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Pest categorisation of *Stegophora ulmea*

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Abstract

Following a request from the European Commission, the EFSA Panel on Plant Health (PLH) performed a pest categorisation of *Stegophora ulmea*, a well-defined and distinguishable fungal species of the family Sydowiellaceae. *S. ulmea* causes a tree disease known as black spot of elm (*Ulmus* spp.). The pathogen is reported from North America (native range) and Asia (Far-East Russia and China), but not from the EU. *S. ulmea* is regulated in Council Directive 2000/29/EC (Annex IIAI) as a harmful organism whose introduction into the EU is banned on plants of *Ulmus* L. and *Zelkova* L., intended for planting, other than seeds. The pathogen has been occasionally intercepted on imported bonsai plants (and then destroyed) in the Netherlands and the UK. It could enter the EU and spread within it via plants for planting (including bonsai) and cut branches. Hosts and favourable climatic conditions are common in the EU. The European native elm species *Ulmus glabra* and *Ulmus laevis* were found to be more susceptible to the disease than North American elm species, but information is lacking on *Ulmus minor*. The disease is rarely fatal, but *S. ulmea* can cause considerable damage, particularly in wet summers. Reduction of inoculum by the removal of leaf debris and avoiding overhead watering in nurseries can reduce the risk of spread of the pathogen. The main knowledge gaps concern (i) the distribution of the pest in Asian countries, (ii) the relative role of the means of entry/spread and (iii) the potential consequences in mature tree plantations and native woodland. The criteria assessed by the Panel for consideration as potential quarantine pest are met. For regulated non-quarantine pests, the criterion on the pest presence in the EU is not met.

Keywords: bonsai, European Union, forest pathology, pest risk, plant health, plant pest, tree health

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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 criterion 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

Stegophora ulmea is one of a number of pests listed in the Appendices to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a quarantine pest or those of a regulated non-quarantine pest (RNQP) for the area of the EU.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *S. ulmea* was conducted at the beginning of the categorisation in the ISI Web of Science database. Both *S. ulmea* and its previous accepted name (*Gnomonia ulmea* and its previously used synonyms) were used as search terms. Further references and information were obtained from experts, from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database (https://gd.eppo.int) and other publications/databases, as detailed in Section 3.2.

Information on European Union Member State (EU MS) imports of *Ulmus* and *Zelkova* plants for planting from North America were sought in the ISEFOR database (Eschen et al., 2017).

The Europhyt database was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network launched by the Directorate General for Health and Food Safety (DG SANTE), 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 *S. ulmea* 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 started following an evaluation of the EU's plant health regime. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a Union quarantine pest and for a Union regulated non-quarantine pest in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required as per the specific 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. In such a case, the working group should consider the possibility to stop the assessment early and to be concise in the sections preceding the question for which the negative answer is reached. Note that a pest that does not qualify as a quarantine pest may still qualify as a regulated non-quarantine pest which needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone, thus the criteria refer to the protected zone instead of the EU territory.

It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, while addressing social impacts is outside the remit of the Panel, in agreement with the 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 2-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

Stegophora ulmea (Fr.) Syd. & P. Syd. is a fungus of the family Sydowiellaceae. In addition to the formerly accepted name *Gnomonia ulmea* (Fr.) Thüm., the fungus has also been referred to by means of the following synonyms: *Asteroma ulmeum*, *Cylindrosporella ulmea*, *Dothidella ulmea*, *Gloeosporium ulmeum*, *Gloeosporium ulmicola*, *Lambro ulmea*, *Sphaeria ulmea* and *Xyloma ulmeum* (Index Fungorum, http://www.indexfungorum.org/names/names.asp).

3.1.2. Biology of the pest

S. ulmea is the causal agent of a disease known as black spot of elm. The primary infections occur in the spring mostly in lower leaves and twigs of elms (*Ulmus* spp.) by means of airborne ascospores produced in overwintered perithecia in leaf debris (Sinclair and Lyon, 2005). The release of ascospores generally occurs under conditions of alternating wetness and drying after several days of temperature of at least 7°C and is usually synchronised with foliar development of elms (Sinclair and Lyon, 2005). The optimum temperature for the germination of ascospores is approximately 8°C and there is a total inhibition of germination above 24°C (McGranahan and Smalley, 1984a). *S. ulmea* may also overwinter in buds and persistent leaves (Sinclair and Lyon, 2005).

