguing and pruning	Roguing and pruning, complemented by chemical treatments, could be implemented for containing or eradicating the pest in newly infested areas	Establishment/spread
Chemical treatments on crops including reproductive material	Application of insecticides in nurseries for plants for planting at regular intervals during the vegetation period and in orchards for reducing the population abundance of larvae that might come in contact with fruits	Entry/spread
Post-entry quarantine and other restrictions of movement in the importing country	Post-entry quarantine could allow detecting infested plants entering with only eggs on their foliage. Damage by larvae would be much more conspicuous than the presence of the eggs	Entry/spread

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 4.

Table 4: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Information sheet title (with hyperlink to information sheet if available)	Supporting measure summary	Risk component (entry/ establishment/ spread/ impact)
Inspection and trapping	<p>Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5)</p> <p>The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. Pheromones have been identified for several <i>Choristoneura</i> species</p>	entry
Laboratory testing	Examination, other than visual, to determine if pests are present using official diagnostic protocols. Currently there are no published diagnostic protocols for <i>Choristoneura</i> . However, taxonomic descriptions are available for identification of <i>Choristoneura</i> to species level	entry
Certified and approved premises	Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by a National Plant Protection Organization in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries	entry
Delimitation of Buffer zones	<p>ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimise the probability of spread of the target pest into or out of the delimited area, and subject to phytosanitary or other control measures, if appropriate' (ISPM 5). In third countries, sourcing plants from a pest free place of production, site or area, surrounded by a buffer zone, would minimise the probability of spread into the pest free zone</p> <p>In the EU, delimiting a buffer zone around an outbreak area</p>	Entry and spread
Sampling	According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing. For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical sampling methodology	entry
Phytosanitary certificate and plant passport	An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) <ul style="list-style-type: none"> a) export certificate (import) b) plant passport (EU internal trade) 	entry
Surveillance	Pheromone traps, visual inspection	Entry, establishment and spread

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

- Hibernacula of overwintering larvae can pass inspection unnoticed.
- The adults fly long distance, and the larvae can disperse by ballooning.
- In the past, resistance to broad spectrum insecticides has been reported for *C. rosaceana* larvae (Omeg, 2001).

3.7. Uncertainty

- The host range of several non-EU *Choristoneura* spp. is not known.
- The impact of several non-EU *Choristoneura* spp. is not known.

4. Conclusions

Non-EU *Choristoneura* spp. meet all criteria assessed by EFSA above for consideration as potential quarantine pests. Non-EU *Choristoneura* spp. do not meet all criteria assessed by EFSA above for consideration as potential RNQPs as they are not present in the EU.

Table 5 provides a summary of the conclusions of each part of this pest categorisation.

Table 5: 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)	<i>Choristoneura</i> is a clearly defined insect genus (Lepidoptera: Tortricidae) and detailed morphological descriptions and molecular tools are available for species identification	<i>Choristoneura</i> is a clearly defined insect genus Lepidoptera: Tortricidae) and detailed morphological descriptions and molecular tools are available for species identification	
Absence/ presence of the pest in the EU territory (Section 3.2)	Non-EU <i>Choristoneura</i> spp. are not known to be present in the EU	Non-EU <i>Choristoneura</i> spp. are not known to be present in the EU	
Regulatory status (Section 3.3)	Non-EU <i>Choristoneura</i> spp. are listed on Annex IAI of Council Directive 2000/29/EC as <i>Choristoneura</i> spp. (Non- European)	Non-EU <i>Choristoneura</i> spp. are listed on Annex IAI of Council Directive 2000/29/EC as <i>Choristoneura</i> spp. (Non-European)	
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Non-EU <i>Choristoneura</i> spp. are able to enter into the EU through plants for planting, cut branches, fruits, round wood and bark. Establishment is possible as host plants are available and climatic conditions similar to their native range do occur in the EU. Active dispersal by flight is the main means for spread	Non-EU <i>Choristoneura</i> spp. mainly spread by active dispersal through adult flight over long distances. Plants for planting are not considered as the main pathway of spread	Dispersal abilities for several species are not known
Potential for consequences in the EU territory (Section 3.5)	There are 11 species and subspecies of Non-EU <i>Choristoneura</i> that are known as pests in their native area. The introduction of these species would cause economic impact on several forest plants and other crops in the EU. For the rest of the species the potential impact is unknown	The presence of Non-EU <i>Choristoneura</i> on plants for planting would have an economic impact on its intended use	The host plants and potential damaging ability of several species is not known

