SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 19 May 2021

doi: 10.2903/j.efsa.2021.6663

Pest categorisation of *Elasmopalpus lignosellus*

EFSA Panel on Plant Health (PLH),
Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Philippe Lucien Reignault, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà, Chris Malumphy, Ewelina Czwienczek, Virag Kertesz, Andrea Maiorano and Alan MacLeod

Abstract

The European Commission requested the EFSA Panel on Plant Health to conduct a pest categorisation of *Elasmopalpus lignosellus* (Zeller) (Leipidoptera: Pyralidae) for the territory of the EU following interceptions of the organism within the EU and its addition to the EPPO Alert List. *E. lignosellus* feeds on over 70 species; hosts include cereals, especially maize, legumes, brassicas and a range of grasses. Seedlings of ornamental and forest trees can also be hosts. *E. lignosellus* is established in tropical and subtropical areas of North, Central and South America. Eggs are usually laid in the soil or on the lower stem of hosts. Larvae develop in the soil and feed on roots and stems causing stunting and yield losses. Plants for planting, rooted with growing media, or with stems cut close to the soil, and fresh vegetables harvested with stems, such as asparagus and cabbage, provide pathways for entry. Population development is favoured by dry and hot conditions (27–33°C). Adults fly and can be carried in air currents. Adults are recorded from temperate areas within the Americas contributing some uncertainty regarding the limits of its establishment potential in the EU. Although cultivated and wild hosts are distributed across the EU, impacts are likely to be confined to production areas on sandy soils around the coastal Mediterranean during hot dry years. Phytosanitary measures are available to inhibit the entry of *E. lignosellus. E. lignosellus* satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

Keywords: Lesser cornstalk borer, pest risk, plant health, plant pest, quarantine

Requestor: European Commission

Question number: EFSA-Q-2021-00214

Correspondence: alpha@efsa.europa.eu

Panel members: Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A. Navas-Cortes, Stephen Parnell, Roel Potting, Philippe L Reignault, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen and Lucia Zappalà.

Declarations of interest: The declarations of interest of all scientific experts active in EFSA's work are available at https://ess.efsa.europa.eu/doi/doiweb/doisearch.

Acknowledgements: EFSA wishes to acknowledge Caterina Campese for her contribution to the establishment part.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques MA, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Malumphy C, Czwienczek E, Kertesz V, Maiorano A and MacLeod A, 2021. Scientific Opinion on the pest categorisation of *Elasmopalpus lignosellus*. EFSA Journal 2021;19(6):6663, 24 pp. https://doi.org/10.2903/j.efsa.2021.6663

ISSN: 1831-4732

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

Table of contents

1. Introduction

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

1.1.1. Background

The new Plant Health Regulation (EU) 2016/2031, on the protective measures against pests of plants, is applying from 14 December 2019. Conditions are laid down in this legislation in order for pests to qualify for listing as Union quarantine pests, protected zone quarantine pests or Union regulated non-quarantine pests. The lists of the EU regulated pests together with the associated import or internal movement requirements of commodities are included in Commission Implementing Regulation (EU) 2019/2072. Additionally, as stipulated in the Commission Implementing Regulation 2018/2019, certain commodities are provisionally prohibited to enter in the EU (high-risk plants, HRP). EFSA is performing the risk assessment of the dossiers submitted by exporting to the EU countries of the HRP commodities, as stipulated in Commission Implementing Regulation 2018/2018. Furthermore, EFSA has evaluated a number of requests from exporting to the EU countries for derogations from specific EU import requirements.

In line with the principles of the new plant health law, the European Commission with the Member States are discussing monthly the reports of the interceptions and the outbreaks of pests notified by the Member States. Notifications of an imminent danger from pests that may fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

As a follow-up of the above mentioned activities (reporting of interceptions and outbreaks, HRP, derogation requests and horizon scanning), a number of pests of concern have been identified. EFSA is requested to provide scientific opinions for these pests, in view of their potential inclusion by the risk manager in the lists of Commission Implementing Regulation (EU) 2019/2072 and the inclusion of specific import requirements for relevant host commodities, when deemed necessary by the risk manager.

1.1.2. Terms of Reference

EFSA is requested, pursuant to Article 29(1) of Regulation (EC) No 178/2002, to provide scientific opinions in the field of plant health.

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D, and 1E (for more details see mandate M-2021-00027 on the Open.EFSA portal). Additionally, EFSA is requested to perform pest categorisations for the pests so far not regulated in the EU, identified as pests potentially associated with a commodity in the commodity risk assessments of the HRP dossiers (Annex 1C; for more details see mandate M-2021-00027 on the Open.EFSA portal). Such pest categorisations are needed in the case where there are not available risk assessments for the EU.

When the pests of Annex 1A are qualifying as potential Union quarantine pests, EFSA should proceed to phase 2 risk assessment. The opinions should address entry pathways, spread, establishment, impact and include a risk reduction options analysis.

Additionally, EFSA is requested to develop further the quantitative methodology currently followed for risk assessment, in order to have the possibility to deliver an express risk assessment methodology. Such methodological development should take into account the EFSA Plant Health Panel Guidance on quantitative pest risk assessment and the experience obtained during its implementation for the Union candidate priority pests and for the likelihood of pest freedom at entry for the commodity risk assessment of High Risk Plants.

1.2. Interpretation of the Terms of Reference

Elasmopalpus lignosellus is one of a number of pests listed in Annex 1A of the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a regulated pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform European Commission decision-making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a regulated pest specific import requirements for relevant host commodities, and/or potential risk reduction options to inhibit spread, will be identified; for pests already present in the EU additional risk reduction options will be identified.

1.3. Additional information

E. lignosellus was added to the EPPO alert list in 2019 following interceptions reported by Ireland and UK on asparagus from Peru (EPPO, 2019; Defra, 2021).

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *Elasmopalpus lignosellus* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), the CABI databases and scientific literature databases as referred above in Section 2.1.1. 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 and TRACES databases were 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. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed 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 Member States and the phytosanitary measures taken to eradicate or avoid their spread. The recording of interceptions switched from Europhyt to TRACES in May 2020.

2.2. Methodologies

The Panel performed the pest categorisation for *E. lignosellus* following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013) and No. 21 (FAO, 2004).

The criteria to be considered when categorising a pest as an EU-regulated quarantine pest (QP) is given in Regulation (EU) 2016/2031 article 3. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

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, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. Whilst the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Article 3 (d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for quarantine pest status. Assessing social impact is outside the remit of the Panel.

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

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3)
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?
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
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.
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
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?
Available measures (Specific import requirements) (Section 3.6)	Are there measures available to prevent the entry into the EU such that the likelihood of introduction 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.

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/or to be transmissible?

Yes. The identity of the species is established and *Elasmopalpus lignosellus* (Zeller) is the accepted name.

Elasmopalpus lignosellus (Zeller) is an insect within the Order Lepidoptera and Family Pyralidae. In the USA, it has the common name of lesser cornstalk borer.

It has the EPPO code[1] LASLI.

A number of junior synonyms, such as *Elasmopalpus major*, *E. incautella*, *E. carbonella*, *E. anthracellus*, *Pempelia lignosella* and *Salebria lignosella,* appear in literature from the early twentieth century (Luginbill and Ainslie, 1917; CABI, 2019).

3.1.2. Biology of the pest

Figure 1 shows the larva and adults of *E. lignosellus*. Key biological features relating to the life history strategy of *E. lignosellus*, relevant to the pest categorisation, are summarised in Table 2.

[1] An EPPO code, formerly known as a Bayer code, is a unique identifier linked to the name of a plant or plant pest important in agriculture and plant protection. Codes are based on genus and species names. However, if a scientific name is changed, the EPPO code remains the same. This provides a harmonised system to facilitate the management of plant and pest names in computerised databases, as well as data exchange between IT systems (Griessinger and Roy, 2015; EPPO, 2019).

Figure 1: Life stages – larva and adults (male on right; female on left) – of *Elasmopalpus lignosellus* (photo credit: John C. French Sr., Retired, Universities: Auburn, GA, Clemson and U of MO, Bugwood.org licensed under a Creative Commons Attribution-Noncommercial 3.0 License.)

