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Pest categorisation of non-EU *Pissodes* spp.

EFSA Panel on Plant Health (PLH),
Michael Jeger, Claude Bragard, David Caffier, Thierry Candresse, Elisavet Chatzivassiliou, Katharina Dehnen-Schmutz, Gianni Gilioli, Josep Anton Jaques Miret, 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, Stephan Winter, Marc Kenis, Virág Kertész and Jean-Claude Grégoire

Abstract

The Panel on Plant Health performed a pest categorisation of the non-EU *Pissodes* spp. (Coleoptera: Curculionidae). They constitute a well-defined taxon, with non-EU species distributed in the USA, Canada, Mexico, Guatemala, El Salvador, China, Japan, Korea, Russia and South Africa, some of which are recognised as severe pests of conifers, mainly *Pinus* spp. and *Picea* spp., or vector pathogens. The immature stages either live in the phloem and cambium of healthy, weakened or dead trees, or in the terminal shoots of living trees. They are listed as quarantine pests in Annex IAI of Directive 2000/29/EC. Plants for planting, branches of conifers and non-squared wood are considered as pathways. The pest can also disperse by hitchhiking, and fly over kilometres. The adults are long-lived (up to 4 years). They feed by puncturing the bark of stems or shoots. Females lay eggs in chewed-out cavities in the bark. The life cycle varies with species and local climatic conditions. At the end of the larval stage, the larva excavates a pupal cell between the sapwood and the bark, in the sapwood or in terminal shoots. *Pissodes* spp. overwinter as adults in the litter or as larvae or teneral adults in the galleries or pupal cells. The current geographic range of the non-European *Pissodes* spp. suggests that many of them may establish in the EU territory, where their hosts are widely present. We list some species which, if introduced to the EU, would most probably have an economic impact on plantations or may interfere with forest ecosystem processes although they are mainly abundant and damaging in intensively managed monocultures. All criteria for considering those non-EU *Pissodes* spp. as potential quarantine pests are met. The criteria for considering them as non-regulated quarantine pests are not met because they are absent from the EU territory.

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Keywords: pine weevils, Curculionidae, European Union, pest risk, plant health, plant pest, quarantine

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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.

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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/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
Popillia japonica Newman
Rhizoecus hibisci Kawai and Takagi

(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

Pissodes spp. (non-EU) 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 quarantine pests or those of regulated non-quarantine pests for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States (MSs) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores.

The scope of this categorisation covers the non-EU species of the genus *Pissodes*, that is the species which are absent in the territory of the European Union.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

Relevant papers were identified and reviewed by the working group including a topic expert. Further references and information were obtained from the expert, 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, online), the CABI Crop Protection Compendium, 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 *Pissodes* spp., 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 regulated non-quarantine pest 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 regulated non-quarantine pest. 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 regulated non-quarantine pest 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, the genus *Pissodes* is a valid genus. The genus contains some species which are important plant pests.

Pissodes is an insect genus in the family Curculionidae (Arthropoda: Coleoptera) which contains several species that differ in distribution, biology, host trees and climatic requirements. The genus is easily identifiable but presents several taxonomic concerns such as cryptic species, hybridisation and undescribed species.

3.1.2. Biology of the pest

Information on the biology of European *Pissodes* spp. can be found in Day et al. (2004) and references therein, and CABI (2018) and references therein for four non-European species: *P. strobi*, *P. terminalis*, *P. nemorensis* and *P. yunnanensis*. Biological data for other non-EU species are less abundant and often restricted to single papers (e.g. Deyrup, 1978 for *P. fasciatus*, Jin, 1989 for *P. nitidus*).

With the exception of the European *Pissodes validirostris*, which develops in pine cones, all other species of the genus feed on and develop in the cambium and phloem of conifer stems (Pinaceae). These species can be broadly divided into two groups. One attacks and develops in boles, in which case mostly dead or dying trees are attacked (e.g. *Pissodes schwarzii*, *P. fasciatus*, *P. piceae*). The other group develops in terminal shoots of healthy trees (e.g. *P. strobi*, *P. terminalis*, *P. nitidus*). However, some species can attack both boles and terminals (e.g. *P. nemorensis*, P. *castaneus*). Adults feed by puncturing the bark of stems or shoots. There is evidence that, at least in some species, the males produce aggregation pheromones that attract unmated females and other males (Booth et al., 1983). After a maturation period, females lay eggs in groups of 1–15 in chewed-out cavities in the bark and cover them with frass. Adults are long-lived (up to 4 years) and strong fliers. Females can lay several hundred eggs over a lifetime. The life cycle varies with species and local climatic conditions. There are four larval instars, which burrow feeding tunnels in the cambium and phloem. At the end of the larval stage, the larva excavates a pupal cell covered with shredded wood fibre between the sapwood and the bark. When terminals are attacked or when the bark is too thin, the pupal cell is built in the sapwood. *Pissodes* spp. overwinter as adults in the litter or as larvae or teneral adults in the galleries or pupal cells. Most *Pissodes* spp. develop without obligatory diapause but a facultative diapause in the larval stage, induced by climatic conditions, is commonly observed and an obligatory diapause has been reported for some species in cold climates, e.g. *P. terminalis* in the Canadian prairies and *P. pini* in the Alps.

3.1.3. Intraspecific diversity

The taxonomy of the genus *Pissodes* is still confusing with several cryptic species that can only be identified using morphological tools and may hybridise (Langor and Sperling, 1997; Wondafrash et al., 2016). Some species also show highly variable host preferences in different parts of their range (Smith and Sugden, 1969).

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, the genus is quite recognisable. But distinguishing among species may require molecular tools.

There is no reference that covers the identification of all *Pissodes* spp. worldwide. In Europe, Freude et al. (1999) provides a key to the genus and to the species (but see Haran et al., 2016 for an

additional species); O'Brien (1989a) describes the genus and provides an identification key for Mexican species; Lu et al. (2007) cover Chinese species. Unfortunately, there is no recent key for North American species. Hopkins (1911) provides a key to adults but some species are missing and others have been synonymised (Smith and Sugden, 1969). The cryptic species of the *P. strobi* species complex, containing the most serious North American pests, can be identified using molecular tools (Langor and Sperling, 1995, 1997; Wondafrash et al., 2016).

