Pest categorisation of *Penthimiola bella*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Penthimiola bella* (Hemiptera: Cicadellidae), the citrus leafhopper, for the European Union (EU). *P. bella* is native to the Afrotropical region; it has spread to Israel (first reported in 1974), Lebanon, and was reported from Morocco in 2018. Within the EU, *P. bella* is established in Portugal (Algarve) where it was first found on sweet oranges in 2012, and then in Spain in 2020, also on sweet oranges. *P. bella* is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072. It is a polyphagous species reported, among cultivated hosts, on sweet orange, grapefruit and avocado. It is also described as being found on unspecified trees and bushes in savannahs, mountain forests and rain forests in Africa. Climatic conditions in some parts of southern EU countries are favourable and host plants are available in those areas to support establishment and spread. Despite being present in Portugal for over 10 years, there is a lack of evidence of impacts; hence, the magnitude of impact following introduction is uncertain. Nevertheless, in South Africa, *P. bella* was reported as being an economically important pest of citrus and to cause damage to avocado fruit during the early stages of development. Phyto sanitary measures are available to reduce the likelihood of entry and further spread. Except for having uncertain economic or environmental impacts as a result of its introduction, *P. bella* satisfies all the other criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

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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 1 E (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

Penthimiola bella (Stål) is one of a number of pests listed in Annex 1C to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine 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 Union quarantine pest, risk reduction options will be identified.
1.3. Additional information

This pest categorisation was initiated following the commodity risk assessment of *Persea americana* plants for planting from Israel performed by EFSA (EFSA PLH Panel, 2021), in which *P. bella* was identified as a relevant non-regulated EU pest which could potentially enter the EU on *P. americana*.

2. Data and methodologies

2.1. Data

2.1.1. Information on pest status from NPPOs

In the context of the current mandate, EFSA is preparing pest categorisations for new/emerging pests that are not yet regulated in the EU. When official pest status is not available in the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), EFSA consults the NPPOs of the relevant EU MSs. To obtain information on the official pest status for *P. bella*, EFSA has consulted the NPPO of Portugal.

2.1.2. Literature search

A literature search on *P. bella* 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.

2.1.3. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database, 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 SANTE) of the European Commission as 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.

GenBank was searched to determine whether it contained any nucleotide sequences for *P. bella* which could be used as reference material for molecular diagnosis. GenBank® ([www.ncbi.nlm.nih.gov/genbank/](http://www.ncbi.nlm.nih.gov/genbank/)) is a comprehensive publicly available database that as of August 2019 (release version 227) contained over 6.25 trillion base pairs from over 1.6 billion nucleotide sequences for 450,000 formally described species (Sayers et al., 2020).

2.2. Methodologies

The Panel performed the pest categorisation for *P. bella*, 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).

The criteria to be considered when categorising a pest as a potential Union quarantine pest (QP) is given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. 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 derived from 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 clearly defined, 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 in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed. |
| 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 for entry and spread. |
| 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 (Section 3.6) | Are there measures available to prevent pest entry, establishment, spread or impacts? |
| 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 clearly defined, or has it been shown to produce consistent symptoms and/or to be transmissible?

Yes, the identity of the species is established and Penthiomila bella (Stål) is the accepted name.

P. bella (Stål) is an insect within the Order Hemiptera and Family Cicadellidae. It is commonly known as the citrus leafhopper. It was first described as Penthima bella Stål and synonyms include Neodartus bella Evans, Penthiomila fasciata Lindberg, Neodartus bellus Metcalff and Penthiomila bella uranos Linnavuori (Honiball, 1998; Zahniser, 2022).
The EPPO code\(^1\) (Griessinger and Roy, 2015; EPPO, 2019) for this species is PETHBE (EPPO, online).