Table 2: Important features of the life history strategy of *Elasmopalpus lignosellus*

Life stage	Phenology and relation to host	Other relevant information
Egg	Eggs are usually laid singly just below the soil surface (in the top 6 mm of soil) close to hosts, a few eggs are laid on host stems and leaves (Gill et al., 2014); depending on temperatures eggs normally hatch after 2–7 days (Huang and Mack, 2002).	Threshold for egg development is approximately 11.3°C; 39.4 degree days (DD) are required before egg hatch (Sandhu et al., 2010).
Larva	After hatching larvae are attracted to CO_2 and volatiles from host roots (Huang and Mack, 2001). Early instars feed on young roots, vegetative buds and on the root-hypocotyl region or leaves touching the soil (Huang and Mack, 2002). Larvae form silken tubes in the soil and burrow into the stalk of hosts such as maize at its base near the soil surface then tunnel within stems damaging vascular tissues causing wilting and stunting (Gill et al., 2014). Larvae retreat into the silken tubes if the plant is disturbed (Luginbill and Ainslie, 1917). During development larvae can feed on several plants (Wolf et al., 1997). There are five to nine larval instars (six is normal) (Gill et al., 2014). Larvae can overwinter during which time development greatly slows although there is no diapause (Gill et al., 2014). Irrigation significantly increases larval mortality (Bessin, 2019)	Threshold for larval development is approximately 9.1°C; 344.8 DD are required for larval development (Sandhu et al., 2010).
Pupa	Pupae form in the soil and can overwinter when development is slowed; there is no pupal diapause (Gill et al., 2014).	Threshold for prepupa development is ~ 9.9°C; 28 DD are required for development; threshold for pupa development is ~ 8.9°C; 142.5 DD are required for development (Sandhu et al., 2010).
Adult	During daylight adults shelter in shady areas under plants and only fly if disturbed (Holloway and Smith, 1975). Adults fly during warm/hot nights (> 27°C) with high relative humidity. Mating and oviposition occur at night above 18–20°C (Capinera, 2001). Two or three days after emergence and mating females lay ~ 30 eggs per day for ~ 6 days and can live for 11–25 days at 27°C (± 2°C) (Simmons and Lynch, 1990).	Approx. threshold for development from egg to adult: 9.5°C; 543.5 DD required for complete development (Sandhu et al., 2010). Under favourable conditions egg to adult takes 25 days (Smith et al., 1980). 3–4 generations per year are possible in southern USA (e.g. South Carolina and Georgia) (Sandhu et al., 2010).

3.1.3. Host range of *Elasmopalpus lignosellus*

E. lignosellus is a highly polyphagous pest; larvae feed on over 70 species in 27 plant families and is regarded as a pest of several field and vegetable crops including cereals and legumes; grasses and some weeds are also hosts (Funderburk et al., 1985). Literature often reports that larvae feed on beans, corn (maize), cowpeas, a range of grasses, sugarcane, sorghum and peanuts. Seedlings of forestry and ornamental trees can also be hosts *e.g. Pinus* spp., and *Juniperus virginiana, Taxodium distichum* and *Robinia pseudoacacia* (Dixon and Mayfield, 2012). An extensive list of hosts is provided in Appendix B.

3.1.4. Intraspecific diversity

E. lignosellus has a variety of colour forms; early literature described the forms as distinct species but Luginbill and Ainslie (1917) found no justification to maintain the distinctions. Nevertheless, Jham et al. (2005) suggested that specimens captured in USA and Brazil may be different subspecies due to their different responses to chemical blends used in lures.

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes. Adults can be lured to pheromone traps (Funderburk et al., 1985, 1987; Jham et al., 2005). Larvae can be found by searching soil and in silken tunnels attached to the underground stem or roots of infested hosts.

In infested crops, plants can show symptoms of wilting and stunted growth, stems may be cut and leaves touching the ground may show signs of larval feeding damage. Field crops suspected to be infested should be examined by inspecting the base of plants close to, or just below, ground level for larval symptoms, such as holes into the stem, and for the silken tubes of larvae in the soil. However, larvae are small and can be difficult to detect (Singsit et al., 1997).

E. lignosellus is included in a key to selected Pyraloidea larvae that have been intercepted in USA (Solis, 2006). Detailed morphological descriptions of life stages and illustrations are provided in Luginbill and Ainslie (1917) and Heinrich (1956) which can be used for identification.

Summary descriptions of life stages are provided below:

Egg: Oval, 0.7 mm long; greenish white at oviposition, turning reddish as it develops.

Larva: Bluish-green, with brownish lines and mottling; narrow white line down the back and a dark brown shield on the first segment. Length up to 13 mm when fully grown (Mulder et al., 2017).

Pupa: Green when first formed, turning brown to black during development; 8 mm long, 2 mm wide (CABI, 2019).

Adult: Moth, forewings 6–9 mm, beige with dark spots and dark brown edges although there is great variation in colour, hindwings pale. Head and thorax are brown (CABI, 2019).

Molecular methods for species identification are available, with sequence records available in BOLD (Ratnasingham and Hebert, 2007; Anon, 2021).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

E. lignosellus is found widely within the Americas in tropical and some temperate regions, as illustrated in Figure 1. However, within the USA, Gill et al. (2014) noted that *E. lignosellus* is most often observed in south-eastern states; records from more northern states and Canada may not indicate establishment but could result from findings of migratory adults. In reporting finds of *E. lignosellus* from Bermuda, Ferguson et al. (1991) noted that the species is widespread in tropical America and southern states of the USA and that it migrates northwards sometimes reaching Canada. There is no suggestion *E. lignosellus* is established everywhere that it is reported.

Appendix A provides national and subnational records of occurrence.

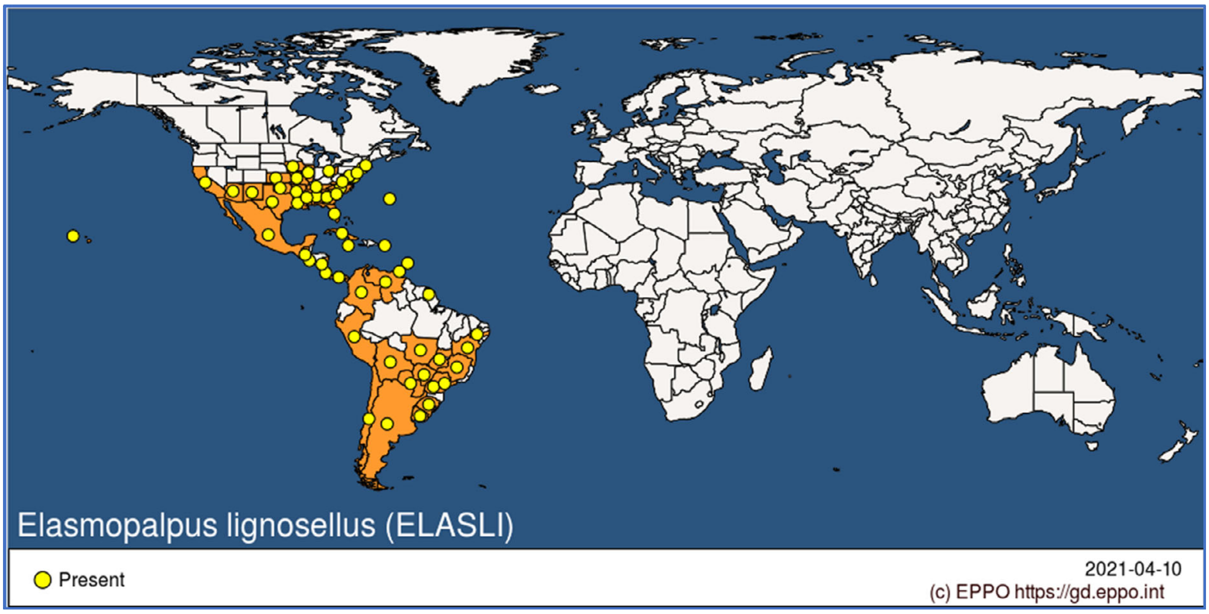

Figure 2: Global distribution of *Elasmopalpus lignosellus* (extracted from the EPPO Global Database, accessed 10/4/2021)

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, *E. lignosellus* is not known to be present in the EU.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

Elasmopalpus lignosellus is not named in EU plant health regulations (EC regulation 2019/2072).