3.2. Pest distribution

Species of the *Pissodes* genus are native to North and Central America, Europe and a large part of Asia, where their distribution coincides with that of their coniferous host species (Langor, 1991) (Appendices A and B).

3.2.1. Pest distribution outside the EU

For a detailed list of non-EU *Pissodes* species, please see Appendix A.
Table 2 lists the distribution of species considered to have economic importance based on reports.

Table 2: Distribution of *Pissodes* spp. which are considered to be of economic importance (EPPO GD and CABI CPC, accessed on 12/4/2018; other references on the species distribution can be found in Appendix A)

Continent	Country	State/region	*P. nemorensis**	*P. nitidus*	*P. strobi*	*P. terminalis*	*P. yunnanensis*
Africa		South Africa	x				
America	Canada	Alberta			x	x	
		British Columbia			x	x	
		Manitoba	x		x	x	
		New Brunswick	x		x		
		Newfoundland			x		
		Northwest Territories				x	
		Nova Scotia	x		x		
		Ontario	x		x		
		Prince Edward Island	x		x		
		Quebec	x		x		
		Saskatchewan			x	x	
		Yukon Territory				x	
	Mexico				x		
	USA	California			x	x	
		Colorado				x	
		Connecticut			x		
		Delaware			x		
		Florida	x				
		Georgia			x		
		Idaho				x	
		Illinois	x		x		
		Indiana			x		
		Iowa			x		
		Kentucky	x				
		Louisiana	x				
		Maine			x		

Continent	Country	State/region	*P. nemorensis**	*P. nitidus*	*P. strobi*	*P. terminalis*	*P. yunnanensis*
		Maryland			x		
		Massachusetts			x		
		Michigan			x		
		Minnesota			x		
		Missouri	x				
		Montana				x	
		New Hampshire			x		
		New Jersey			x		
		New Mexico			x		
		New York	x		x		
		Ohio	x				
		Oklahoma	x				
		Oregon				x	
		Pennsylvania			x		
		Rhode Island			x		
		South California			x		
		South Dakota				x	
		Vermont			x		
		Virginia	x		x		
		Washington			x	x	
		West Virginia			x		
		Wisconsin			x		
		Wyoming				x	
Asia	China	Guizhou					x
		Sichuan					x
		Yunnan					x
		Liaoning		x			
		Jilin		x			
		Heilongjiang		x			
	Japan			x			
		Hokkaido	x				
	Korea			x			
Europe (non EU)	Russia	Russian Far east	x	x			

*: Note that its occurrence in East Asia has been questioned by some authors (e.g. Lu et al., 2007) and Wondafrash et al. (2016) showed that the species established in South Africa is rather an undescribed species or a hybrid between. *P. nemorensis* and *P. strobi*.

The distribution of three of the most economically important species, *P. nemorensis, P. strobi* and *P. terminalis* is presented in Figures 1–3; see also Table 2.

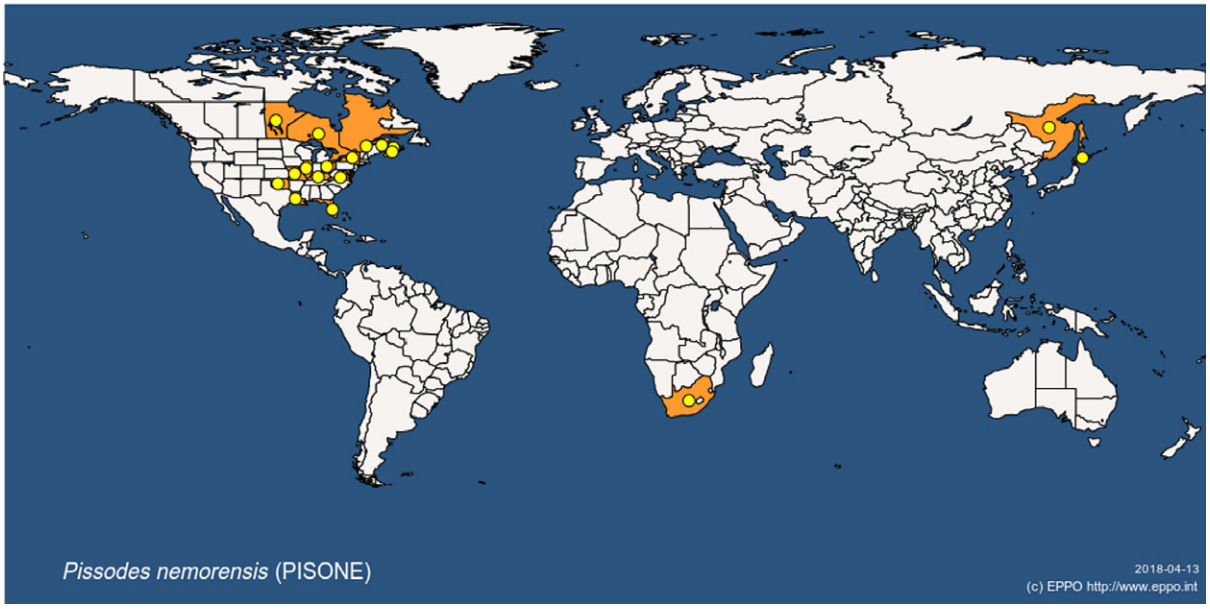

Figure 1: Global distribution map for *Pissodes nemorensis* (extracted from the EPPO Global Database accessed on 13 April 2018). (see comment under Table 2)