3.1.2. Biology of the pest

*P. bella* is a plant phloem sap feeder belonging to the Deltocephalinae, a highly diverse and economically significant subfamily of leafhoppers, known to be able to vector plant diseases (Weintraub and Beanland, 2006). However, we found no evidence that *P. bella* is a vector of any plant pathogen. Adult females mate within 24 h after emergence and then pass through a 7- to 15-day period of pre-oviposition. They can lay more than 30 eggs, each laid singly through a minute slit in leaves and fruits. There are five nymphal instars. Egg development ranges from 9 to 20 days, and nymphal development from 35 to 63 days at temperatures of 20–27°C. Adult longevity was recorded up to 59 days (Honiball, 1998). Although little information on the biology is available, based on the above data, we assume the species performs multiple overlapping generations. In South Africa, the *P. bella* population peaked in December and February (Begemann and Schoeman, 2000). Adults are more frequent on the shady southern side of South-African citrus trees, as first- and second-nympha stages seem to prefer the underside of the leaves on which they feed. Other stages/stadia do not show any additional preference in the trees (Honiball, 1998).

In South Africa, *P. bella* is parasitised by seven Chalcidoidea egg-parasitoid species (five Mymaridae, one Trichogrammatidae and one Aphelinidae), according to Annecke (1965), Prinsloo (1986) and Honiball (1998). Annecke (1964) and Honiball (1998) report 50% parasitism and satisfactory natural control. No further information is available on natural enemies in other regions.

3.1.3. Host range/species affected

*P. bella* is a polyphagous species observed both on wild and cultivated species (Appendix A). Indeed, it can be found in mountain and rain forests and in various unspecified trees and bushes in savannahs, as well as in agricultural ecosystems. As for cultivated species, *P. bella* has been found infesting plants and fruit of sweet orange, grapefruit and avocado in South Africa (Annecke, 1964; Dupont and Dennill, 1996; Begemann and Schoeman, 2000) and also avocado in Lebanon.

3.1.4. Intraspecific diversity

No intraspecific diversity is reported for this species.

3.1.5. Detection and identification of the pest

**Are detection and identification methods available for the pest?**

Yes, visual detection is possible, and morphological identification methods are available.

**Symptoms**

*P. bella* nymphs and adults produce damage when feeding and ovipositing (Honiball, 1998). Prolonged feeding on leaves may produce a spotted chlorosis on the leaf surface, while heavy infestations in orchards carrying green fruits may result in chlorotic spots, protrusions (i.e. elevated lesions on the fruit surface with brown corky scar tissue in the centre of the lesion right under the fruit surface) and dark spots on the surface of maturing fruits, rendering them unacceptable for export (Du Toit et al., 1993; Dupont and Dennill, 1996; Honiball, 1998). However, in some cases, injuries become less evident in mature fruits (Begemann and Schoeman, 2000). Observations in South Africa indicate that even exceptionally heavy infestations in citrus orchards resulting in very noticeable chlorotic spots on the fruit, finally disappear when fruit colours, with the result of little or no culling necessary at the packinghouse (Honiball, 1998). In Portugal, circular yellow spots were found on fruits in the orchards where *P. bella* was detected (Zina et al., 2013). Du Toit et al. (1993) observed that approximately 40% of bagged young ‘Hass’ avocado fruit, ranging from 5 to 25 mm in length, exposed to *P. bella*, developed typical lesions, including dark spots with white excreta, watermarks, as well as protrusions. Similar lesions were also observed on leaves and twigs.

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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).
In South African citrus orchards, the January–March (summer) generation has been reported to cause problems over a number of years at a local scale (Honiball, 1998). From observations carried in South Africa, adults are more abundant in the shady, southern side of citrus trees, though no differences in egg presence was recorded among different tree sides (Honiball, 1998).

**Identification**

*P. bella* is easily macroscopically differentiated from other green-coloured citrus leafhoppers present in the Mediterranean basin such as *Empoasca* spp. and *Asymmetrasca decedens* (Paoli), and also from its congenus *Penthimiola variabilis* (Evans), which is predominantly black (Linnavuori, 1977; Garcia-Mari, 2012).