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
Available measures (Section 3.6)	There are measures available to prevent entry, establishment and spread of non-EU <i>Choristoneura</i> spp. in the EU which are described in Council Directive 2000/29/EC and in Section 3.6	There are measures available to prevent pest presence on plants for planting (e.g. plants for planting from pest free areas and grown in isolation) that could mitigate the risk in case the pest entered the EU	
Conclusion on pest categorisation (Section 4)	Non-EU <i>Choristoneura</i> spp. meet all criteria assessed by EFSA above for consideration as potential quarantine pests	Non-EU <i>Choristoneura</i> spp. do not meet all criteria assessed by EFSA above for consideration as potential regulated non-quarantine pests, as they are not present in the EU	
Aspects of assessment to focus on/ scenarios to address in future if appropriate			

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Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 1995, 2017)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 1995, 2017)
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2017)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2017)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2017)
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2017)
Measures	Control (of a pest) is defined in ISPM 5 (FAO, 2017) as 'Suppression, containment or eradication of a pest population' (FAO, 1995). Control measures are measures that have a direct effect on pest abundance. Supporting measures are organisational measures or procedures supporting the choice of appropriate Risk Reduction Options that do not directly affect pest abundance.
Pathway	Any means that allows the entry or spread of a pest (FAO, 2017)
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2017)
Protected zones (PZ)	A Protected zone is an area recognised at EU level to be free from a harmful organism, which is established in one or more other parts of the Union.
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2017)
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (FAO, 2017)
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2017)
DG SANTÉ	Directorate General for Health and Food Safety

Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State

PLH EFSA Panel on Plant Health
RNQP regulated non-quarantine pest
SBW spruce budworm complex
TFEU Treaty on the Functioning of the European Union
ToR Terms of Reference

Appendix A – List of *Choristoneura* spp. reported outside the EU

Appendix A lists *Choristoneura* species⁶ reported outside the EU (47 species and subspecies). Species in **blue** indicate known pests; species in **red** indicate species removed by Fagua et al. 2019.⁷

Species name	Occurrence at continent level	Known pest
<i>Choristoneura bracatana</i>	Canary Islands (Spain) ⁴	
<i>Choristoneura simonyi</i>	Canary Islands (Spain)³	
<i>Choristoneura africana</i> Razowski	Africa	
<i>Choristoneura deuterus</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura dinota</i> (Meyrick, 1918)	Africa (Razowski & Trematerra 2012)	
<i>Choristoneura gerstbergeri</i> Hausmann	Africa (Karisch & Blackstein 2014)	
<i>Choristoneura heliaspis</i> Meyrick	Africa	
<i>Choristoneura holovera</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura nowakiana</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura occidentalis</i> Walsingham	Africa	
<i>Choristoneura oluduana</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura palladinoi</i> Razowski & Trematerra	Africa	
<i>Choristoneura prostheta</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura prostheta</i> Razowski	Africa (Razowski 2014)	
<i>Choristoneura psoricodes</i> Meyrick	Africa	
<i>Choristoneura saotome</i> Razowski and Wojtusiak	Africa (Razowski and Wojtusiak 2014)	
<i>Choristoneura adumbratanus</i> Walsingham	Asia	
<i>Choristoneura chapana</i> Razowski	Asia	
<i>Choristoneura colyma</i> Razowski	Asia	
<i>Choristoneura evanidana</i> Kennel	Asia (Russia)	
<i>Choristoneura expansiva</i> Wang & Yang	Asia	
<i>Choristoneura ferrugininotata</i> Obratzsov	Asia	
<i>Choristoneura griseicoma</i> Meyrick	Asia	
<i>Choristoneura improvisana</i> Kuznetzov	Asia (Russia)	
<i>Choristoneura irina</i> Dubatolov & Syachina	Asia (Russia)	
<i>Choristoneura jecorana</i> Kennel	Asia (Iran)	
<i>Choristoneura jezoensis</i> Yasuda & Suzuki	Asia (Japan)	
<i>Choristoneura longicellanus</i> Walsingham	Asia	
<i>Choristoneura luticostana</i> Christoph	Asia (Russia)	
<i>Choristoneura metasequoiicola</i> Liu	Asia	
<i>Choristoneura neurophaea</i> Meyrick	Asia	
<i>Choristoneura propensa</i> Razowski	Asia	
<i>Choristoneura quadratica</i> Diakonoff	Asia	
<i>Choristoneura thyrifera</i> Razowski	Asia	