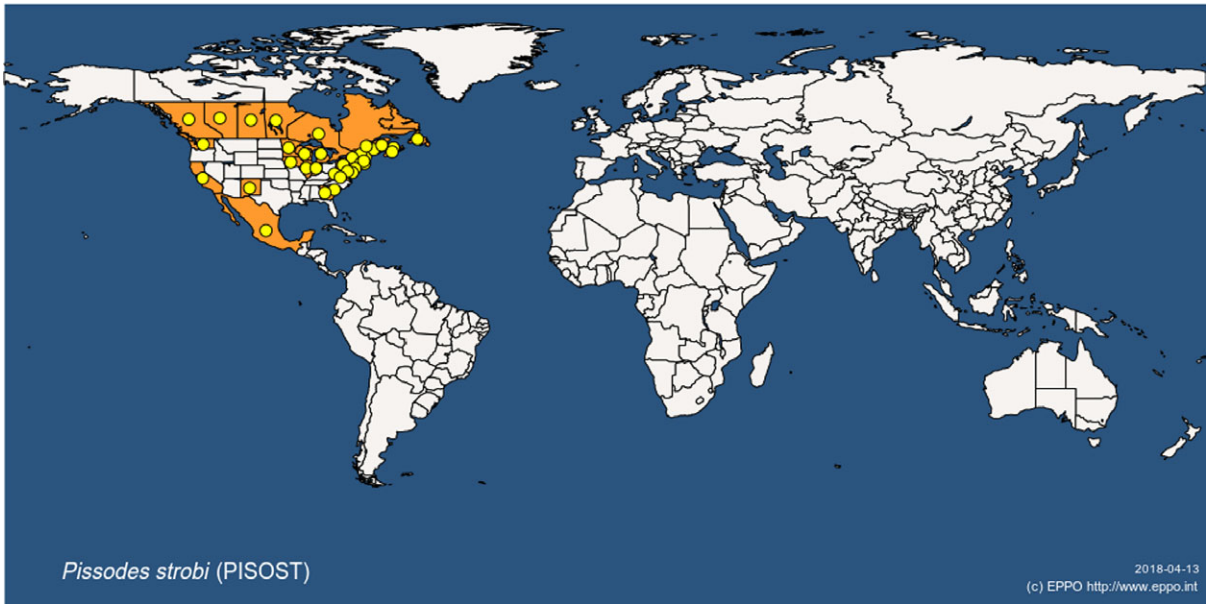

Figure 2: Global distribution map for *Pissodes strobi* (extracted from the EPPO Global Database accessed on 13 April 2018)

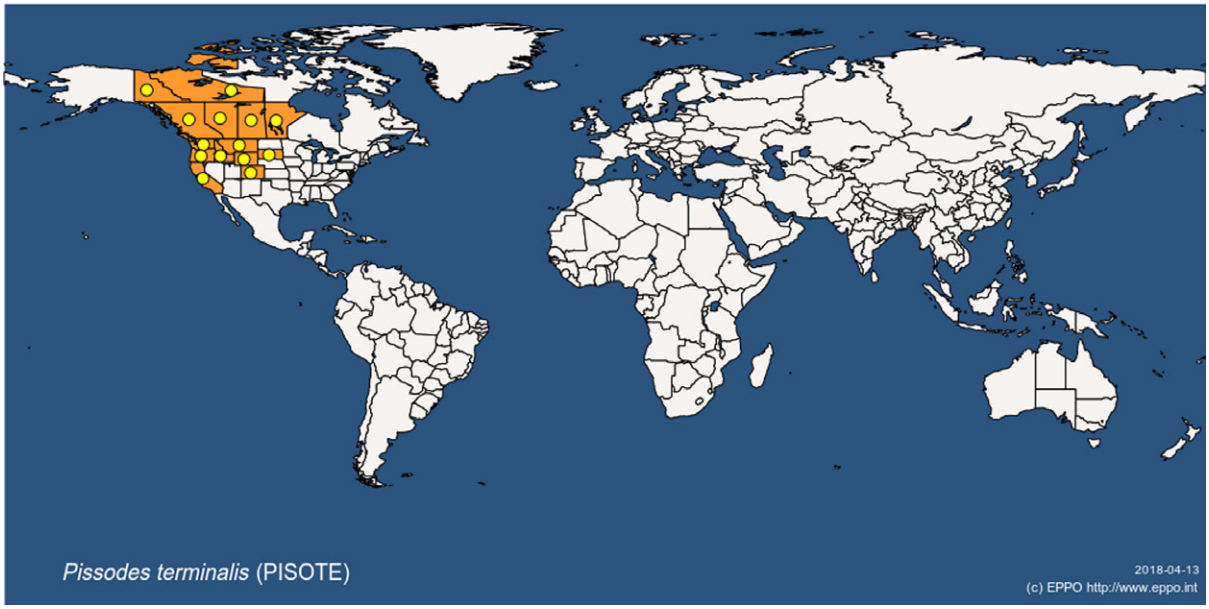

Figure 3: Global distribution map for *Pissodes terminalis* (extracted from the EPPO Global Database accessed on 13 April 2018)

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 *Pissodes* are not yet present in the EU territory.

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

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Pissodes spp. is listed in Council Directive 2000/29/EC. Details are presented in Tables 3 and 4.

Table 3: *Pissodes* spp. 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
22.	*Pissodes* spp. (non-European)	Plants of conifers (*Coniferales*), other than fruit and seeds, wood of conifers (*Coniferales*) with bark, and isolated bark of conifers (*Coniferales*), originating in non-European countries