**Description**

The first instar is distinctly coloured, easily differentiated from other instars by having the head, thorax and two basal segments of the abdomen largely black, with the remaining parts of the body creamy white. Second and later nymphal instars are largely brownish with lighter marks (Honiball, 1998). Adults, 3–3.9 mm long, are yellowish or brownish grey, with brown spots. Face is dark brown, but greyish on upper margin. A pair of dark-brown spots are present behind eyes on the pronotum. Elytrae are yellow-grey, with dark brown areas. Ventral surface of head, thorax and basal segments of legs is dark brown (Zina et al., 2013).

### 3.2. Pest distribution

#### 3.2.1. Pest distribution outside the EU

*P. bella* is native to the Afrotropical region, where it is widespread (Figure 1). It is also known from the Cape Verde islands and Madagascar (Lindberg, 1958; Linnavuori, 1977; Medler, 1980; EPPO, online), having expanded its presence, to Israel in 1974 (Raccah and Bar-Joseph, 1975) and Lebanon (Zina et al., 2013) in the Palaearctic region. It was detected in 2018 on avocado in Morocco with restricted distribution (Smaili and Benyahia, 2018); its impact on avocado and other important crops, such as citrus, remains to be further studied in this country (EPPO, online). The species has been reported as being present in Argentina (Zina et al., 2013) though this record is considered as unreliable as it was not confirmed by the ‘Sistema Nacional Argentino de Vigilancia y Monitoreo de Plagas’ which considers it as ‘Absent’ (EPPO, online). Appendix B provides all the records of occurrence.

![Figure 1: Global distribution of *Penthimiola bella* (Source: EPPO Global Database accessed on 07 October 2022)](https://gf.eppo.int)
3.2.2. Pest distribution in the EU

Is the pest present in the EU territory?

Yes, *P. bella* has been recorded in Portugal and Spain.

If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.

*P. bella* is present in a limited part of the EU; indeed, it has a restricted distribution in southern Portugal (Algarve) (EPPO, online) and in Spain (Andalusia and Valencia).

In Portugal, the occurrence of *P. bella* in a relatively large area of at least 70 km length suggests that this species became established and has been expanding its distribution in the region for several years since its first detection (Zina et al., 2013). There are records of the species in Spain, from Andalusia and Valencia in citrus orchards (https://observation.org/species/998838/observations/, https://www.biodiversidadvirtual.org/insectarium/Penthimiola-bella-img1272952.html). No official record is however available.

3.3. Regulatory status

3.3.1. Commission implementing regulation 2019/2072

*P. bella* is not present in Annex II Part A (2) of Commission implementing regulation (EU) 2019/2072. Import requirements are listed in Reg. 2020/1213 related to certain plants for planting of *P. americana* (host of *P. bella*) from Israel. Annex I of EU 2018/2019 prohibits the introduction of plants of *P. americana* from all third countries, pending risk assessment, with the exception of Israel ((EU) 2021/1936).

3.3.2. Hosts or species affected that are prohibited from entering the union from third countries

According to the Commission Implementing Regulation (EU) 2019/2072, Annex VI, introduction of several *P. bella* hosts into the EU from certain third countries is prohibited (Table 2).

**Table 2:** List of plants, plant products and other objects that are *Penthimiola bella* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

| Description                                                                 | CN Code                        | Third country, group of third countries or specific area of third country |
|----------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------|
| Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf. and their hybrids, other than fruits and seeds | ex 0602 10 90 | All third countries |
|                                                                            | ex 0602 20 |                                                             |
|                                                                            | 200602 20 30 |                                                             |
|                                                                            | ex 0602 20 80 |                                                             |
|                                                                            | ex 0602 90 45 |                                                             |
|                                                                            | ex 0602 90 46 |                                                             |
|                                                                            | ex 0602 90 47 |                                                             |
|                                                                            | ex 0602 90 50 |                                                             |
|                                                                            | ex 0602 90 70 |                                                             |
|                                                                            | ex 0602 90 91 |                                                             |
|                                                                            | ex 0602 90 99 |                                                             |
|                                                                            | ex 0604 20 90 |                                                             |
|                                                                            | ex 1404 90 00 |                                                             |

**Persea americana** is listed in Annex I of EU 2018/2019, a list of high-risk plants whose introduction into the EU is prohibited pending risk assessment. Israel has been exempted from the prohibition (EU 2021/1936) (see Section 3.3.1).
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.