⁶ Based on Tortricid Net (<http://www.tortricidae.com/catalogueSpeciesList.asp?gcode=216&chkLastInput=>)

⁷ Fagua et al. (2019): 'One important taxonomic issue concerns *Archips occidentalis* (Walsingham), which was originally described as *Cacoecia occidentalis* from specimens collected in The Gambia, and recently transferred to *Choristoneura* (Razowski, 2008) based on limited morphological evidence (Gilligan and Brown, 2014). This taxonomic transfer necessitated a name change for *C. occidentalis* Freeman, a western North American conifer-feeding species of the SBW complex, because the African name [*Archips occidentalis* (Walsingham)] was published earlier (Article 23. Principle of Priority, ICZN 1999). This nomenclatural change creates confusion about an important western North American forest pest, which is well studied as a forest defoliator (Johns et al., 2016). It is thus essential to test the phylogenetic placement of *A. occidentalis* (Walsingham) within Archipini and *Choristoneura* with DNA sequences'. (...) 'Because our first objective was to delimit the genus *Choristoneura* and determine the position of *A. occidentalis* (Walsingham), we used all available sequences of COI and 28S genes from Archipini species to reconstruct the phylogeny'. (...) 'Neither of the subtropical or tropical taxa analysed in this work, *C[acoecia]. simonyi* and *A[rchips]. occidentalis*, were included as part of the genus *Choristoneura*. In addition, a Palearctic species, *C. evanidana*, was excluded. Razowski (1987, 1992, 2008) transferred all these three taxa to *Choristoneura* from their original placements as *Pandemis simonyi*, *Cacoecia occidentalis* and *Cacoecia evanidana* based on genitalia morphology, but using limited information'.

Species name	Occurrence at continent level	Known pest
<i>Choristoneura argentifasciata</i> Heppner	North America	
<i>Choristoneura carnana</i> Barnes & Busck	North America	x
<i>Choristoneura conflictana</i> Walker	North America	x
<i>Choristoneura fractivittana</i> Clemens	North America	
<i>Choristoneura freemani</i> Razowski = <i>C. occidentalis occidentalis</i> Freeman	North America	x
<i>Choristoneura fumiferana</i> Clemens	North America	x
<i>Choristoneura lambertiana</i> Busck	North America	x
<i>Choristoneura obsoletana</i> Walker	North America	
<i>Choristoneura occidentalis biennis</i> Freeman	North America	x
<i>Choristoneura orae</i> Freeman	North America	x
<i>Choristoneura parallela</i> Robinson	North America	x
<i>Choristoneura pinus</i> Freeman	North America	x
<i>Choristoneura retiniana</i> Walsingham	North America	x
<i>Choristoneura rosaceana</i> Harris	North America	x
<i>Choristoneura spaldingana</i> Obraztsov	North America	
<i>Choristoneura zapulata</i> Robinson	North America	

Appendix B – List of *Choristoneura* spp. reported from the EU

This table is based on the Fauna Europaea database.

Species	Distribution in the EU
<i>Choristoneura albaniana</i>	Sweden, Finland ^(a)
<i>Choristoneura diversana</i>	Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, UK
<i>Choristoneura hebenstreitella</i>	Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, UK
<i>Choristoneura lafauryana</i>	Belgium, France, Germany, Italy, Netherlands, Romania, Spain, UK
<i>Choristoneura murinana</i>	Austria, Belgium, Bulgaria, France, Czech Republic, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Romania, Slovakia, Slovenia
<i>Choristoneura simonyi</i> ^(b)	Spain (Canary Islands)

(a): Also present in North America. According to Fagua et al. (2019): '*Choristoneura albaniana* (Walker) is the only species with a Holarctic distribution'.