3.3.2. Legislation addressing the hosts of *Pissodes* spp

Table 4: Regulated hosts and commodities that may involve *Pissodes* spp. 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
	Plants of *Abies* Mill., *Cedrus* Trew, [. . .], *Larix* Mill., *Picea* A. Dietr., *Pinus* L., *Pseudotsuga* Carr. and *Tsuga* Carr., other than fruit and seeds	Non-European countries
Annex IV, Part A	**Special requirements which shall be laid down by all member states for the introduction and movement of plants, plant products and other objects into and within all member states**	
Section I	**Plants, plant products and other objects originating outside the community**	
	Plants, plant products and other objects	Special requirements
1.5	Whether or not listed among the CN codes in Annex V, Part B, wood of conifers (Coniferales), other than in the form of: – chips, particles, sawdust, shavings, wood waste and scrap obtained in whole or part from these conifers, – wood packaging material, in the form of packing cases, boxes, crates, drums and similar packings, pallets, box pallets and other load boards, pallet collars, dunnage, whether actually in use or not in the transport of objects of all kinds, except dunnage supporting consignments of wood, which is constructed from wood of the same type and quality as the wood in the consignment and which meets the same Union phytosanitary requirements as the wood in the consignment, but including that which has not kept its natural round surface, originating in Russia, Kazakhstan and Turkey.	Official statement that the wood: (a) originates in areas known to be free from: — *Pissodes* spp. (non-European) The area shall be mentioned on the certificates referred to in Article 13.1.(ii), under the rubric 'place of origin,' or [. . .] or (c) has undergone kiln-drying to below 20% moisture content, expressed as a percentage of dry matter, achieved through an appropriate time/temperature schedule. There shall be evidence thereof by a mark 'kiln-dried' or 'K.D'. or another internationally recognised mark, put on the wood or on any wrapping in accordance with the current usage, or (d) has undergone an appropriate heat treatment to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including at its core). There shall be evidence thereof by a mark 'HT' put on the wood or on any wrapping in accordance with current usage, and on the certificates referred to in Article 13.1.(ii), or (e) has undergone an appropriate fumigation to a specification approved in accordance with the procedure laid down in Article 18.2. There shall be evidence thereof by indicating on the certificates referred to in Article 13.1.(ii), the active ingredient, the minimum wood temperature, the rate (g/m 3) and the exposure time (h), or (f) has undergone an appropriate chemical pressure impregnation with a product approved in accordance with the procedure laid down in Article 18.2. There shall be evidence thereof by indicating on the certificates referred to in Article 13.1.(ii), the active ingredient, the pressure (psi or kPa) and the concentration (%)

1.7	Whether or not listed among the CN codes listed in Annex V, Part B, wood in the form of chips, particles, sawdust, shavings, wood waste and scrap obtained in whole or in part from conifers (Coniferales), originating in — Russia, Kazakhstan and Turkey, — non-European countries other than Canada, China, Japan, the Republic of Korea, Mexico, Taiwan and the USA, where *Bursaphelenchus xylophilus* (Steiner et Bührer) Nickle et al. is known to occur.	Official statement that the wood: (a) originates in areas known to be free from: — Pissodes spp. (non-European) The area shall be mentioned on the certificates referred to in Article 13.1.(ii), under the rubric 'place of origin,' or (b) has been produced from debarked round wood, or (c) has undergone kiln-drying to below 20% moisture content, expressed as a percentage of dry matter, achieved through an appropriate time/temperature schedule, or (d) has undergone an appropriate fumigation to a specification approved in accordance with the procedure laid down in Article 18.2. There shall be evidence of the fumigation by indicating on the certificates referred to in Article 13.1.(ii), the active ingredient, the minimum wood temperature, the rate (g/m 3) and the exposure time (h), or (e) has undergone an appropriate heat treatment to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including at its core), the latter to be indicated on the certificates referred to in Article 13.1.(ii)
8.1.	Plants of conifers (Coniferales), other than fruit and seeds, originating in non-European countries	Without prejudice to the prohibitions applicable to the plants listed in Annex III(A)(1), where appropriate, official statement that the plants have been produced in nurseries and that the place of production is free from *Pissodes* spp. (non-European)

3.3.3. Legislation addressing the organisms vectored by *Pissodes* spp. (Directive 2000/29/EC)

Pissodes nemorensis has been reported to vector *Fusarium circinatum* and *Leptographium procerum*; For *F. circinatum*, emergency measures are in place in Commission Decision 2007/433/EC on provisional emergency measures to prevent the introduction into and the spread within the Community of *Gibberella circinata* Nirenberg & O'Donnell.

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Nearly all European and non-native cultivated Pinaceae are at risk by at least some of the non-EU *Pissodes* species. Most *Pissodes* spp. attack *Pinus* spp. *Picea*, *Abies* and *Pseudotsuga* are listed as main hosts for some species whereas *Larix* and *Cedrus* are cited as minor hosts (Appendix A).

3.4.2. Entry

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

Yes.

The main pathways of entry are:

- Plants for planting: live Pinaceae including Christmas trees (for species attacking terminals). Pathway closed.
- Pinaceae logs, mostly with bark, although, depending on the species and the tree size and species, debarked logs and bark pieces may also contain viable mature larvae, pupae and/or teneral adults in their pupal cells. Pathway closed.
- Cut branches of Pinaceae. Pathway closed.
- Live, long-lived adults can be transported in containers as hitchhikers.
- It cannot be ruled out that immature *Pissodes* spp. may enter with artificially dwarfed plants of conifers (the plants for planting pathway is closed, but there are derogations in place and there is trade in artificially dwarfed plants from Japan and Korea), but it is highly unlikely that *Pissodes* spp. would be able to be introduced or survive the 2 years inspection and treatment regime. It has never been reported in the post-quarantine inspections in the EU.

There is trade of coniferous wood products into the EU from countries where *Pissodes* species are present (USA, Canada, Mexico, China, Japan, Korea, Russia and South Africa). Among these countries, Russia is by far the biggest exporter of wood into the EU (exporting 0.7–1.2 million tonnes of wood products into the EU in 2012–2016, according to EUROSTAT).

There are no records of interception of *Pissodes* spp. in the Europhyt database.

3.4.3. Establishment

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

Yes, most non-European *Pissodes* spp. would be able to establish in at least some EU countries.

3.4.3.1. EU distribution of main host plants

Pissodes spp. attack mostly *Pinus* spp. and other Pinaceae genera. These are distributed throughout the EU territory (Figure 4).