S. ulmea is active during both cool spring and warm early summer weather conditions (Sinclair and Lyon, 2005). In laboratory experiments, mycelia grew in a range of temperatures comprised between 8°C and 24°C with optimum ranging from 16°C to 24°C (McGranahan and Smalley, 1984a). When infection is started early in the growing season, symptoms in the form of lesions may develop on petioles and succulent stems. Severe infections at this stage cause shoot and leaf blights. Blighted parts of the tree may then recover during the summer as a result of growth from previously dormant buds (Sinclair and Lyon, 2005).

Foliar symptoms develop as yellow spots of about 1 mm diameter on upper surfaces of leaves when they are unfolding from buds. Subsequently, an acervulus forms in the centre of the lesion and a black stroma forms beneath the acervulus (Sinclair and Lyon, 2005). The stroma is visible as a black dot of about 0.5 mm diameter. Two or more stromata may coalesce to form a single, irregular black stroma of up to 3–5 mm diameter surrounded by a narrow band of white dead leaf tissue (Stipes and Campana, 1981; Sinclair and Lyon, 2005). A white mass of conidia appears on the acervuli. It may take 10–20 days for mature conidia to develop after infection (Sinclair and Lyon, 2005). Two conidial stages develop successively in the acervuli. The first (formerly known as *Gloeosporium ulmiculum*) produces infectious unicellular macroconidia, 8–10 × 3–3.5 μm in size and responsible for secondary cycles during spring and early summer. Rain splash is deemed important for the dispersal of macroconidia from lower to upper leaves. The second conidial stage (*Cylindrosporella ulmea*) develop later, starting from midsummer and produces non-infectious microconidia 4–6 × 1–2 μm in size serving as spermatia (Sinclair and Lyon, 2005). While macroconidia germination was reduced at temperatures lower than 8°C and higher than 28°C, microconidia did not germinate at any of the temperatures tested (between 4°C and 32°C) (McGranahan and Smalley, 1984a).

Perithecia develop in lesions starting from late summer and autumn. At maturity, they are flask-shaped with bodies 200–385 μm wide, 150–230 μm deep and beaks 80–100 μm long (Sinclair and Lyon, 2005).

In addition to leaves, petioles and shoots, green fruit of some elm species may also be attacked and they may develop a crumpled appearance as a result of infection (Sinclair and Lyon, 2005). Symptoms are present year-round on evergreen elms, e.g. Chinese elm (*U. parvifolia*) (EPPO, 2005).

3.1.3. Intraspecific diversity

No information was found on the intraspecific diversity within *S. ulmea*.

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?
Yes, detection and identification methods are available, which are based on traditional morphological criteria.

Inspection of leaves in the spring for the presence of symptoms (e.g. lesions and black stromata) is the most effective method to detect the disease (EPPO, 2005). Microscopic observation of leaves may be performed to confirm the presence of the pathogen (EPPO, 2005).

Successful isolation of the pathogen from surface-sterilised leaf discs onto potato dextrose or oatmeal agar solid media was previously reported and described (McGranahan and Smalley, 1984b). No molecular methods for detection and identification are available.

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

S. ulmea is reported in North America, where it is deemed native (EPPO, 2005), and in Asia (EPPO, 2017) (Figure 1). In North America, the pathogen is present in central and eastern Canada (Manitoba Nova Scotia, Ontario and Quebec) and is widespread in the USA from the Great Plains to New England (Sinclair and Lyon, 2005; EPPO, 2005). The pathogen is also present in Texas and California (EPPO, 2005, 2017).

In Asia, the pathogen is present in Far East Russia. In addition, it is present in China, since the pathogen has been repeatedly detected on exported bonsai plants (EPPO, 2005, 2017).