(b): See footnote number 7.

Appendix C – List of hosts of non-EU *Choristoneura* spp.

Species	Host plants	Source
<i>C. adumbratanus</i>	<i>Malus baccata</i> , <i>Malus pumila</i> , <i>Prunus x yedoensis</i> , <i>Quercus acutissima</i> , <i>Quercus cerris</i> , <i>Quercus</i> sp., <i>Salix</i> sp.	Tortricid.net
<i>C. africana</i>		
<i>C. argentifasciata</i>		
<i>C. bracetana</i>	<i>Viburnum rugosum</i>	Tortricid.net
<i>C. carnana</i>	<i>Abies concolor</i> , <i>Pseudotsuga macrocarpa</i> , <i>Pseudotsuga menziesii</i>	Tortricid.net
<i>C. chapana</i>		
<i>C. colyma</i>		
<i>C. conflictana</i>	<i>Acer negundo</i> , <i>Alnus incana</i> , <i>Amelanchier</i> sp., <i>Betula alleghaniensis</i> , <i>Betula papyrifera</i> , <i>Betula populifolia</i> , <i>Cornus alternifolia</i> , <i>Corylus</i> sp., <i>Malus</i> sp., <i>Picea glauca</i> , <i>Pinus banksiana</i> , <i>Pinus strobus</i> , <i>Populus alba</i> , <i>Populus balsamifera</i> , <i>Populus grandidentata</i> , <i>Populus</i> sp., <i>Populus tremuloides</i> , <i>Prunus pensylvanica</i> , <i>Prunus</i> sp., <i>Prunus virginiana</i> , <i>Rosa</i> sp., <i>Salix</i> sp., <i>Sorbus</i> sp., <i>Vaccinium</i> sp.	Tortricid.net
<i>C. deuterus</i>		
<i>C. dinota</i>	<i>Acacia xanthophloea</i> , <i>Arachis hypogaea</i> , <i>Camellia sinensis</i> , <i>Capsicum annum</i> , <i>Cassia tora</i> , <i>Coffea arabica</i> , <i>Dovyalis abyssinica</i> , <i>Dracaena steudneri</i> , <i>Dracaena steudneri</i> , <i>Erythrina</i> sp., <i>Eucalyptus tereticornis</i> , <i>Gomphocarpus semilunatus</i> , <i>Gossypium</i> sp., <i>Hibiscus</i> sp., <i>Lantana camara</i> , <i>Macadamia integrifolia</i> , <i>Prunus africana</i> , <i>Psychotria pedicularis</i> , <i>Rubus niveus</i> , <i>Syzygium guineense</i> , <i>Vigna unguiculata</i>	Afromoths.net
<i>C. expansiva</i>		
<i>C. ferruginotata</i>		
<i>C. fractivittana</i>	<i>Acer rubrum</i> , <i>Acer saccharinum</i> , <i>Betula papyrifera</i> , <i>Fagus</i> sp., <i>Malus</i> sp., <i>Pyrus</i> sp., <i>Quercus rubra</i> , <i>Quercus</i> sp., <i>Rubus</i> sp., <i>Ulmus americana</i>	Tortricid.net
<i>C. fumiferana</i>	<i>Abies alba</i> , <i>Abies amabilis</i> , <i>Abies balsamea</i> , <i>Abies concolor</i> , <i>Abies grandis</i> , <i>Abies lasiocarpa</i> , <i>Impatiens</i> sp., <i>Juniperus</i> sp., <i>Larix occidentalis</i> , <i>Larix</i> sp., <i>Picea abies</i> , <i>Picea engelmannii</i> , <i>Picea glauca</i> , <i>Picea mariana</i> , <i>Picea pungens</i> , <i>Picea rubens</i> , <i>Picea sitchensis</i> , <i>Pinus banksiana</i> , <i>Pinus contorta</i> , <i>Pinus monticola</i> , <i>Pinus resinosa</i> , <i>Pinus strobus</i> , <i>Pinus sylvestris</i> , <i>Populus balsamifera</i> , <i>Pseudotsuga</i> sp., <i>Pseudotsuga menziesii</i> , <i>Thuja occidentalis</i> , <i>Tsuga canadensis</i> , <i>Tsuga heterophylla</i> , <i>Tsuga mertensiana</i>	Tortricid.net
<i>C. gerstbergeri</i>		
<i>C. griseicoma</i>		
<i>C. heliaspis</i>		
<i>C. holovera</i>		
<i>C. improvisana</i>		
<i>C. irina</i>		
<i>C. jecorana</i>		
<i>C. jezoensis</i>	<i>Abies sachalinensis</i>	Higashiura 1991
<i>C. lambertiana</i>	<i>Abies concolor</i> , <i>Abies magnifica</i> , <i>Juniperus</i> sp., <i>Picea engelmannii</i> , <i>Pinus albicaulis</i> , <i>Pinus contorta</i> , <i>Pinus flexilis</i> , <i>Pinus lambertiana</i> , <i>Pinus ponderosa</i>	Tortricid.net
<i>C. longicellanus</i>	<i>Castanea crenata</i> , <i>Castanea</i> sp., <i>Malus pumila</i> , <i>Prunus persica</i> , <i>Prunus salicina</i> , <i>Prunus x yedoensis</i> , <i>Pyrus pyrifolia</i> , <i>Pyrus</i> sp., <i>Pyrus ussuriensis</i> , <i>Quercus acutissima</i> , <i>Quercus aliena</i> , <i>Quercus dentata</i> , <i>Quercus mongolica</i> , <i>Quercus serrata</i> , <i>Quercus variabilis</i> , <i>Ribes uva-crispa</i> , <i>Rosa</i> sp.	Tortricid.net
<i>C. luticostana</i>	<i>Malus pumila</i>	Tortricid.net
<i>C. metasequoicola</i>	<i>Metasequoia glyptostroboides</i>	Tortricid.net
<i>C. neurophaea</i>		