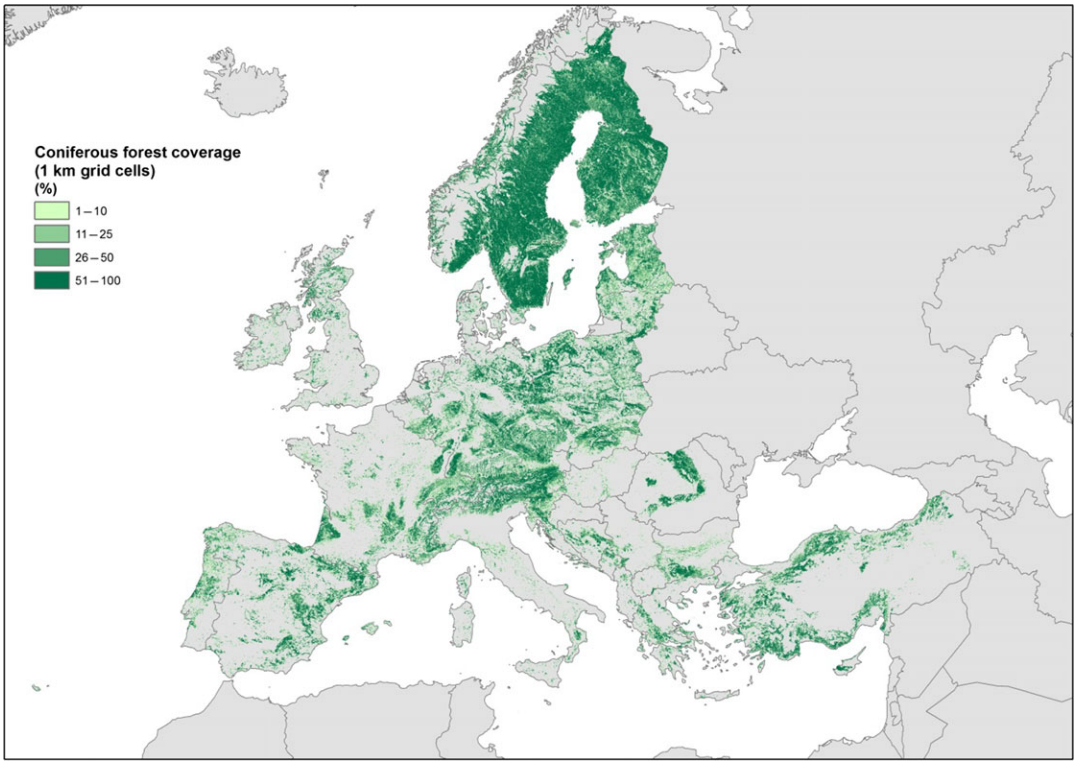

Figure 4: The cover percentage of coniferous forests in Europe with a range of values from 0 to 100 at 1 km resolution (source: Corine Land Cover year 2012 version 18.5 by EEA)

3.4.3.2. Climatic conditions affecting establishment

Most non-EU *Pissodes* spp., including all species known as being severely damaging in their native area, live in temperate climates in North America and East Asia (including *P. punctatus* and *P. yunnanensis* that are found at low latitude but high elevations in China). For these species, most European climates would surely be suitable.

Exceptions include the three tropical species recorded in El Salvador and, possibly, some of the five species occurring in Mexico (See Appendix A). However, the distribution within Mexico of these latter species is too poorly known to allow the assessment of potential establishment in the EU.

3.4.4. Spread

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

Yes. Pissodes weevils are strong flyers and can easily travel as hitchhikers. Immature stages can be transported in plants for planting and logs.

(Regulated non-quarantine pest) RNQPs: Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects?

Yes, should they enter the EU, species attacking terminals or stems of young trees can be easily transported in their immature stages through the movement of live conifer plants, including Christmas trees.

There are evidences showing that the long-lived *Pissodes* adults are strong flyers (Day et al., 2004) although there is no precise data on their flight capacity. They probably also can easily be transported as hitchhiker in any container.

Species attacking terminals or stems of young trees can be easily transported in their immature stages through the movement of live conifer plants, including Christmas trees. Those attacking boles can be transported in logs with bark, although, depending on the species and the tree, debarked logs and bark pieces may also contain viable mature larvae, pupae and/or tenerals (young immature adults) in their pupal cells.

3.5. Impacts

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

Yes, some *Pissodes* spp. would most probably have an economic impact on plantations. They may also interfere with forest ecosystem processes although they are mainly abundant and damaging in intensively managed monocultures.

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]

Not relevant. The damaging species are not in the EU.

All non-EU *Pissodes* species feed on, and develop in the cambium and phloem of conifers (Pinaceae). While the majority of *Pissodes* species attack dead or dying trees and do not cause economic impact in their region of origin, a few are considered as economic pests of conifer plantations, mostly through the destruction of terminal leaders. It must be noted that these latter species are considered pests mainly in monoculture, even-aged plantations and much less so in native and mixed forests.

- *Pissodes strobi* is considered as the most damaging species of the genus. By feeding on, and infesting terminal leaders of – mostly – young pines and spruces, it causes growth loss, crooked and distorted stems, reducing timber quality. Impact on white pine (*Pinus strobus*) plantations in Eastern North America has been so severe that it strongly affected the planting programme and management practice of this valuable tree species (Gross, 1985). Impacts on Sitka spruce (*Picea sitchensis*) plantations have been similarly severe (Alfaro, 1994). *Pissodes strobi*, as other species affecting conifer terminals are also considered pests of Christmas trees since these do not tolerate aesthetic damages.