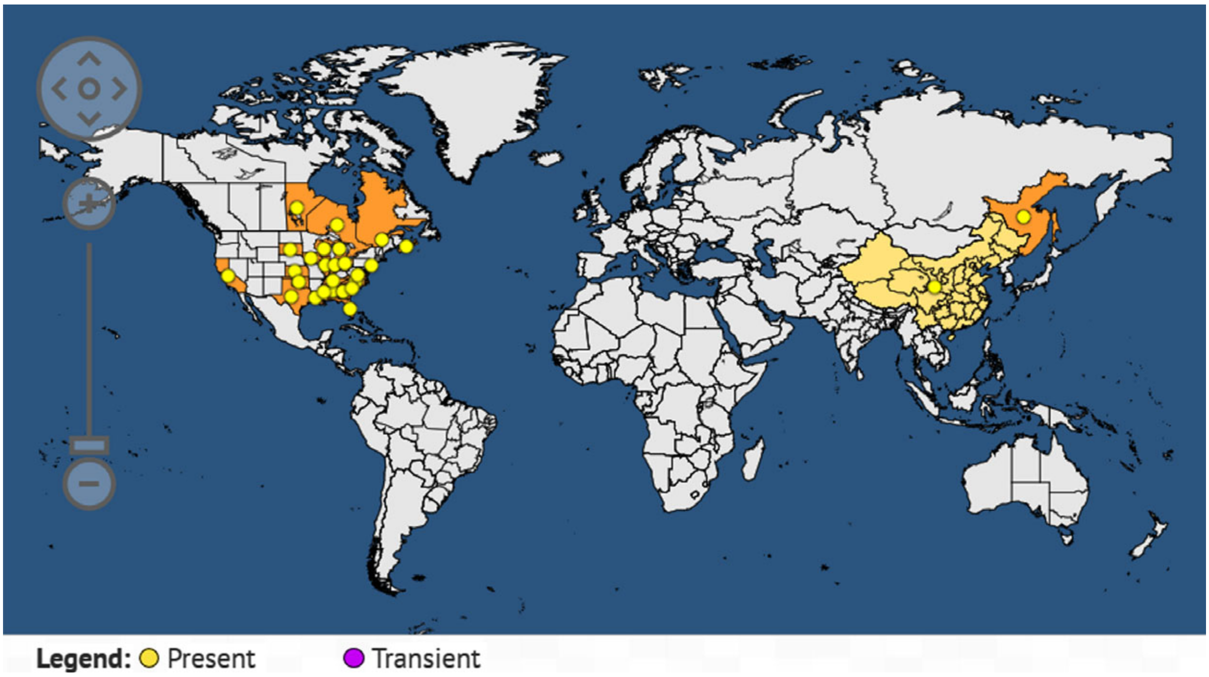

Figure 1: Global distribution map for *Stegophora ulmea* (extracted from EPPO (2017), accessed August 2017). There are no reports of transient populations for this species. China is shown with a lighter colour because there are no data at subnational level. The presence of the pathogen in that country has been inferred from interceptions on bonsai plants exported from China

3.2.2. Pest distribution in the EU

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

No, the pest is not reported to be present in the EU.

Although *S. ulmea* is officially absent in the EU territory, there is a doubtful and unconfirmed record of the fungus in Romania (see EPPO, 2005). In addition, *S. ulmea* was intercepted in a glasshouse in the Netherlands in 2000 (EPPO, 2001) and repeatedly during 1999–2007 on imported bonsai in the UK (Lane et al., 2013), but was successfully destroyed.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

S. ulmea is listed in Council Directive 2000/29/EC. Details are presented in Tables 2 and 3.

Table 2: *Stegophora ulmea* in Council Directive 2000/29/EC

Annex II, Part A	Harmful organisms whose introduction into, and spread within, all member states shall be banned if they are present on certain plants or plant products	
Section I	Harmful organisms not known to occur in the community and relevant for the entire community	
(c)	Fungi	
	Species	Subject of contamination
14.1.	*Stegophora ulmea* (Schweinitz: Fries) Sydow & Sydow	Plants of *Ulmus* L. and *Zelkova* L., intended for planting, other than seeds

3.3.2. Legislation addressing plants and plant parts on which *S. ulmea* is regulated

Table 3: Regulated hosts and commodities that may involve *Stegophora ulmea* in Annexes III, IV and V of Council Directive 2000/29/EC

Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community — in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community
Part B	Plants, plant products and other objects originating outside the Community
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community
2.	Cut branches of [...], *Ulmus davidiana* Planch. [...], with or without foliage, originating in Canada, China, Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea, Russia, Taiwan and USA

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

S. ulmea is a serious foliar disease agent on several elm (*Ulmus*) species. *Zelkova serrata* (Japanese zelkova) is also susceptible (Sinclair and Lyon, 2005). In North America, *U. americana* is the major host of the pathogen. The following species are also known to be hosts of *S. ulmea*: *U. alata*, *U. carpinifolia*, *U. crassifolia*, *U. glabra*, *U. hollandica*, *U. japonica*, *U. laciniata*, *U. laevis*, *U. minor*, *U. parvifolia*, *U. procera*, *U. pumila*, *U. rubra*, *U. serotina*, *U. thomasii*.