3.3.2. Hosts of *Elasmopalpus lignosellus* that are prohibited from entering the Union from third countries

As specified in Annex VI of 2019/2072, some plants, which are also *E. lignosellus* host plants, are prohibited from entering the EU as plants for planting. Host plants that are prohibited from the Americas are *Pinus* (Annex VI, 1.), members of the Poaceae (grass family), other than seed (Annex VI, 14.), *Solanum tuberosum* seed potatoes (Annex VI, 15.). Plants for planting of *Capsicum annuum* and *Solanum lycopersicum* would be covered by the prohibition on Solanaceae plants for planting (Annex VI, 18.).

Table 3: List of plants, plant products and other objects that are *Elasmopalpus lignosellus* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	**CN Code**	**Third country, group of third countries or specific area of third country**
1.	*Pinus*	Various codes from ex 0602 20 20 to ex 0604 20 40	Third countries other than: specified European third countries (see Annex VI for details)

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	**CN Code**	**Third country, group of third countries or specific area of third country**
14.	Plants for planting of the family *Poaceae*, other than plants of ornamental perennial grasses of the subfamilies [...], other than seeds	ex 0602 90 50 ex 0602 90 91 ex 0602 90 99	Third countries other than: specified European third countries (see Annex VI for details)
15.	Tubers of *Solanum tuberosum*, seed potatoes	0701 10 00	Third countries other than Switzerland
18.	Plants for planting of *Solanaceae* other than seeds and the plants covered by entries 15, 16 or 17	Various codes from ex 0602 90 30 to ex 0602 90 99	Third countries other than: specified European third countries (see Annex VI for details)
19.	Soil as such [...]	ex 2530 90 00 ex 3824 99 93	Third countries other than Switzerland
20.	Growing medium as such [...]	ex 2530 10 00 ex 2530 90 00 ex 2703 00 00 ex 3101 00 00 ex 3824 99 93	Third countries other than Switzerland

3.4. Entry, establishment and spread in the EU

3.4.1. Entry

Is the pest able to enter into the EU territory? If yes, identify and list the pathways. Comment on plants for planting as a pathway.

Yes, larvae of *E. lignosellus* have been intercepted on asparagus in the EU; interceptions were reported by Ireland in 2019. There is no evidence of plants for planting being the main pathway for entry into the EU.

Main pathway(s):

- Given that there have been interceptions on asparagus spears, fresh asparagus spears for consumption clearly provide a viable pathway. Similar vegetables whose stems are cut close to ground level, such as cabbage, could also provide a pathway.

Other potential pathways:

- As noted above, larvae mainly feed on the roots and young stems of hosts. The import of ornamental plants for planting with roots, or with stems that are cut close to the ground, could therefore provide a pathway.
- Soil could provide a pathway.
- Nuts that develop in the soil, e.g. groundnuts (*Arachis hypogaea*) and tiger nuts (*Cyperus esculentus*) could potentially provide a pathway.
- There is uncertainty as to whether root and tuber vegetables such as potato, sweet potato, beet and turnip could provide pathways. Available literature reports these crops as hosts but does not provide details of what plant parts are damaged. Larvae tunnel within the stem of hosts close to ground level (Gill et al., 2014). No evidence of larvae infesting tubers or roots of these crops was found.

Table 4: Potential pathways for *Elasmopalpus lignosellus* into the EU 27 with existing mitigations (if any)

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI) or special requirements (Annex VII) within Implementing Regulation 2019/2072]
Hosts plants for planting with roots and growing media from southern USA, Central and South America	Eggs in soil, larvae in stems and silken tunnels attached to roots, pupae in soil	Section 3.3.2 summarises plants for planting that are prohibited by Annex VI The growing medium attached to or associated with plants, intended to sustain the vitality of the plants, are regulated in Article VII of Regulation 2019/2072 (point 1.) Plants for planting from third countries require a phytosanitary certificate and may be inspected on arrival No special requirements in Annex VII relate to *E. lignosellus*.
Host plants for planting with stems cut close to the soil	Larvae in stems	Section 3.3.2 summarises plants for planting that are prohibited by Annex VI Plants for planting from third countries require a phytosanitary certificate and may be inspected on arrival No special requirements in Annex VII relate to *E. lignosellus*.
Soil	Eggs, larvae, pupae in soil	Soil from third countries is prohibited (Annex VI, 19. and 20.)
Asparagus and cabbage from southern USA, Central and South America	Larvae in stems	Annex XI, B indicates that a phytosanitary certificate is required for the import of asparagus; imports may be inspected on arrival
Root and tuber vegetables	Possible larvae in roots and tubers but no evidence found in literature	Annex XI, A indicates that a phytosanitary certificate is required for the import of root and tubercle vegetables; imports may be inspected on arrival
Nuts that develop in soil (e.g. groundnuts, tiger nuts)	Larvae in shells	Annex XI, B indicates that a phytosanitary certificate is required for the import of groundnuts; imports may be inspected on arrival

Notifications of EU interceptions of harmful organisms were recorded in Europhyt between May 1994 and June 2020. TRACES began recording interceptions in May 2020. Both databases were consulted on 14 April 2021. Europhyt records two interceptions of *E. lignosellus* on *Asparagus* from Peru by Ireland (both in September 2019).

Twenty-three other records of *E. lignosellus* in Europhyt are notifications from the UK, no longer a member of the EU. All UK findings were on *Asparagus* from Peru between August 2019 and February 2020.

There are no records on *E. lignosellus* in TRACES.

Larvae of *E. lignosellus* have been intercepted on *Asparagus* from Peru. Cabbage could also potentially provide a pathway. Statistics showing EU 27 imports of fresh asparagus from the Americas where *E. lignosellus* is recorded are provided in Table 5; imports of fresh cabbage are shown in Table 6. Imports of groundnuts appear in Table 7.

Table 5: EU 27 annual imports of asparagus (CN 0709 2000) from countries where *Elasmopalpus ligno*sellus is present, 2016–2020 (Hundreds of kg) Source: Eurostat (accessed 25/04/2021)

Source\Year:	2016	2017	2018	2019	2020
Peru	209,000.0	195,070.7	233,576.5	246,424.0	183,643.3
United States	396.1	487.6	757.9	290.3	242.3
Chile	17.2	25.6	21.9	64.5	100.0
Argentina	–	52.9	15.7	–	–
Brazil	–	0.0	11.9	–	31.4
Costa Rica	–	17.7	–	–	–
Colombia	17.0	0.0	–	–	–
Guatemala	9.6	0.0	–	–	–

Table 6: EU 27 annual imports of cabbage (CN 0704 9010) from countries where *Elasmopalpus lignosellus* is present, 2016–2020 (Hundreds of kg) Source: Eurostat (accessed 25/04/2021)

Source\Year:	2016	2017	2018	2019	2020
Costa Rica	346.6	–	46.0	135.7	198.8
Guatemala	–	–	277.3	251.4	–
United States	–	0.0	0.2	–	–

Table 7: EU 27 annual imports of groundnuts (CN 1202 41) from countries where *Elasmopalpus lignosellus* is present, 2016–2020 (Hundreds of kg) Source: Eurostat (accessed 25/04/2021)

Source\Year:	2016	2017	2018	2019	2020
United States	250,814.52	221,903.64	237,854.43	214,157.11	250,417.03
Argentina	10,860.50	5,268.10	3,045.05	6,237.33	7,319.43
Brazil	449.60	0.00	–	–	–
Nicaragua	3.19	235.00	–	–	–
Chile	–	0.00	–	–	192.60
Bolivia	47.18	50.75	–	19.68	14.50
Mexico	0.08	5.37	–	–	–
Peru	0.06	0.10	0.10	–	3.07
Venezuela	–	–	–	–	0.54
Colombia	0.05	0.00	–	–	–

3.4.2. Establishment

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

Yes, biotic factors (host availability) and abiotic factors (climate suitability) suggest that some parts of the EU would be suitable for establishment.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker et al., 2000). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

3.4.2.1. EU distribution of main host plants

As noted above, and in Appendix B, E*. lignosellus* is polyphagous. Cultivated hosts such as alfalfa (lucerne), asparagus, beans, beet, broadbean, buckwheat, cabbage, cowpea, maize, oats, oilseed rape, pea, potato, radish, sorghum, soyabean, sweet potato, turnip and wheat are distributed widely as commercial crops across the EU; many of the legumes and root vegetables are also grown in home-gardens (de Rougemont, 1989). Table 8 shows the harvested area of key hosts cultivated in the EU 27 in recent years.