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

- *Pissodes terminalis* is rather similar to *P. strobi* in the sense that that it also attacks terminal leaders, which results in crooked forked stems, but attacks are usually less severe and rather restricted to young *Pinus contorta* and *P. banksiana* of 2–6 m. In some cases, the weevil can affect nearly all trees of a plantation. However, deformities have disappeared when trees are harvested and, thus, *P. terminalis* is usually considered as a minor pest, except for Christmas tree plantations (Stevens and Knopf, 1974; Langor et al., 1992).
- *Pissodes nemorensis* attacks mainly boles of dead or dying trees but can also damage living trees, including terminals. In some cases, it may kill apparently healthy trees. It is also considered a pest in nurseries because adults can intensively feed on seedlings (Ollieu, 1971; Overgaard and Nachod, 1971; Phillips et al., 1987). In addition, *P. nemorensis* has been reported to be associated with several tree pathogens, in some cases as vectors, e.g. of *Fusarium circinatum*, the causal agent of pitch canker and *Leptographium procerum*, the causal agent of procerum root disease (see Wondafrash, 2016 for review). The association with *F. circinatum* has also been shown in South Africa, where the beetle has been introduced and causes increasing damage on *Pinus radiata* plantations, mainly through the destruction of terminal leaders. However, recent molecular studies suggest that this species is not *P. nemorensis*, but an unrecognised species of the *P. strobi* complex or a hybrid between *P. strobi* and *P. nemorensis* (Wondafrash et al., 2016).
- *Pissodes fasciatus* attacks dead or dying stems of Douglas-fir, *Pseudotsuga menziesii*, which in itself is not of economic importance. However, Witcosky et al. (1986) showed that the species can act as vector of *Ophiostoma wageneri* Kendrick, the causal agent of black-stain root disease of Douglas-fir, absent from the EU territory. This and the previous example of *P. nemorensis* and pitch canker show the potential of *Pissodes* spp. to become vectors of serious tree diseases.
- *Pissodes nitidus* is a pest of young pines in East Asia. Damage varies among regions, and the most severe damage has been reported on *Pinus koraiensis* in Northern China (Jin, 1989). Similarly to *P. strobi* and *P. terminalis*, it attacks terminals, which reduces annual growth and causes deformities. Several years of attack produce a stem that cannot be used as saw timber.
- Other Asian *Pissodes* spp. are still rather poorly known but are potentially very damaging. Two species recently described from south-western China, *P. punctatus* and *P. yunnanensis*, are reported to cause stem deformities in pine plantations, similar to those caused by the above-mentioned species. *Pissodes yunnanensis* is also able to kill young trees through repeated attacks or even in a single year on very young (3–4 years old) trees (Langor et al., 1999; Zhang et al., 2004). Damage has increased in recent decades, partly as a result of the advent of extensive pine monocultures.
- Similarly, although little is known from Mexican and Central American *Pissodes* spp., damage on pine plantations have been reported, particularly for *P. cibriani* and *P. zitacuarense* (O'Brien, 1989a).

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, measures listed on the annexes of Council Directive 2000/29 directly target *Pissodes* spp. or more generally prevent the introduction of conifer plants for planting and wood with bark from Third countries (see Section 3.3).

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

Non-EU Pissodes spp. are not known to occur in the EU so RNQP status is not being considered.

3.6.1. Phytosanitary measures

Several measures not directly related to *Pissodes* spp. but targeting coniferous trees and wood from Third countries are included on the annexes of Council Directive 2000/29.

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

In case of derogations regarding the importation of living conifers (e.g. artificially dwarfed plants), infestations by *Pissodes* spp. cannot be easily noticed without destroying (debarking) the plant.

3.6.2. Pest control methods

Control methods vary with the species. In the EU, control methods are rarely applied against *Pissodes* spp., which are considered as secondary pests. *P. castaneus* is still considered as pest in young pine monocultures in some regions but much less so in mixed forests and plantations. In general, *Pissodes* spp. are much more prevalent in such monocultures of even-aged, open-grown trees and their importance decrease with the increase of stand complexity.

In North America, control methods are mostly applied against *Pissodes strobi*. These can also be applied to other terminal-infesting species. The methods that have shown some success in limiting the impact include:

- pruning of infested leaders and corrective pruning of attacked trees;
- manipulation of stand densities, composition and shading;
- avoid planting susceptible species in highly favourable sites, using hazard rating systems;
- insecticides;
- selection of resistant varieties.

In South Africa, the control of the invasive *Pissodes* sp. (previously recorded as *P. nemorensis*) also includes:

- Avoidance of stress on pines by planting at sites that are favourable for the planted trees species.
- Removal of breeding material such as slash and dying trees since *Pissodes* sp. mainly develops in dead or dying trees.

3.7. Uncertainty

The main uncertainty is related to the assessment of impact for species that are not yet invasive elsewhere. There are several examples of bark and wood boring beetles (and other insects and pathogens) that are innocuous in their native range and became extremely damaging in their invasion range because they encountered plant species that had not developed resistance mechanisms against the species or because they invaded new regions without their natural enemies. The recent invasion of Eastern USA by the emerald ash borer, *Agrilus planipennis* is a good example. Native to Asia where the local *Fraxinus* species are generally resistant, the pest is presently threatening to eliminate the North American ashes (Herms and McCullough, 2014; Morin et al., 2017). Thus, it cannot be ruled out that some *Pissodes* spp. that are of limited importance in their native range become serious pests in Europe.

The likelihood of beetles entering the EU as hitchhikers is also highly uncertain. *Pissodes* spp. do not aggregate as other beetles or bugs do and, thus, even if a beetle arrives in Europe accidentally, it is likely to arrive alone or in very small numbers, under its Allee threshold, limiting the chance of establishment (Lewis and Kareiva, 1993; Liebhold and Tobin, 2008).

There is a high uncertainty associated with the ability of *Pissodes* spp. to become vectors of tree pathogens. Several cases of *Pissodes*-plant pathogens associations have been reported but in general the importance of the weevils as vectors could not be ascertained.

Finally, there is a significant uncertainty related to the taxonomy of *Pissodes* species. In particular, the *Pissodes strobi* species complex includes cryptic species that interbreed and, since their ranges overlap, their identity as separate species can be questioned. The invasive species in South Africa that belongs to this complex was identified as an undescribed species or a hybrid between *P. strobi* and *P. nemorensis*, highlighting the taxonomic issues related to this group.

4. Conclusions

Pissodes spp. (non-EU) that have recorded impacts (*Pissodes strobi, P. terminalis, P. nemorensis, P. yunnanensis, P. nitidus*) do meet the criteria assessed by EFSA to be considered as potential quarantine pests. The impact of some other species (*P. punctatus, P. fasciatus, P. cibriani, P. zitacuarense*) is less clearly documented.

Pissodes spp. (non-EU) being absent from the EU territory, do not meet the criteria assessed by EFSA for consideration as potential regulated non-quarantine pests (Table 5).