The European species *U. laevis* and *U. glabra* were found to be the most susceptible species to the disease (McGranahan and Smalley, 1981).

The hosts for which the pest is regulated are comprehensive of the known host range. Only cut branches of *U. davidiana* are regulated, but this species is not known to be a host.

3.4.2. Entry

Is the pest able to enter into the EU territory?
Yes, the pest could enter the EU via plants for planting and cut branches (see below).

S. ulmea entered into the EU in 2000, in a glasshouse in the Netherlands. However, it was successfully eradicated (EPPO, 2001). Similarly, during 1999–2007, the pathogen was repeatedly intercepted on bonsai plants in the UK of both *Ulmus* spp. and *Zelkova* spp. originating predominantly from China or in transit via the Netherlands and Belgium (Lane et al., 2013). Also in the UK, the pathogen was eradicated.

As of September 2017, there are three records of interception of *Stegophora* spp. in the Europhyt database, one reported by the Netherlands (1999, on *Zelkova* spp.) and two reported by the UK (2000, on *Ulmus parvifolia*, and 2003, on *Zelkova* spp.), all originating from China. Further interceptions are reported in the UK rapid pest risk analysis (Lane et al., 2013).

In the ISEFOR database of plants for planting, there are many records of shipments of *Ulmus* spp. and *Zelkova* spp. plants for planting (including bonsai plants) imported by the EU from China.

As the fungus can overwinter and survive in leaves, twigs, fruits and dormant buds, movement and introduction of the pathogen may occur via:

- plants for planting (including bonsai plants),
- and cut branches.

3.4.3. Establishment

3.4.3.1. EU distribution of main host plants

Is the pest able to become established in the EU territory?
Yes, the pest could establish in the EU, as hosts are widespread and climatic conditions are comparable to those present in the native range of the pathogen.

The pathogen can infect a wide range of native and exotic *Ulmus* spp. as well as *Zelkova serrata*. Some hosts are present in European forests, nurseries and as amenity trees (Sinclair and Lyon, 2005; EPPO, 2005) (Figure 2). In particular, the European species *U. glabra* and *U. laevis,* which are widely distributed across Europe, mostly in its central and eastern areas, respectively (Figures 3 and 4), are highly susceptible to *S. ulmea* (McGranahan and Smalley, 1981; EPPO, 2005). *Ulmus minor,* another European *Ulmus* species, is known to be a host and is distributed in the central and southern parts of Europe (Figure 5).

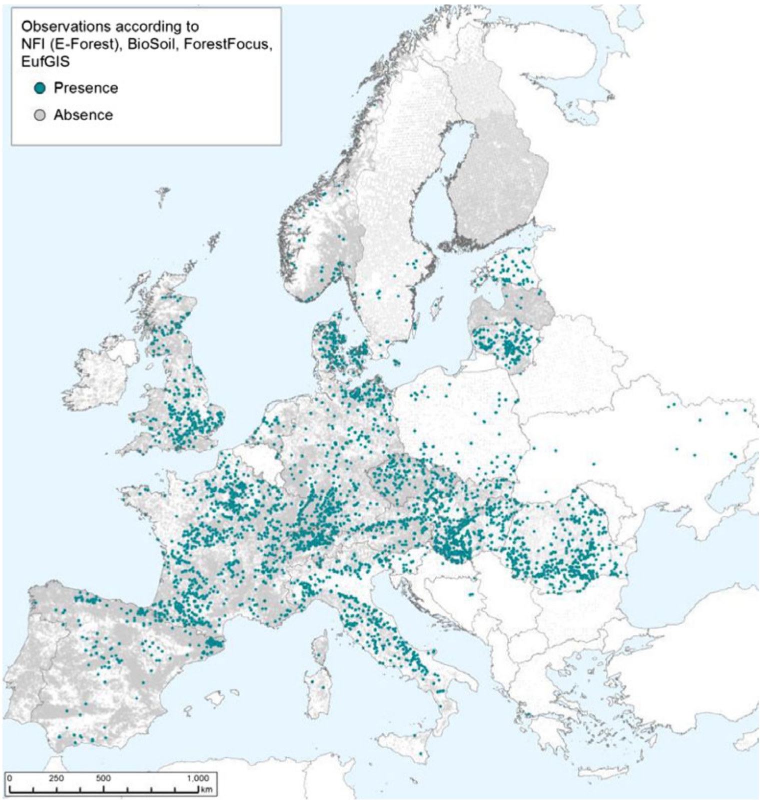

Figure 2: The plain spatial distribution of recorded presences of *Ulmus* spp. in Europe plotted (LAEA EPSG CODE 3035) against the corresponding distribution of all the available field observations (including the ones in which *Ulmus* taxa are not reported) (EFSA PLH Panel, 2014)