Table 8: Harvested area of some *Elasmopalpus lignosellus* hosts in EU 27, 2016–2020 (thousand ha). Source EUROSTAT (accessed 25/04/2021)

Crop	Code	2016	2017	2018	2019	2020
Wheat and spelt	C1100	25,210.30	24,138.62	23,751.66	24,210.19	22,799.94
Grain maize and corn–cob–mix	C1500	8,541.42	8,266.64	8,252.47	8,917.07	8,942.31
Green maize	G3000	6,061.45	5,985.90	6,134.91	6,212.11	6,210.47
Potatoes (including seed potatoes)	R1000	1,550.51	1,601.18	1,562.85	1,607.36	1,653.23
Soya	I1130	831.18	962.39	955.40	907.91	937.95
Field peas	P1100	861.10	985.79	829.14	785.58	827.26
Broad and field beans	P1200	477.86	495.80	469.39	410.79	451.28
Brassicas	V1000	247.01	252.60	252.64	265.78	:

Crop	Code	2016	2017	2018	2019	2020
Fresh peas	V5100	142.53	141.93	143.95	149.04	149.57
Fresh beans	V5200	96.17	99.36	94.65	91.31	93.27

':' data not available.

3.4.2.2. Climatic conditions affecting establishment

Although hosts are widely available across the EU (see Section 3.4.2.1), EU climates may be a limiting factor affecting where in the EU establishment of *E. lignosellus* may be possible. *E. lignosellus* is primarily a tropical and subtropical species although it can migrate and adults are recorded in temperate regions. However, because *E. lignosellus* does not diapause (Holloway and Smith, 1976) winter temperatures in northern US states and Canada probably prevent it from establishing there. The same limitations can be expected to limit *E. lignosellus* establishment within the EU where cool winter temperatures are expected to limit winter survival. As suggested in Sections 3.1.2 (summary of biology) and 3.5 (impacts), *E. lignosellus* is a warmth loving insect. Sandhu et al. (2010) report thresholds of development between approximately 9 and 11°C according to developmental stage (e.g. egg, larva, pupa). Individuals develop fastest at 30°C whilst the most favourable temperatures for population growth are between 27°C and 33°C (Sandhu et al., 2010). *E. lignosellus* typically survives well in dry hot conditions and in sandy soils (Luginbill and Ainslie, 1917). The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern). Climatic zones BSh (dry, hot semi-arid steppe; subtropical steppe; low-altitude dry) and Cfa (temperate, uniform precipitation through year; humid subtropical, mild, no dry season, hot summer) occur in south western and south eastern USA (Figure 3) where adult *E. lignosellus* can be found year round. These climates also occur in the EU. *E. lignosellus* have also been found in climates Csa (USDA, 1953, 1961), Csb (Luginbill and Ainslie, 1917), Cfb (Marques et al., 2019) and BSk (Reynolds et al., 1959). These climate types also occur in the EU (Figure 3) (MacLeod and Korycinska, 2019). Literature reporting the occurrence of *E. lignosellus* in the latter regions is more sporadic and whether populations are established in these zones is uncertain.

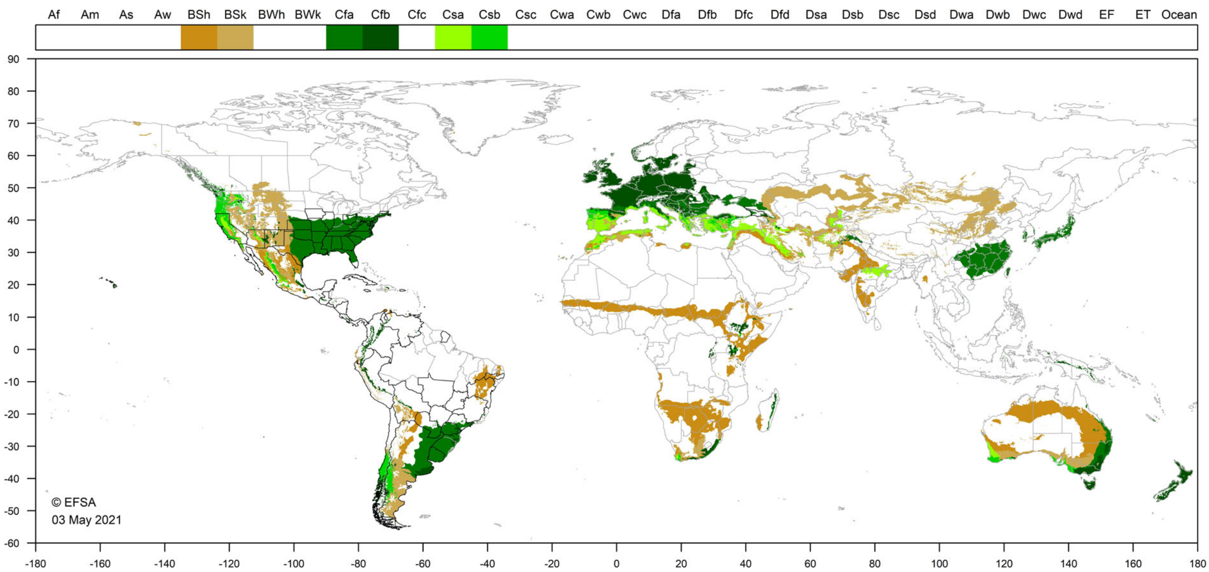

Figure 3: World distribution of six Köppen–Geiger climate types that occur in the EU and which occur in the Americas where *Elasmopalpus lignosellus* has been reported

Suitable conditions for establishment of *E. lignosellus* in the EU are found in parts of the southern EU where it is dry and where hosts grow in sandy soils. Two or more generations per year may be possible in such conditions, especially if not irrigated. From these areas, adults could disperse more widely within the EU (see Section 3.4.3 Spread) although establishment in cooler areas is uncertain.

Regarding establishment in protected cultivation, there were no reports of *E. lignosellus* feeding on hosts in greenhouses. It is assumed *E. lignosellus* would not establish in EU greenhouses due to the intensive control used in greenhouse production and the irrigation of growing media; irrigation causes significant larval mortality (Bessin, 2019).

The number of generations that would develop in areas where *E. lignosellus* could establish is uncertain; at least two would be expected but perhaps up to four in hot years.

3.4.3. Spread

Describe how the pest would be able to spread within the EU territory following establishment?

As a free living moth, adults could spread during night flights. Winds and air currents could also aid adult spread within the EU.

Comment on plants for planting as a mechanism for spread.

Eggs, larvae and pupae in soil moved with rooted host plants for planting could facilitate long-distance spread in trade. Local-spread would mainly be caused by adult dispersal.

Adults fly at night and are most active above 27°C (Gill et al., 2014). Winds and air currents are likely able to carry adults long distances. Such dispersal aids migration from southern US states to northern US states and Canada (Ferguson et al., 1991). When disturbed during the day, adults fly erratically just above the tops of seedling hosts (Dixon and Mayfield, 2012).

E. lignosellus spends most of its life in the soil feeding on host roots and stems. Spread would therefore be possible via movement of infested rooted plants for planting with soil.

3.5. Impacts

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

Yes, if *E. lignosellus* established in the EU, non-irrigated hosts grown on free draining sandy soil could potentially suffer yield impacts in hot dry years.