Yes, the pest has already entered the EU territory. It could further enter into the EU territory with citrus and avocado fruit and plants for planting.

Comment on plants for planting as a pathway.

It could further enter the EU territory with plants for planting although some of the host plants, namely *Citrus* spp., from some third countries are prohibited (Table 3) while the introduction of some other plants, namely *P. americana*, is prohibited pending risk assessment, except for Israel (Section 3.3.1).

Table 3: Potential pathways for *Penthimiola bella* into the EU 27

| Pathways       | Life stage       | Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072] |
|----------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plants for planting | Eggs, nymphs and adults | Annex VI of Commission Implementing Regulation (EU) 2019/2072, prohibits the introduction into the EU of plants of *Citrus*, *Fortunella*, *Poncirus* and their hybrids, other than fruits and seed from all third countries. Annex I of EU 2018/2019 prohibits the introduction of plants of *Persea americana* from all third countries, pending risk assessment, with the exception of Israel ((EU) 2021/1936). Phytosanitary certificates required for plants for planting |
| Fruits          | Eggs, nymphs and adults | Fruits from third countries other than Switzerland require a phytosanitary certificate for import into the EU (2019/2072, Annex XI, Part A) |

The EFSA PLH Panel (2021) commodity risk assessment for *Persea americana* plants for planting from Israel indicated, with 95% certainty, that between 9,927 or more imported grafted plants per 10,000, produced using specified mitigation measures, would be free of *P. bella*, giving an overall evaluation of ‘extremely frequently pest free’.

Considering that *P. bella* oviposits also on fruits, and leafhopper eggs can survive transport even over long distances and time (Mifsud et al., 2010), fruits are probably the main pathway of introduction (see import statistics for some cultivated hosts in Tables 4-6.). Nonetheless, the importation of plants for planting of suitable hosts from outside of the EU (e.g. *P. americana* from Israel) may be also a pathway for introduction (Suffert et al., 2018).

Table 4: Sweet oranges, fresh or chilled (CN code 08051022 – Navel oranges, CN code 08051024 – White oranges, CN code 08051028 – Other sweet oranges), imported (100 kg) into the EU (27) from regions where *Penthimiola bella* is known to occur (Source Eurostat accessed on 6 January 2022)

| Region         | 2016  | 2017  | 2018  | 2019  | 2020   |
|----------------|-------|-------|-------|-------|--------|
| South Africa   | 3,678,250.16 | 3,885,942.54 | 3,574,783.73 | 4,508,053.48 |
| Morocco        | 1,083,373.87 | 776,898.76 | 949,500.04 | 741,819.01 |
| Uganda         | 0.10            | :       | :       | :      |
| Israel         | 28,005.54       | 21,546.64 | 13,801.61 | 8,210.10 |
| Lebanon        | 1,422.61        | 1.78    | 1.63    | 0.83   |
| Total          | 4,791,052.28    | 4,684,389.72 | 4,538,087.01 | 5,257,147.05 |
Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As on 28 July 2022, there were no records of interception of *P. bella* in the Europhyt and TRACES databases.

### 3.4.2. Establishment

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

Yes, *P. bella* is established in Portugal and Spain. In some parts of the EU countries of southern Europe, the climate is suitable and there are available hosts that can support 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, 2002). 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

Main hosts of *P. bella* are sweet oranges, grapefruits and avocados (Tables 7–9 and Appendix A).