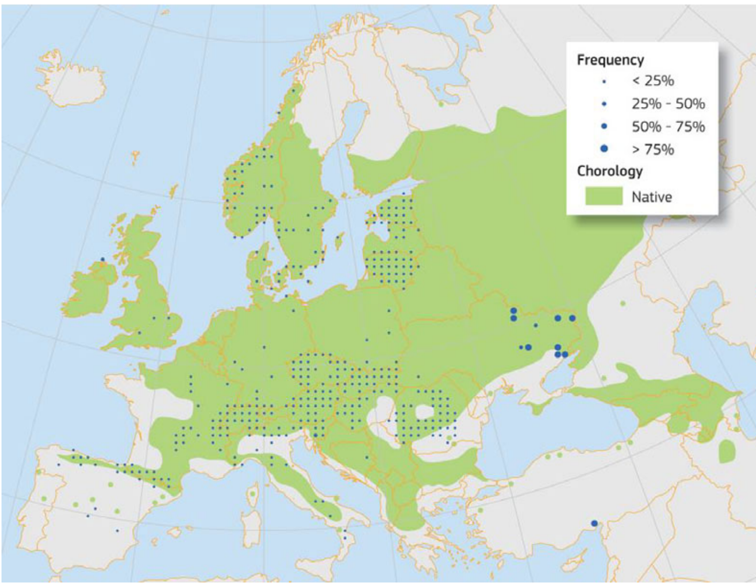

Figure 3: Plot distribution and simplified chorology map for *Ulmus glabra.* Frequency of occurrences within the field observations as reported by the National Forest Inventories (from Caudullo and de Rigo, 2016)

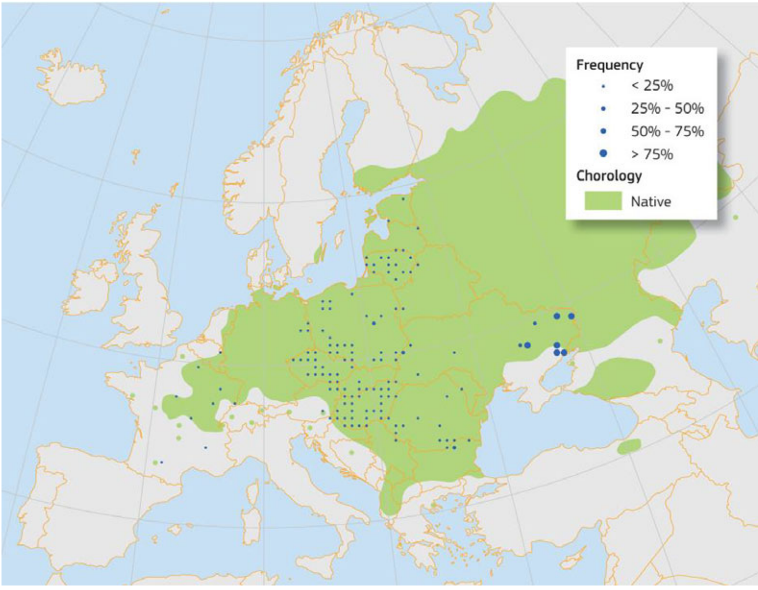

Figure 4: Plot distribution and simplified chorology map for *Ulmus laevis.* Frequency of occurrences within the field observations as reported by the National Forest Inventories (from Caudullo and de Rigo, 2016)