As noted above (see Section 3.4.1), *E. lignosellus* is a polyphagous pest with field and vegetable crop hosts (Funderburk et al., 1985). Damage is caused by larvae feeding on young plants at or just below the soil surface, damaging the growing point and subsequently killing young plants (Reisig et al., 2015). Root feeding and feeding on the stem damages the vascular system resulting in wilting (Gill et al., 2014) lowering yields. Hosts of commercial significance in the Americas include corn (maize), sugar cane, soyabean and peanuts (Luginbill and Ainslie, 1917; Gilreath et al., 1989; CABI, 2019). In the USA, economic damage caused by *E. lignosellus* is generally confined to the south-eastern states, from South Carolina to Texas (Gill et al., 2014). In Florida peanut production, Davidson et al. (1991) reported *E. lignosellus* only when minimum temperatures in the soil where peanut pods developed were above 24°C for more than 14 days. In Alabama, southern USA, *E. lignosellus* can become a significant pest of peanuts in hot dry years e.g. during 1993 when the average temperature above a peanut crop canopy between May and September was 32.9°C; with 48.5% relative humidity (Stewart et al., 1997). During development larvae can feed on several plants and in severe outbreaks yield losses in peanuts can be 70% (Wolf et al., 1997). *E. lignosellus* can also be a serious pest of soyabean in hot dry years (Walker et al., 2000). *E. lignosellus* is also a pest of non-irrigated crops, including peanuts, in southwestern USA (Berberet et al., 1979). Southwestern USA is an ill-defined region but is generally thought to include Arizona and New Mexico and can include Oklahoma and Texas.

In Brazil, *E. lignosellus* is a major pest of peanut, upland rice and maize; the most serious damage occurs to crops in sandy soils in areas with low rainfall (Ferreira and Barrigossi, 2003). Peanuts and asparagus are best grown in warm conditions in sandy soils, such factors contribute to *E. lignosellus* being a pest of such crops.

Although known as the lesser cornstalk borer, perhaps suggesting it is primarily a pest of corn (maize) *E. lignosellus* is regarded as a sporadic pest of maize (Siebert et al., 2012). The widespread use of transgenic maize in the USA and Brazil limits the impact of *E. lignosellus* (Buntin et al., 2004); seedlings of transgenic maize suffer significantly lower feeding damage from *E. lignosellus* than non-transgenic maize seedlings (Vilella et al., 2002). In trials in Brazil, less than 5% of transgenic maize showed injury from *E. lignosellus* whereas 66.5% of non-transgenic maize suffered injury from *E. lignosellus* (Marques et al., 2019).

If *E. lignosellus* established in the EU, non-irrigated hosts grown on free draining sandy soil in the warmest parts of the southern EU could potentially suffer yield impacts in hot dry years. Appendix C identifies the warmest parts of the southern EU based on accumulated temperature.

3.6. Available measures and/or potential specific import requirements and limits of mitigation measures

Are there measures available to prevent the entry into the EU such that the risk becomes mitigated?

Yes, some hosts are already prohibited as plants for planting from third countries (see 3.3.2). Options are available to reduce the likelihood of pest entry into the EU.

3.6.1. Identification of potential additional measures

Phytosanitary measures (prohibitions) are currently applied to some host plants for planting (see Section 3.3.2).

Potential control measures for imported hosts are listed in Table 9.

Table 9: Potential additional measures (a full list is available in EFSA PLH Panel, 2018) to mitigate the likelihood of pest entry

Special requirements/measures (with hyperlink to summary information sheet if available)	Control measure summary in relation to *Elasmopalpus lignosellus*
Growing plants in isolation	*E. lignosellus* is not known as a greenhouse pest. Used to mitigate likelihood of infestation by specified pest in vicinity of growing site
Soil treatment	Larvae and pupae occur in the soil. Flooding would reduce pest populations. Used to mitigate likelihood of infestation by specified pest at site of production.
Inspections	Fresh produce could be inspected for symptoms. Could inspect plants for planting in field before and at export
Chemical treatments on consignments or during processing	Appropriate chemical treatments could be targeted against susceptible life stages.
Physical treatments on consignments or during processing	Roots of plants for planting could be washed prior to export
Heat and cold treatments	As a warmth loving organism, cold treatments could mitigate infestation of consignments
Controlled atmosphere	Modified atmospheres (increased CO_2) are assumed to be effective
Cleaning and disinfection of facilities, tools and machinery	Used to mitigate likelihood of entry of soil-borne pests. Possible option. Larvae and pupae occur in the soil.
Limits on soil	Would mitigate likelihood of entry of eggs, larvae and pupae

3.6.1.1. Biological or technical factors limiting the effectiveness of measures to prevent the entry of the pest

- Larvae feeding internally within stems or roots may be difficult to detect.
- Multiple and overlapping generations means measures targeting specific life stages are needed multiple times.
- Adults fly when disturbed and may avoid treatments.

3.7. Uncertainty

If entering on produce, there are uncertainties over the pests' ability to transfer to a suitable host following arrival in the EU. Uncertainties affecting establishment, which are common to other pests that enter, also include the ability to find a mate and other Allee effects (effects causing reduced survival of new colonies with a small number of individuals (Tobin et al., 2011)) as well as the impact of natural enemies.

The extent of the area suitable for establishment is uncertain given that the limits of establishment in the Americas are unknown. Most of the literature examined refers to established populations in southern US states; records in northern states are often adult finds and evidence of breeding and successful development is lacking.

4. Conclusions

E. lignosellus is a polyphagous pest of several agricultural and horticultural crops in tropical and subtropical regions of the Americas. It satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest (Table 10).

Table 10: 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	Key uncertainties
Identity of the pest (Section 3.1)	The identity of *Elasmopalpus lignosellus* (Zeller) is established.	
Absence/presence of the pest in the EU (Section 3.2)	*E. lignosellus* is not known to be present in the EU. It is established in the Americas in tropical and subtropical regions and extends into temperate areas.	
Regulatory status (Section 3.3)	*E. lignosellus* is not regulated in EU plant health regulations.	
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*E. lignosellus* could enter the EU via rooted plants for planting with growing media or with stems cut close to the soil and with infested vegetable hosts such as asparagus and cabbages. Hosts are grown widely across the EU and small areas of southern EU provide suitable temperatures and sufficient accumulated temperatures to facilitate establishment. Adults could spread naturally by flying.	Ability to transfer to a suitable host to initiate a population in the EU is uncertain.
Potential for consequences in the EU (Section 3.5)	If *E. lignosellus* established in the EU, non-irrigated hosts grown on free draining sandy soil could potentially suffer yield impacts in hot dry years.	Damage occurs in hot years. Frequency of hot years in the EU and potential extent of damage is uncertain.
Available measures (Section 3.6)	Options are available to mitigate the likelihood of entry.	
Conclusion (Section 4)	*E. lignosellus* satisfies all the criteria assessed by EFSA for consideration as a potential Union quarantine pest.	
Aspects of assessment to focus on/scenarios to address in future if appropriate	There have been interceptions of larvae of *E. lignosellus* in the EU previously. The Commission may find an assessment of the likelihood of larvae that enter developing to mate and locate hosts to oviposit on in areas where establishment may be possible informative if risk reduction options are to be introduced.	

References

Anon, 2021. *Elasmopalpus lingosellus* species. BOLD Barcode of life data systems. Available online: https://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=534908 [Accessed: 25 April 2021].

Baker RHA, 2002. Predicting the limits to the potential distribution of alien crop pests. In: Hallman GJ and Schwalbe CP (eds.). Invasive Arthropods in Agriculture: problems and solutions. Science Publishers Inc, Enfield, USA. pp. 207–241.

Baker RHA, Sansford CE, Jarvis CH, Cannon RJ, MacLeod A and Walters KF, 2000. The role of climatic mapping in predicting the potential geographical distribution of non-indigenous pests under current and future climates. Agriculture, Ecosystems & Environment, 82, 57–71.

Berberet RC, Sander DA and Wall RG, 1979. Parasitism of the Lesser Cornstalk Borer, *Elasmopalpus lignosellus*, in 'Florunner' and 'Spanhoma' Peanuts by Native Hymenopterous Species in Oklahoma. Peanut Science, 6, 106–109.

Bessin R, 2019. Lesser Cornstalk Borer. Entfact-129. University of Kentucky, Entomology, Lexington, KY. Available online: http://www.ca.uky.edu/entomology/entfacts/ef100. Last revised November 2019. [Accessed: 11 April 2021].