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)	The genus *Pissodes* is a valid taxon	The genus *Pissodes* is a valid taxon	The taxonomy within the genus includes several uncertainties. See Section 3.7
Absence/ presence of the pest in the EU territory (section 3.2)	The species described in this opinion are by definition absent from the EU territory	The species described in this opinion are by definition absent from the EU territory	None
Regulatory status (section 3.3)	The *Pissodes* spp. considered in this opinion are quarantine organisms included in Annex IIAI of Council Directive 2000/ 29/EC	The *Pissodes* spp. considered in this opinion are quarantine organisms included in Annex IIAI of Council Directive 2000/ 29/EC	None
Pest potential for entry, establishment and spread in the EU territory (section 3.4)	The pest is able to enter into, become established in, and spread within, the EU territory. The identified pathways are: a) conifer plants for planting (closed pathway); b) Pinaceae roundwood with bark or debarked (closed pathway); c) cut branches (closed pathway); d) artificially dwarfed plants of conifers imported under derogation; e) hitchhiking insects	The pest is able to enter into, become established in, and spread within, the EU territory. The identified pathways are: a) conifer plants for planting (closed pathway); b) Pinaceae roundwood with bark or debarked (closed pathway); c) cut branches (closed pathway); d) artificially dwarfed plants of conifers imported under derogation; e) hitchhiking insects	Hitchhiking is a possibility, the adult weevils being long-lived. However, it has never been reported so far
Potential for consequences in the EU territory (section 3.5)	Some *Pissodes* spp. would most probably have an economic impact on plantations. They may also interfere with forest ecosystem processes although they are mainly abundant and damaging in intensively managed monocultures	Some *Pissodes* spp. would most probably have an economic impact on plantations. They may also interfere with forest ecosystem processes although they are mainly abundant and damaging in intensively managed monocultures	The fact that new hosts and, possibly, new pathogens would be involved gives some uncertainty regarding damage magnitude. Also, entering new areas, possibly free from natural enemies could increase the pest's damage
Available measures (section 3.6)	Entry: most of the major pathways are closed, except artificially dwarfed plants of conifers under derogation Establishment and spread: monitoring for, and destruction of infested material could prevent establishment and spread	Spread: production of plants for planting in a pest free place of production or a pest-free area would prevent or slow the spread. Monitoring for, and destruction of, infested material could contribute to prevent the spread	The cryptic nature of the immature stages makes them often difficult to notice The insects are strong flyers and, hence, spread by natural means can occur

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
Conclusion on pest categorisation (section 4)	All criteria assessed by EFSA above for consideration as a potential quarantine pest were met regarding the species that have recorded impacts: *Pissodes strobi, P. terminalis, P. nemorensis, P. nitidus, P. yunnanensis*	The pests being absent from the EU territory, do not meet the criteria assessed by EFSA for consideration as potential regulated non-quarantine pests	The impact of species such as *P. punctatus, P. fasciatus P. cibriani* and *P. zitacuarense* is incompletely documented Furthermore, other species may become harmful in newly colonised areas because they would attack new, more susceptible hosts or enter without their natural enemies from the native area
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The nature and extent of the damage of some of the species mentioned in Appendix A requires clarification		

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Abbreviations

DG SANTÉ	Directorate General for Health and Food Safety
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 – List of *Pissodes* spp. not reported from the EU

This table is largely based on that presented in Wondafrash (2016). Other references are listed in the table.

Species	Economic damage reported[a]	Distribution-reported from	Reference	Host genera
Pissodes affinis Randall	?[b]	USA, Canada	O'Brien (1989b), Furniss and Carolin (1977)	*Pinus*
Pissodes ayacahuite Osella	No	El Salvador	Osella (1977)	*Pinus*
Pissodes barberi Hopkins	No	USA	O'Brien (1989b), Furniss and Carolin (1977)	Piceae in Wondafrash, *Pinus*? in Furniss and Carolin (1977)
Pissodes burkei Hopkins	No	USA, Canada	O'Brien (1989b), Furniss and Carolin (1977)	*Abies*
Pissodes californicus Hopkins	No	USA	O'Brien (1989b), Furniss and Carolin (1977)	*Pinus*
Pissodes cembrae Motschulsky	?[c]	China, Japan	Kulinich and Orlinskii (1998)	*Pinus* (*Larix*, *Picea*, *Abies*)
Pissodes championi O'Brien	No	Mexico	O'Brien (1989a)	*Pinus*
Pissodes cheni Lu, Zhang and Langor	No	China	Lu et al. (2007)	*Pinus*
Pissodes cibriani O'Brien	?[d]	Mexico	O'Brien (1989a)	*Pinus*
Pissodes coloradensis Hopkins	No	USA (Wondafrash adds Canada)	O'Brien (1989b), Furniss and Carolin (1977)	*Picea* (Furniss and Carolin add *Pinus*)
Pissodes costatus Mannerheim	No	USA, Canada	O'Brien (1989b), Furniss and Carolin (1977)	*Picea* (Furniss and Carolin add *Pinus*)
Pissodes fasciatus LeConte	?[e]	USA, Canada	O'Brien (1989b)	*Pseudotsuga*
Pissodes fiskei Hopkins	No	USA, Canada	O'Brien (1989b), Furniss and Carolin (1977)	*Picea*
Pissodes galloisi Kóno	No	Japan, Russia	EPPO (2005)	*Pinus*
Pissodes guatemaltecus Voss	No	Mexico, Guatemala	O'Brien (1989a)	*Pinus*
Pissodes incavatus Osella	No	El Salvador	Osella (1977)	*Pinus*
Pissodes insignatus Boheman	?[f]	Russia	Legalov (2010), EPPO (2005)	*Pinus* (*Larix*)
Pissodes mexicanus O'Brien	No	Mexico	O'Brien (1989a)	*Pinus*
Pissodes murrayanae Hopkins	No	USA	O'Brien (1989b), Furniss and Carolin (1977)	*Pinus*
Pissodes nemorensis Germar	Yes	USA, Canada (occurrence in South Africa may refer to a different species and references from Russian Far East and Japan may be misidentifications)[g]	O'Brien (1989b), Wondafrash et al. (2016)	*Pinus*, *Cedrus*, *Picea*
Pissodes nitidus Roelofs	Yes	China, Japan, Korea, Russia	Lu et al. (2007), Jin (1989)	*Pinus*
Pissodes obscurus Roelofs	No	Russia, Japan, Korea	Legalov (2010)/EPPO (2005)	*Pinus* (*Picea*, *Abies*)