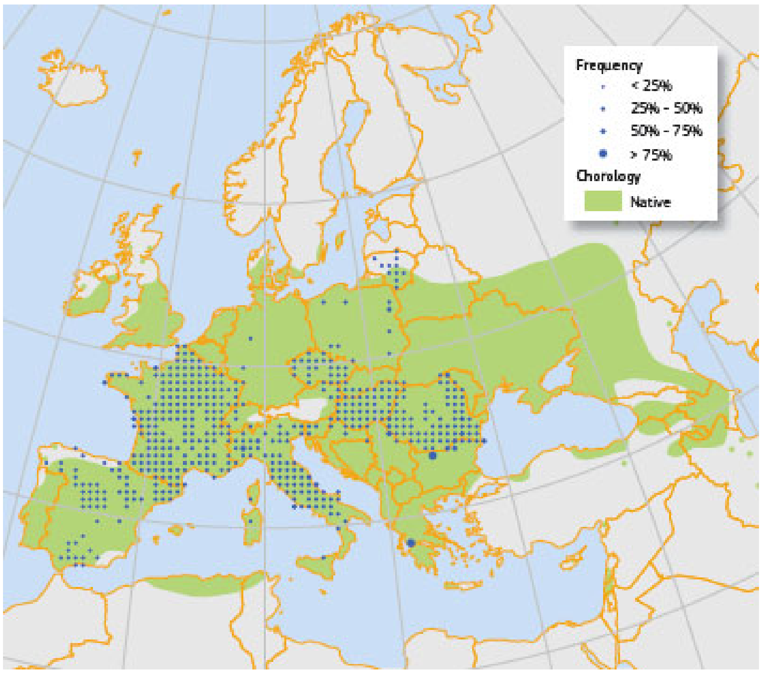

Figure 5: Plot distribution and simplified chorology map for *Ulmus minor*. Frequency of *U. minor* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *U. minor* is derived after several sources (from Caudullo and de Rigo, 2016)

3.4.3.2. Climatic conditions affecting establishment

S. ulmea is active during both cool spring weather and warm conditions of early summer (Sinclair and Lyon, 2005). Such conditions are often found in most of the continental parts of the EU.

The pathogen is reported from a wide range of climatic conditions in North America (from e.g. Texas to Ontario, from California to Florida), thus suggesting that European climatic conditions would not be a limiting factor for establishment.

3.4.4. Spread

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

Yes, mainly by human movement of infected plants for planting.

Local spread may occur by means of wind and rain splash, which are pivotal for the dissemination of ascospores and conidia. Spread at a longer distance may occur by the movement of infected plant materials mediated by humans. Plants for planting (as well as bonsai plants) may thus represent the main means of spread.

3.5. Impacts

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

Yes, the pest introduction could have impacts especially in nurseries and on amenity trees.

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]

Yes, the introduction of the pest could have an impact on the intended use of plants for planting.

S. ulmea may cause damages to both ornamental trees, e.g. trees in gardens and parks and bonsai plants, and to wild native elms and those used in forestry (Figure 6).

The disease is rarely fatal, even to small elms defoliated repeatedly (Sinclair and Lyon, 2005). However, it has been reported that when infection begins early in the spring, *S. ulmea* can cause considerable damage, particularly in wet summers (Stipes and Campana, 1981), as a result of defoliation and blight of young leaves and succulent shoots. *S. ulmea* can cause significant defoliation and twig dieback on susceptible elms in nurseries (EPPO, 2005).

Whether damages would be more severe on the European elm species than on species in the pathogens native range is uncertain, but *U. glabra* and *U. laevis* were found to be more susceptible to the disease than North American elm species (McGranahan and Smalley, 1981; Sinclair and Lyon, 2005). The susceptibility of *U. minor* compared to the other elm species native to Europe is not known. The population of native elm species in Europe has also been decimated as a result of Dutch elm disease.

Hybrid elm cultivars with resistance to Dutch elm disease (*Ophiostoma novo-ulmi*) planted as a consequence of the Dutch elm disease pandemic in Europe are known to have parents susceptible to *S. ulmea* and may therefore be susceptible to the disease (Lane et al., 2013).

Figure 6: Damage on elm due to *Stegophora ulmea*, courtesy of Paul Bachi, Univ. of Kentucky, USA, Bugwood.org. Available online https://www.forestryimages.org/collections/viewcollection.cfm?&coll=72271

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

3.6. Availability and limits of mitigation measures

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

Yes. Please see Section 3.6.3.

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

- Overwintering in buds may mask the presence of the pathogen
- Use of fungicides in nurseries may mask symptom development and expression of resistance

3.6.2. Biological or technical factors affecting the ability to prevent the presence of the pest on plants for planting

- No information was retrieved on chemical control of *S. ulmea* with fungicides on plants for planting (EPPO, 2005).
- Evergreen elms may carry inoculum on leaves year-round.
- Plants for planting can hardly be considered completely safe even if they are moved during winter or when completely defoliated because viable inoculum of *S. ulmea* may persist in buds.