Buntin GD, All JN, Lee RD and Wilson DM, 2004. Plant-incorporated *Bacillus thuringiensis* resistance for control of fall armyworm and corn earworm (Lepidoptera: Noctuidae) in corn. Journal of Economic Entomology, 97, 1603–1611.

CABI, 2019. Datasheet for *Elasmopalpus lignosellus* (lesser corn stalk borer). Available online: https://www.cabi.org/cpc/datasheet/20663 Last modified 03 December 2019. [Accessed: 25 April 2021].

Capinera JL, 2001. Handbook of Vegetable Pests. Academic Press, San Diego.

Davidson JI, Blankenship PD, Henning RJ, Guerke WR, Smith RD and Cole RJ, 1991. Geocarposphere temperature as it relates to Florunner peanut production. Peanut Science, 18, 79–85.

Defra, 2021. Rapid pest risk analysis (PRA) for: *Elasmopalpus lignosellus.* Available online: https://planthealthportal.defra.gov.uk/data/pests/15069 [Accessed: 11 April 2021].

Dixon WN and Mayfield III AE, 2012. Lesser cornstalk borer. In Cram MM, Frank MS and Mallams KS (technical coordinators). Forest nursery pests. Agriculture Handbook 680. USDA Forest Service, Washington, DC. 150–152.

EFSA PLH Panel (EFSA Panel on Plant Health), Jeger M, Bragard C, Caffier D, Candresse T, Chatzivassiliou E, Dehnen-Schmutz K, Gregoire J-C, Jaques Miret JA, MacLeod A, Navajas Navarro M, Niere B, Parnell S, Potting R, Rafoss T, Rossi V, Urek G, Van Bruggen A, Van Der Werf W, West J, Winter S, Hart A, Schans J, Schrader G, Suffert M, Kertesz V, Kozelska S, Mannino MR, Mosbach-Schulz O, Pautasso M, Stancanelli G, Tramontini S, Vos S and Gilioli G, 2018. Guidance on quantitative pest risk assessment. EFSA Journal 2018;16(8):5350, 86 pp. https://doi.org/10.2903/j.efsa.2018.5350

EFSA Scientific Committee, Hardy A, Benford D, Halldorsson T, Jeger MJ, Knutsen HK, More S, Naegeli H, Noteborn H, Ockleford C, Ricci A, Rychen G, Schlatter JR, Silano V, Solecki R, Turck D, Benfenati E, Chaudhry QM, Craig P, Frampton G, Greiner M, Hart A, Hogstrand C, Lambre C, Luttik R, Makowski D, Siani A, Wahlstroem H, Aguilera J, Dorne J-L, Fernandez Dumont A, Hempen M, Valtueña Martínez S, Martino L, Smeraldi C, Terron A, Georgiadis N and Younes M, 2017. Scientific Opinion on the guidance on the use of the weight of evidence approach in scientific assessments. EFSA Journal 2017;15(8):4971, 69 pp. https://doi.org/10.2903/j.efsa.2017.4971

EPPO (European and Mediterranean Plant Protection Organization), 2019. EPPO codes. Available online: https://www.eppo.int/RESOURCES/eppo_databases/eppo_codes

EPPO (European and Mediterranean Plant Protection Organization), online. EPPO Global Database. Available online: https://gd.eppo.int [Accessed: 10 April 2021]

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

FAO (Food and Agriculture Organization of the United Nations), 2013. ISPM (International Standards for Phytosanitary Measures) 11—Pest risk analysis for quarantine pests. FAO, Rome, 36 pp. Available online: https://www.ippc.int/sites/default/files/documents/20140512/ispm_11_2013_en_2014-04-30_201405121523-494.65%20KB.pdf

FAO (Food and Agriculture Organization of the United Nations), 2018. International Standards for Phytosanitary Measures. ISPM 5 Glossary of phytosanitary terms. Revised version adopted CPM 13, April 2018. FAO, Rome. Available online: https://www.ippc.int/en/publications/621/

Ferguson DC, Hilburn DJ and Wright B, 1991. The Lepidoptera of Bermuda: their food plants, biogeography, and means of dispersal. The Memoirs of the Entomological Society of Canada, 123(S158), 3–105.

Ferreira E and Barrigossi JA, 2003. A Field technique for infesting rice with *Elasmopalpus lignosellus* (Zeller) (Lepidoptera: Pyralidae) and evaluating insecticide treatments. Neotropical Entomology, 32, 367–371.

Funderburk JE, Herzog DC, Mack TP and Lynch RE, 1985. Sampling lesser cornstalk borer (Lepidoptera: Pyralidae) adults in several crops with reference to adult dispersion patterns. Environmental Entomology, 14, 452–458.

Funderburk JE, Herzog DC and Lynch RE, 1987. Seasonal abundance of lesser cornstalk borer (Lepidoptera: Pyralidae) adults in soybean, peanut, corn, sorghum, and wheat in northern Florida. Journal of Entomological Science, 22, 159–168.

Gill HK, Capinera JL and McSorley R, 2014. Lesser Cornstalk Borer, Elasmopalpus lignosellus (Zeller) (Insecta: Lepidoptera: Pyralidae). UF/IFAS Extension, University of Florida, EENY155. Available online: https://entnemdept.ufl.edu/creatures/

Gilreath ME, Funderburk JE, Gorbet DW, Zimet DJ, Lynch RE and Herzog DC, 1989. Economic benefits of selected granular insecticides for control of lesser cornstalk borer in non-irrigated peanut. Peanut Science, 16, 82–87.

Griessinger D and Roy A-S, 2015. EPPO codes: a brief description. Available online: https://www.eppo.int/media/uploaded_images/RESOURCES/eppo_databases/A4_EPPO_Codes_2018.pdf

Heinrich C, 1956. American moths of the subfamily Phycitinae. Bulletin of the United States National Museum, Washington, D.C. 207: i–viii, 1–581, figs 1–1138.

Holloway RL and Smith Jr JW, 1975. Locomotor activity of adult lesser cornstalk borer. Annals of the Entomological Society of America, 68, 885–887.

Holloway RL and Smith Jr JW, 1976. Lesser cornstalk borer response to photoperiod and temperature. Environmental Entomology, 5, 996–1000.

Huang X and Mack TP, 2001. Artificial carbon dioxide source to attract lesser cornstalk borer (Lepidoptera: Pyralidae) larvae. Journal of Economic Entomology, 94, 860–867.

Huang X and Mack TP, 2002. Collection and determination of lesser cornstalk borer (Lepidoptera: Pyralidae) larval attractant from peanut plants. Environmental Entomology, 31, 15–21.

Isely D and Miner FD, 1944. The Lesser cornstalk borer, a pest of fall beans. Journal of the Kansas Entomological Society, 17, 51–56.

Jham GN, da Silva AA, Lima ER and Viana P, 2005. Identification (GC and GC-MS) of unsaturated acetates in *Elasmopalpus lignosellus* and their biological activity (GC-EAD and EAG). Journal of separation science, 28, 281–285.

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

Luginbill P and Ainslie FK, 1917. The lesser cornstalk borer. USDA Agricultural Bulletin No 529, 1–27.

MacLeod A and Korycinska A, 2019. Detailing Köppen-Geiger climate zones at a country and regional level: a resource for pest risk analysis. EPPO Bulletin, 49, 73–82.

Marques LH, Santos AC, Castro BA, Moscardini VF, Rosseto J, Silva OA and Babcock JM, 2019. Assessing the efficacy of Bacillus thuringiensis (Bt) pyramided proteins Cry1F, Cry1A. 105, Cry2Ab2, and Vip3Aa20 expressed in Bt maize against Lepidopteran pests in Brazil. Journal of Economic Entomology, 112, 803–811.

Mulder PG, Grantham R and Arnold DC, 2017. Field key to larvae in peanuts. Oklahoma cooperative extension service. EPP-7158. Available online: https://extension.okstate.edu/fact-sheets/field-key-to-larvae-in-peanuts.html

Ratnasingham S and Hebert PD, 2007. BOLD: The Barcode of Life Data System (http://www. barcodinglife.org). Molecular Ecology Notes, 7, 355–364.