**Table 5:** Avocados, fresh or chilled (CN code 08044000), imported (100 kg) into the EU (27) from regions where *Penthimiola bella* is known to occur (Source Eurostat accessed on 6 January 2022)

| Region            | 2016  | 2017  | 2018  | 2019  | 2020  |
|-------------------|-------|-------|-------|-------|-------|
| Congo             | 0.66  | 1.47  | 0.10  | 0.65  | :     |
| Côte d’Ivoire     | 8.15  | 18.26 | 230.36| 72.20 | 68.24 |
| South Africa      | 419,768.89| 315,854.56| 652,817.98| 40,1352.79| 416,290.25|
| Cameroon          | 133.50| 173.54| 221.30| 259.38| 205.93|
| Morocco           | 60,519.96| 136,393.65| 187,093.75| 170,230.30| 329,422.08|
| Madagascar        | :     | 0.00  | :     | :     | 0.96  |
| Uganda            | 1,912.57| 2,195.25| 2,233.81| 3,364.25| 3,575.69|
| Nigeria           | 1.06  | 3.15  | 3.18  | 0.51  | :     |
| Israel            | 301,123.91| 424,267.97| 370,378.23| 437,318.01| 345,663.97|
| Lebanon           | 2.10  | 57.84 | 3.84  | 3.66  | 25.75 |
| Total             | 783,470.80| 878,965.69| 1,212,982.55| 1,012,601.75| 1,095,252.87|

*Note: data not available.*

**Table 6:** Grapefruits (including pomelos), fresh or chilled (CN code 08054000), imported (100 kg) into the EU (27) from regions where *Penthimiola bella* is known to occur (Source Eurostat accessed on 6 January 2022)

| Region            | 2016  | 2017  | 2018  | 2019  | 2020  |
|-------------------|-------|-------|-------|-------|-------|
| Morocco           | 5,277.22| 15,400.52| 9,259.81| 11,002.35| 11,995.21|
| Sudan             : | 0.00  | :     | :     | :     | 0.50  |
| Uganda            : | 0.00  | :     | :     | :     | 2.11  |
| South Africa      | 818,033.13| 851,594.34| 978,681.31| 921,280.18| 854,917.75|
| Côte d’Ivoire     | 224.00| 0.00  | :     | :     | :     |
| Israel            | 257,904.61| 208,679.65| 218,945.84| 141,834.58| 230,787.50|
| Lebanon           | 0.48  | 0.24  | :     | 0.25  | :     |
| Total             | 1,081,439.44| 1,075,674.75| 1,206,886.96| 1,074,117.36| 1,097,703.07|

**Table 7:** Harvested area of avocados in EU 27, 2016–2020 (code F2300, ×1,000 ha). Source EUROSTAT (accessed on 11 September 2021)

| MS/Year | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------|------|------|------|------|------|
| EU (27) | 12.24| 12.72| 13.22| 17.50| 17.29|
| Spain   | 11.44| 11.81| 12.16| 14.10| 15.85|
3.4.2.2. Climatic conditions affecting establishment

*P. bella* occurs mainly in tropical and subtropical regions in Africa. It has spread to countries bordering the Mediterranean (Israel, Lebanon, Morocco) and has established in southern Portugal and southern and eastern Spain (see Section 3.2.2). Figure 2 shows the world distribution of Koppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and which occur in countries where *P. bella* has been reported.

| Table 8: Harvested area of sweet oranges (Navel, code: T1100; White, code: T1200 and other sweet oranges, code: T1900) in EU 27, 2016–2020. Source EUROSTAT (accessed on 11 September 2021) |
| MS/Year | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------|------|------|------|------|------|
| Greece  | 0.48 | 0.60 | 0.72 | 1.08 | 1.10 |
| France  | 0.23 | 0.23 | 0.24 | 0.24 | 0.24 |
| Cyprus  | 0.09 | 0.08 | 0.10 | 0.10 | 0.10 |
| Portugal| 0.00 | 0.00 | 0.00 | 1.98 | 0.00 |

| Table 9: Harvested area of grapefruits, including pomelos (code: T4000) in EU 27, 2016–2020. Source EUROSTAT (accessed on 11 September 2021) |
| MS/Year | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------|------|------|------|------|------|
| EU (27) | 172.99 | 252.39 | 253.08 | 251.05 | 226.01 |
| Spain   | 141.27 | 139.57 | 138.68 | 138.89 | 139.53 |
| Italy   | 0.00  | 83.22 | 82.80 | 81.85 | 55.88 |
| Greece  | 31.72 | 29.60 | 31.60 | 30.31 | 30.60 |