3.6.3. Control methods

- Eradication of *S. ulmea* on bonsai plants has been achieved by the destruction of the affected bonsai plants and spraying remaining healthy stock with prochloraz (Lane et al., 2013).
- Reduction of inoculum by the removal of leaf debris may be achieved in selected environments, such as nurseries, parks and gardens (EPPO, 2005).
- Avoid overhead watering in nurseries to minimise the risk of spread of inoculum (EPPO, 2005).
- Resistance to *S. ulmea* is variable depending on the species and is genetically determined (EPPO, 2005).

3.7. Uncertainty

Uncertainties refer to:

- the level of impact of the disease, which has rarely been described in detail,
- the presence and distribution of the pathogen in China and possibly elsewhere in the Far East (EPPO, 2005),
- the trade of *Ulmus* and *Zelkova* bonsai plants within the EU.

Other knowledge gaps concern:

- the relative role of the means of entry/spread (plants for planting other than bonsai plants, bonsai plants and cut foliage),
- the relative susceptibility of *Ulmus minor* compared to *U. glabra* and *U. laevis*, and
- the potential consequences in mature tree plantations and native woodland.

4. Conclusions

S. ulmea meets the criteria assessed by EFSA for consideration as a potential quarantine pest (Table 4).

Table 4: 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	Uncertainties
Identity of the pest (Section 3.1)	The identity of the pest as a species is clear	The identity of the pest as a species is clear	None
Absence/ presence of the pest in the EU territory (Section 3.2)	The pest is not reported to be present in the EU	The pest is not reported to be present in the EU	There is a doubtful and unconfirmed record of the fungus in Romania. Interceptions in the Netherlands and UK were followed by eradication
Regulatory status (Section 3.3)	*S. ulmea* is regulated by Council Directive 2000/29/EC (Annex IIA) on plants of *Ulmus* and *Zelkova*, intended for planting, other than seeds	*S. ulmea* is regulated by Council Directive 2000/29/EC (Annex IIA) on plants of *Ulmus* and *Zelkova*, intended for planting, other than seeds	None
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Entry: the pest could enter the EU via the plants for planting pathway, as well as on bonsai plants and cut foliage Establishment: hosts and favourable climatic conditions are widespread in the risk assessment (RA) area Spread: the pest would be able to spread following establishment mainly on infected plants for planting and bonsai plants	Entry: the pest could enter the EU via the plants for planting pathway, as well as on bonsai plants and cut foliage Establishment: hosts and favourable climatic conditions are widespread in the RA area Spread: the pest would be able to spread following establishment mainly on infected plants for planting and bonsai plants	There is a lack of data on the trade of *Ulmus* spp. and *Zelkova* spp. bonsai plants within the EU
Potential for consequences in the EU territory (Section 3.5)	The pest introduction could have impacts especially in nurseries and on amenity trees	The introduction of the pest could have an impact on the intended use of plants for planting	There is uncertainty about the level of impact of the disease, which has rarely been described in detail, particularly in native woodland and planted forests. The consequences for *U. minor* are uncertain, given the lack of information on its susceptibility
Available measures (Section 3.6)	Reduction of inoculum by the removal and appropriate disposal of leaf debris and avoiding overhead watering in nurseries can reduce the risk of spread of the pathogen. Breeding for host resistance/ tolerance may reduce the level of impacts	Reduction of inoculum by the removal of leaf debris and avoiding overhead watering in nurseries can reduce the risk of spread of the pathogen	The relative importance of overwintering in buds compared to primary infection in spring

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	Uncertainties
Conclusion on pest categorisation (Section 4)	The criteria assessed by the Panel for consideration as potential quarantine pest are met	The criterion on the pest presence in the EU is not met	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps concern (i) the distribution of the pest in Asian countries, (ii) the relative role of the means of entry/spread (plants for planting other than bonsai plants, bonsai plants and cut foliage), and (iii) the potential consequences in mature tree plantations and native woodland. However, the present categorisation has explored most if not all of the available data on these knowledge gaps		

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Abbreviations

DG SANTE	Directorate General for Health and Food Safety
EPPO	European and Mediterranean Plant Protection Organization
EU MS	European Union Member State
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
RA	Risk assessment
PLH	EFSA Panel on Plant Health
RNQP	Regulated non-quarantine pest
ToR	Terms of Reference