Reisig DD, Akin DS, All JN, Bessin RT, Brewer MJ, Buntin DG, Catchot AL, Cook D, Flanders KL, Huang FN and Johnson DW, 2015. Lepidoptera (Crambidae, Noctuidae, and Pyralidae) injury to corn containing single and pyramided Bt traits, and blended or block refuge, in the southern United States. Journal of Economic Entomology, 108, 157–165.

de Rougemont GM, 1989. A Field Guide to the Crops of Britain and Europe. Collins Sons and Co. Ltd., London.

Reynolds HT, Anderson LD and Andres LA, 1959. Cultural and chemical control of the lesser cornstalk borer in Southern California. Journal of Economic Entomology, 52.

Robinson GS, Ackery PR, Kitching IJ, Beccaloni GW and Hernández LM, 2010. HOSTS—a Database of the World's Lepidopteran Hostplants. Available online: "https://eur03.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.nhm.ac.uk%2Fresearch-curation%2Fresearch%2Fprojects%2Fhostplants%2F&data=04%7C01%7C%7C57c89d04629f4654a16a08d92fe232b2%7C406a174be31548bdaa0acdaddc44250b%7C1%7C0%7C637593470830013553%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=UMG1UCPktnTHXM77BBi%2FI0IlXdgSipG%2BFi5TG26C9EE%3D&reserved=0" http://www.nhm.ac.uk/research-curation/research/projects/hostplants/. Natural History Museum, London

Sandhu HS, Nuessly GS, Webb SE, Cherry RH and Gilbert RA, 2010. Life table studies of *Elasmopalpus lignosellus* (Lepidoptera: Pyralidae) on sugarcane. Environmental Entomology, 39, 2025–2032.

Siebert MW, Nolting SP, Hendrix W, Dhavala S, Craig C, Leonard BR, Stewart SD, All J, Musser FR, Buntin GD and Samuel L, 2012. Evaluation of corn hybrids expressing Cry1F, Cry1A. 105, Cry2Ab2, Cry34Ab1/Cry35Ab1, and Cry3Bb1 against southern United States insect pests. Journal of economic entomology, 105, 1825–1834.

Simmons AM and Lynch RE, 1990. Egg production and adult longevity of *Spodoptera frugiperda*, *Helicoverpa zea* (Lepidoptera: Noctuidae), and *Elasmopalpus lignosellus* (Lepidoptera: Pyralidae) on selected adult diets. Florida Entomologist, 73, 665–671.

Singsit C, Adang MJ, Lynch RE, Anderson WF, Wang A, Cardineau G and Ozias-Akins P, 1997. Expression of a *Bacillus thuringiensis* cryIA (c) gene in transgenic peanut plants and its efficacy against lesser cornstalk borer. Transgenic Research, 6, 169–176.

Smith Jr JW, Posada L and Smith OD, 1980. Greenhouse screening peanut germ plasm for resistance to the lesser cornstalk borer. Peanut Science, 7, 68–71.

Solis AM, 2006. Key to selected Pyraloidea (Lepidoptera) larvae intercepted at U. S. Ports of entry: Revision of pyraloidea in "keys to some frequently intercepted lepidopterous larvae" by weisman 1986 (updated 2006). Systematic Entomology Laboratory, PSI, Agriculture Research Service, U.S. Department of Agriculture, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560-0168.

Stewart SD, Boweri KL, Mack TP and Edwards JH, 1997. Impact of Row Spacing and Planting Date on the Canopy Environment, Abundance of Lesser Cornstalk Borer and Other Arthropods, and Incidence of Aflatoxigenic Fungi in Peanuts. Peanut Science, 24, 52–59.

Tobin PC, Berec L and Liebhold AM, 2011. Exploiting Allee effects for managing biological invasions. Ecology letters, 14, 615–624.

USDA, 1933. The insect pest survey bulletin. 13, 194. USDA https://ufdc.ufl.edu/AA00023228/00188/pageturner?search=lesser+cornstalk#page/9 [Accessed 09/05/2021].

USDA, 1953. Cooperative economic insect report, U.S. Department of Agriculture, Vol.3 No. 27, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine. 674 pp.

USDA, 1961. Cooperative economic insect report, U.S. Department of Agriculture, Vol. 11 No. 27, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine. 1046 pp.

Vilella FM, Waquil JM, Vilella EF, Viana PA, Lynch RE and Foster JE, 2002. Resistance of Bt transgenic maize to lesser cornstalk borer (Lepidoptera: Pyralidae). Florida Entomologist, 85, 523–652.

Walker DR, All JN, McPherson RM, Boerma HR and Parrott WA, 2000. Field evaluation of soybean engineered with a synthetic cry1Ac transgene for resistance to corn earworm, soybean looper, velvetbean caterpillar (Lepidoptera: Noctuidae), and lesser cornstalk borer (Lepidoptera: Pyralidae). Journal of Economic Entomology, 93, 613–622.

Wolf SP, Bowen KL and Mack TP, 1997. Augmentation of southern stem rot in peanuts by larval feeding of the lesser cornstalk borer (Lepidoptera: Pyralidae). Journal of economic entomology, 90, 1341–1345.

Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PLH	EFSA Panel on Plant Health
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2018).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2018).
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2018).
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2018).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2018).
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units.
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2018).
Pathway	Any means that allows the entry or spread of a pest (FAO, 2018).
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2018).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2018).
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2018).

Appendix A – Distribution of Elasmopalpus lignosellus

Distribution records based on EPPO Global Database (EPPO, online accessed on 27/4/2021).

Region	Country	Subnational (e.g. State)	Status
North America	Bermuda		Present, no details
	Mexico		Present, no details
	USA		Present, no details
		Alabama, Arizona, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Illinois, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Mississippi, Missouri, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, Texas, Virginia	Present, no details
Central America	Costa Rica		Present, no details
	Guatemala		Present, no details
	Nicaragua		Present, no details
	Panama		Present, no details
Caribbean	Barbados		Present, no details
	Cuba		Present, no details
	El Salvador		Present, no details
	Jamaica		Present, no details
	Puerto Rico		Present, no details
	Trinidad and Tobago		Present, no details
South America	Argentina		Present, no details
	Bolivia		Present, no details
	Brazil		Present, no details
		Bahia, Goias, Mato Grosso Mato Grosso do Sul, Minas Gerais, Parana, Pernambuco Rio Grande do Sul, Sao Paulo	Present, no details
	Chile		Present, no details
	Colombia		Present, no details
	French Guiana		Present, no details
	Paraguay		Present, no details
	Peru		Present, no details
	Uruguay		Present, no details
	Venezuela		Present, no details
Europe			Intercepted only, presumed absent
Africa			No records, presumed absent
Asia			Presumed absent
	Vietnam		Absent, unreliable record
Oceania			No records, presumed absent

Appendix B – *Elasmopalpus lignosellus* host plants

Source: EPPO Global Database (2021) unless indicated

Host status	Plant Family	Host name	Common name	Reference EPPO
Cultivated hosts	Amaranthaceae	*Beta vulgaris*	Beet	
	Annonaceae	*Annona muricata*	Soursop	Robinson et al. (2010)
	Araucariaceae	*Araucaria angustifolia*		
	Asparagaceae	*Asparagus officinalis*	Asparagus	
		Gladiolus	Gladiolus	Sandhu et al. (2010)
	Brassicaceae	*Brassica napus*	Oilseed rape	
		Brassica oleracea var. *capitata*	Cabbage	
		Brassica rapa	Turnip	
		Matthiola sp.		
		Raphanus sativus	Radish	
	Bromeliaceae	*Ananas comosus*	Pineapple	Solis (2006)
	Convolvulaceae	*Ipomoea batatas*	Sweet potato	
	Cornaceae	*Cornus florida*	Flowering dogwood	
	Corylaceae	*Corylus avellana*	Hazel	Solis (2006)
	Cucurbitaceae	*Cucumis melo*	Muskmelon	
	Cupressaceae	*Cupressus arizonica*	Arizona cypress	
		Juniperus virginiana var. *silicicola*	Red cedar	
	Cyperaceae	*Cyperus esculentus*	Nutsedge/tiger nut	
	Fabaceae	*Arachis hypogaea*	Groundnut/peanut	
		Glycine max	Soyabean	
		Medicago sativa	Alfalfa	
		Mimosa pigra		Solis (2006)
		Phaseolus	Beans	USDA (1933), Isely and Miner (1944)
		Phaseolus vulgaris	Common bean	
		Pisum sativum	Pea	
		Robinia pseudoacacia	Black locust	
		Trifolium incarnatum	Crimson clover	
		Vicia faba	Broadbean	
		Vigna luteola	Cowpea	
		Vigna mungo		
		Cajanus cajan	Pigeon pea	CABI (2019)
		Lupinus	Lupins	Robinson et al. (2010)
		Phaseolus lunatus	Lima bean	
		Vigna unguiculata	Cowpea	
	Labiatae	*Mentha*	Mint	Solis (2006)
	Linaceae	*Linum usitatissimum*		
	Malvaceae	*Gossypium hirsutum*	Cotton	CABI (2019)
	Marantaceae	*Maranta*	Prayer plant	Solis (2006)
	Nyssaceae	*Nyssa sylvatica*		
	Pinaceae	*Pinus*		
		Pinus clausa	Sand pine	
		Pinus elliottii	Slash pine	
		Pinus taeda	Loblolly pine	