Species	Host plants	Source
<i>C. nowakiana</i>		
<i>C. obsoletana</i>	<i>Aronia melanocarpa</i> , <i>Asimina</i> sp., <i>Asimina triloba</i> , <i>Betula papyrifera</i> , <i>Chamaedaphne calyculata</i> , <i>Fragaria</i> sp., <i>Gaylussacia</i> sp., <i>Lespedeza cuneate</i> , <i>Rubus</i> sp., <i>Senna</i> sp., <i>Typha</i> sp.	Tortricid.net
<i>C. occidentalis biennis</i>	<i>Abies lasiocarpa</i> , <i>Picea engelmanni</i> , <i>Picea glauca</i> ,	Tortricid.net
<i>C. occidentalis occidentalis</i>	<i>Abies amabilis</i> , <i>Abies concolor</i> , <i>Abies grandis</i> , <i>Picea engelmanni</i> , <i>Picea pungens</i> , <i>Pinus contorta</i> , <i>Pinus ponderosa</i> , <i>Pseudotsuga menziesii</i>	Tortricid.net
<i>C. oluduana</i>		
<i>C. orae</i>	<i>Abies amabilis</i> , <i>Picea sitchensis</i>	Tortricid.net
<i>C. palladinoi</i>		
<i>C. parallela</i>	<i>Chamaedaphne calyculata</i> , <i>Citrus</i> sp., <i>Gardenia</i> sp., <i>Gerbera jamesonii</i> , <i>Hypericum perforatum</i> , <i>Kalmia</i> sp., <i>Myrica</i> sp., <i>Phaseolus</i> sp., <i>Rosa</i> sp., <i>Salix humilis</i> , <i>Sarracenia</i> sp., <i>Smilax</i> sp., <i>Solidago</i> sp., <i>Vaccinium</i> sp.	Tortricid.net
<i>C. pinus</i>	<i>Abies balsamea</i> , <i>Larix</i> sp., <i>Picea glauca</i> , <i>Picea mariana</i> , <i>Picea pungens</i> , <i>Pinus banksiana</i> , <i>Pinus resinosa</i> , <i>Pinus rigida</i> , <i>Pinus strobus</i> , <i>Pinus sylvestris</i> , <i>Pinus virginiana</i>	Tortricid.net
<i>C. propensa</i>		
<i>C. prostheca</i>		
<i>C. psoricodes</i>		
<i>C. quadratica</i>		
<i>C. retiniana</i>	<i>Abies concolor</i> , <i>Abies magnifica</i> , <i>Abies grandis</i> , <i>Pseudotsuga menziesii</i>	Tortricid.net