Species	Economic damage reported[(a)]	Distribution-reported from	Reference	Host genera
Pissodes ochraceus Van Dyke	No	USA	O'Brien (1989b)	?
Pissodes pilatsquamosus Lu, Zhang and Langor	No	China	Lu et al. (2007)	*Pinus*
Pissodes punctatus Langor and Zhang	?[(h)]	China	Langor et al. (1999)	*Pinus*
Pissodes puncticollis Hopkins	No	USA	O'Brien (1989b)	*Picea*
Pissodes radiatae Hopkins	No	USA	O'Brien (1989b); Furniss and Carolin (1977)	*Pinus*
Pissodes robustus Van Dyke	No	USA	O'Brien (1989b)	?
Pissodes rotundatus LeConte	No	USA	O'Brien (1989b)/Furniss and Carolin (1977)	*Picea* (Pinus, Tsuga)
Pissodes rotundicollis Desbrochers[(i)]	No	Russia	Lu and Zhang (2007)	?
Pissodes schmutzenhoferi Osella	No	El Salvador	Osella (1977)	*Pinus*
Pissodes schwarzi Hopkins	?[(j)]	USA, Canada	O'Brien (1989b); Furniss and Carolin (1977)	*Pinus*, *Larix*
Pissodes similis Hopkins	No	USA, Canada	O'Brien (1989b); Furniss and Carolin (1977)	*Abies*
Pissodes striatulus (F.)	No	USA, Canada	O'Brien (1989b); Furniss and Carolin (1977)	*Abies*
Pissodes strobi (Peck)	Yes	USA/Canada	O'Brien (1989b); Furniss and Carolin (1977)	*Pinus*, *Picea*
Pissodes terminalis Hopping	Yes	USA, Canada	O'Brien (1989b); Furniss and Carolin (1977)	*Pinus*
Pissodes webbi Hopkins	No	USA	O'Brien (1989b); Furniss and Carolin (1977)	*Pinus*
Pissodes yunnanensis Langor and Zhang	Yes	China	Langor et al. (1999); Xu et al. (2002), Zhang et al. (2004)	*Pinus*
Pissodes zitacuarense Sleeper	?[(d)]	Mexico	O'Brien (1989a)	*Pinus*

(a): Economic damage reported: Yes: publications describing economic damage such as yield losses or important mortality and/or management practices; No: No publications suggesting economic damage and/or management practices: ?: doubtful situations, as explained in footnotes.
(b): *Pissodes affinis*: Some old papers, e.g. Martin (1964) associate this species in a complex causing high pine mortality in Canada.
(c): *Pissodes cembrae*: East Asian species still present in several lists although Legalov and Opanassenko (2000) synonymised it with the European *Pissodes pini*. EPPO (2005) considers *P. cembrae* as having low to high impact but does not provide original sources.
(d): *Pissodes cibriani* and *P. zitacuarense*: O'Brien (1989a) mentions that these species could be important for Christmas tree plantations and *P. cibriani* apparently destroyed *Prunus patula* at one site, but no additional data are provided.
(e): *Pissodes fasciatus*: Only breeds in boles of dead or dying douglas fir, but Witcosky et al. (1986) showed that the species can act as vector of *Verticicladiella wageneri*, the causal agent of black-stain root disease.
(f): *Pissodes insignatus*: EPPO (2005) mentions low to medium impact but does not cite its sources, which are probably Russian papers.
(g): *Pissodes nemorensis*: Molecular studies showed that the invasive populations in South Africa, previously recorded as *P. nemorensis*, is rather an unrecognised species of the *P. strobi* complex or a hybrid between *P. strobi* and *P. nemorensis* (Wondafrash et al., 2016). Records from the Russian Far East and Japan may results from misidentifications of *P. nitidus* (Lu et al., 2007). *Pissodes nemorensis* has been reported to vector *Fusarium circinatum* and *Leptographium procerum.*
(h): *Pissodes punctatus*: In the first description, Langor et al. (1999) do not provide details on damage. In later papers, the same authors (e.g. Lu et al., 2007) mention it as a serious pest but without providing further details.

(i): *Pissodes rotundicollis*: Russian species appearing in only few publications (e.g. Lu and Zhang, 2007; Wondafrash, 2016), possibly referring to erroneous records. It does not appear in the list of Russian *Pissodes* spp. of Kulinich and Orlinskii (1998).
(j): *Pissodes schwartzi*: This species is part of the *P. strobi* species complex but, in contrast to the three other species of the complex, is usually not cited as damaging healthy trees.

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

This table is based on the EPPO Global Database and Fauna europaea.

Species	Distribution in the EU
Pissodes harcyniae (Herbst)	Austria, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Latvia, Poland, Slovakia, Sweden, Netherlands (doubtful)
Pissodes scabricollis Miller	Austria, Croatia, Czech Republic, Germany, Hungary, Italy, Poland, Slovakia
Pissodes piceae (Illiger)	Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Latvia, Poland, Slovakia, Spain, Netherlands (doubtful)
Pissodes piniphilus (Herbst)	Austria, Bulgaria, Croatia, Czech republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Poland, Slovakia, Sweden, Netherlands
Pissodes validirostris Gyllenhal	Austria, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Netherlands, Poland, Portugal, Slovakia, Sweden, UK
Pissodes irroratus[(a)] Reitter	France, Italy
Pissodes castaneus (De Geer)	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, UK
Pissodes pini (Linnaeus)	Austria, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Netherlands, Poland, Slovakia, Spain, Sweden, UK
Pissodes gyllenhali (Sahlberg)	Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Netherlands, Poland, Slovakia, Sweden

(a): A recent finding (Haran et al., 2016) has allowed to add *Pissodes irroratus*, so far known only as an East Russian species, to the EU fauna. The capture of specimens of this species in 2015 in the French Alps led to an inventory of European collection, where a misidentified specimen caught in Switzerland in 1966 was found.