Host status	Plant Family	Host name	Common name	Reference EPPO
	Platanaceae	*Platanus occidentalis*		
	Poaceae	*Alopecurus pratensis*		
		Bambusa		Robinson et al. (2010)
		Cynodon dactylon	Bermuda grass	Gill et al. (2014)
		Digitaria eriantha subsp. pentzii		
		Hordeum vulgare		
		Oryza sativa	Rice	
		Saccharum officinarum	Sugarcane	
		Secale cereale		
		Sorghum bicolor	Sorghum	
		Sorghum x drummondii		
		Triticum aestivum	Wheat	
		Zea mays	Maize/corn	
		Zea mexicana		
		Avena sativa	Oats	
		Sorghum sudanense	Sudan grass	CABI (2019)
	Polygonaceae	*Fagopyrum esculentum*	Buckwheat	
	Rosaceae	*Fragaria X ananassa*	Strawberry	Robinson et al. (2010)
	Rubiaceae	*Coffea arabica*	Coffee	Solis (2006)
	Solanaceae	*Capsicum annuum*	Pepper	
		Solanum lycopersicum	Tomato	
		Solanum tuberosum	Potato	USDA (1933)
	Taxodiaceae	*Taxodium distichum*	Bald cypress	
Wild/	Convolvulaceae	*Convolvulus arvensis*	Bindweed	Robinson et al. (2010)
Weed	Cyperaceae	*Cyperus rotundus*	Java grass	Sandhu et al. (2010)
Hosts	Fabaceae	*Dolichos*		Robinson et al. (2010)
	Malvaceae	*Gossypium herbaceum*	Levant cotton	Robinson et al. (2010)
	Malvaceae	*Gossypium thurberi*	Arizona wild cotton	Robinson et al. (2010)
	Malvaceae	*Sida*	Fanpetals	Solis (2006)
	Poaceae	*Aristida stricta*	Wiregrass	
	Poaceae	*Avena fatua*	Common wild oat	
	Poaceae	*Chloris gayana*	Rhodes grass	
	Poaceae	*Digitaria sanguinalis*	Large crabgrass	
	Poaceae	*Echinochloa crus-galli*	Barnyard grass	
	Poaceae	*Eleusine indica*	Indian goosegrass	
	Poaceae	*Luziola fluitans*	Watergrass	Gill et al. (2014)
	Poaceae	*Sorghum halepense*	Johnson grass	Robinson et al. (2010)
	Poaceae	*Sorghum subglabrescens*	Sorghum	Sandhu et al. (2010)
	Poaceae	*Cynodon dactylon*	Bermuda grass	
	Poaceae	*Eleusine*	A grass	Robinson et al. (2010)
	Poaceae	*Panicum*	A grass	Robinson et al. (2010)
	Poaceae	*Paspalum*	Crowngrass	Robinson et al. (2010)
	Rosaceae	*Fragaria vesca*	Wild strawberry	Robinson et al. (2010)
	Rosaceae	*Fragaria virginiana*	Wild strawberry	
	Solanaceae	*Capsicum frutescens*	Wild pepper	

Host status	Plant Family	Host name	Common name	Reference EPPO
Artificial/ experimental host		None reported		

Appendix C – Identifying the endangered area

Whilst Köppen–Geiger climate zones can be used to inform pest categorisation (MacLeod and Korycinska, 2019), they do not capture accumulated temperature which can influence the distribution and abundance of poikilothermic organisms and determine where pests might have the greatest impacts.

Interpreting the available literature to the level appropriate for a pest categorisation, *E. lignosellus* appears to be reported as a crop pest in regions of the USA that accumulate over 2,500 degree days above a threshold of 10°C (Figure C.1). Regions of the EU with over 2,500 degree days above a threshold of 10°C are seen in Figure C.2 (Note that Figure C.2 uses the same colour scale as shown in Figure C.1).

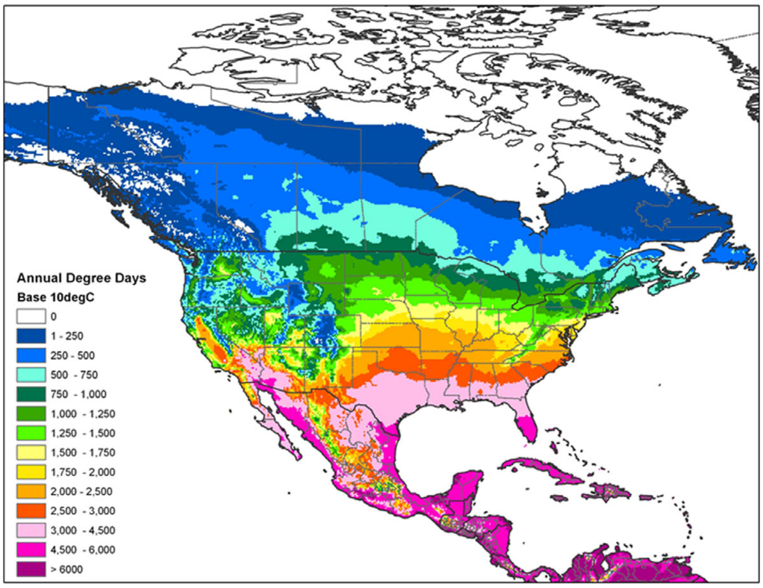

Figure C.1: Accumulated degree days above 10°C in North America (from Baker, 2002)

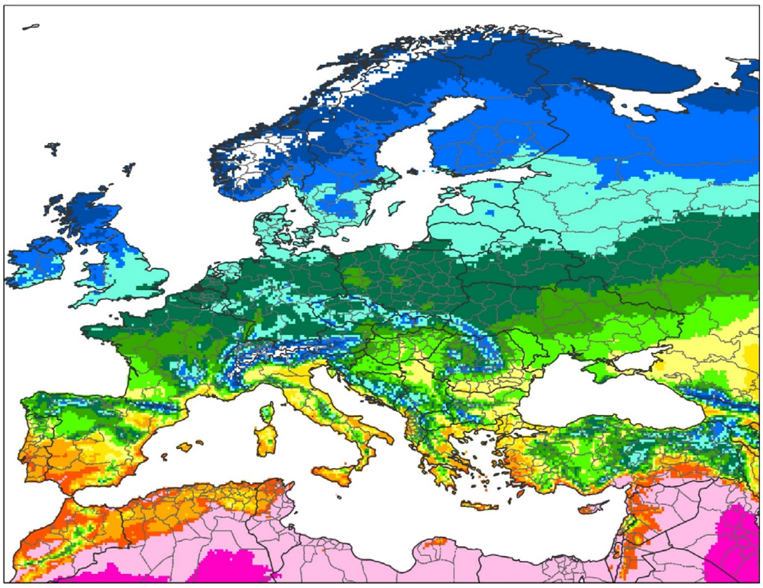

Figure C.2: Accumulated degree days above threshold of 10°C for the Euro-Mediterranean area (from Baker, 2002) (Same colour scale as Figure C.1)

Southern Portugal and coastal regions of the EU around the Mediterranean provide accumulated temperatures that are within the range of those where *E. lignosellus* is most often reported causing crop impacts in North America.