<i>C. rosaceana</i>	<i>Abies balsamea</i> , <i>Acer negundo</i> , <i>Acer rubrum</i> , <i>Acer saccharinum</i> , <i>Acer</i> sp., <i>Aesculus californica</i> , <i>Aesculus californica</i> , <i>Alnus incana</i> , <i>Ambrosia</i> sp., <i>Amelanchier spicata</i> , <i>Amorpha fruticosa</i> , <i>Aster</i> sp., <i>Betula alleghaniensis</i> , <i>Betula papyrifera</i> , <i>Calycanthus occidentalis</i> , <i>Ceanothus integerrimus</i> , <i>Celtis occidentalis</i> , <i>Cercis canadensis</i> , <i>Comandra umbellate</i> , <i>Cornus florida</i> , <i>Cornus glabrata</i> , <i>Cornus racemosa</i> , <i>Cornus</i> sp., <i>Corylus avellane</i> , <i>Crataegus</i> sp., <i>Dianthus caryophyllus</i> , <i>Fraxinus</i> sp., <i>Geranium</i> sp., <i>Helianthus annuus</i> , <i>Hypericum</i> sp., <i>Lonicera periclymenum</i> , <i>Malus domestica</i> , <i>Malus pumila</i> , <i>Ostrya virginiana</i> , <i>Phaseolus vulgaris</i> , <i>Picea glauca</i> , <i>Pistacia</i> sp., <i>Populus balsamifera</i> , <i>Populus</i> sp., <i>Populus tremuloides</i> , <i>Prunus avium</i> , <i>Prunus ilicifolia</i> , <i>Prunus pennsylvanica</i> , <i>Prunus persica</i> , <i>Prunus virginiana</i> , <i>Pseudotsuga menziesii</i> , <i>Pyrus communis</i> , <i>Quercus agrifolia</i> , <i>Quercus alba</i> , <i>Quercus macrocarpa</i> , <i>Quercus rubra</i> , <i>Rhamnus</i> sp., <i>Rhododendron</i> sp., <i>Rhus coriaria</i> , <i>Rosa</i> sp., <i>Rubus flagellaris</i> , <i>Rubus idaeus</i> , <i>Rubus</i> sp., <i>Salix lasiolepis</i> , <i>Solidago</i> sp., <i>Spiraea</i> sp., <i>Symphoricarpos vaccinioides</i> , <i>Syringa</i> sp., <i>Syringa vulgaris</i> , <i>Tilia americana</i> , <i>Tilia</i> sp., <i>Trifolium pretense</i> , <i>Tsuga heterophylla</i> , <i>Typha latifolia</i> , <i>Ulmus Americana</i> , <i>Ulmus</i> sp., <i>Vaccinium corymbosum</i> , <i>Verbena</i> sp., <i>Viburnum lentago</i>	Tortricid.net
<i>C. saotome</i>		
<i>C. spaldingiana</i>		
<i>C. thyrsoifera</i>		
<i>C. zapulata</i>	<i>Alnus</i> sp., <i>Arctostaphylos manzanita</i> , <i>Betula papyrifera</i> , <i>Ceanothus</i> sp., <i>Comptonia peregrina</i> , <i>Fragaria</i> sp., <i>Populus tremuloides</i> , <i>Prunus virginiana</i> , <i>Rosa</i> sp., <i>Symphoricarpos</i> sp., <i>Trifolium</i> sp., <i>Vaccinium</i> sp.	Tortricid.net