3.4.2.2. Climatic conditions affecting establishment

*P. bella* occurs mainly in tropical and subtropical regions in Africa. It has spread to countries bordering the Mediterranean (Israel, Lebanon, Morocco) and has established in southern Portugal and southern and eastern Spain (see Section 3.2.2). Figure 2 shows the world distribution of Koppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and which occur in countries where *P. bella* has been reported.
Within South Africa, *P. bella* occurs in the Northern Cape (Begemann and Schoeman, 2000) where the climate is warm to hot (largely BWk, BWh type climates which do not occur in the EU). The Northern Cape is one of the warmest regions in South Africa with a mean daily maximum of 26°C. For several months of the year, maximum temperatures are continuously above 25°C (https://www.worlddata.info/africa/south-africa/climate-northern-cape). Low temperatures are an important limiting factor affecting the distribution of species with no known diapause (Bale, 1991), such as *P. bella* for which no diapause was observed in South Africa. Köppen–Geiger climate zones do not capture the number of frost days in a region and such information may further inform judgements about where in the EU *P. bella* could establish. Figure 3 shows the mean number of frost days each year in Africa, western Asia and Europe (Map data for the 30 year period 1988–2017 was sourced from the Climatic Research Unit high resolution gridded data set CRU TS v. 4.03 at 0.5° resolution (https://crudata.uea.ac.uk/cru/data/hrg/)).

In addition to frost days, the annual mean accumulated temperature can also inform judgements about where in the EU *P. bella* could establish. Figure 4 shows mean accumulated temperature above a base of 10°C (1961–1990) (Baker, 2002). Recalling the distribution of *P. bella* shown in Figure 1, *P. bella* occurs in countries which normally have less than 20 frost days each year and accumulate more than 2,000 degree days above a base of 10°C. Such conditions are found in citrus growing regions of the EU, for example in southern Portugal and Spain.
Parts of southern EU countries provide suitable climatic conditions for the establishment of *P. bella*, indeed the pest has already established in part of Portugal and Spain.

### 3.4.3. Spread

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

Natural spread by flying adults can occur. All stages can be moved over long distances via infested plant materials, specifically plants for plantings and fruit.

*Comment on plants for planting as a mechanism of spread.*

Plants for planting provide a main spread mechanism for *P. bella* over long distances.

Although *P. bella* is considered a highly mobile species (Dupont and Dennill, 1996), there is no data regarding its rate of spread. In Portugal, *P. bella* is present over an area of at least 70 km length suggesting that this species became established and has been expanding its distribution in the region for several years since its arrival (Zina et al., 2013). In Spain, this species has been found over an area of 600 km from Huelva to Valencia, having been first reported in December 2020 (https://observation.org/species/998838/observations/, https://www.biodiversidadvirtual.org/insectarium/Penthimiola-bella-img1272952.html). Although no information on the rate of spread of *P. bella*, estimates for other Hemiptera indicate rates of spread from 8 to 15 km per year (Liebhold and Tobin, 2008). Moreover,
some species of leafhoppers were seen to be able to migrate over long distances (Ghauri, 1983; Mifsud et al., 2010).

### 3.5. Impacts

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

There is no evidence that establishment of *P. bella* in the EU has caused an economic or environmental impact. *P. bella* has been reported as an economically important pest in South Africa. However, to date *P. bella* has not been reported as causing economic damage in Algarve (Portugal) where it has been present for over 10 years, nor in Spain where it was first reported in 2020.

In South Africa, this leafhopper is considered a minor occasional pest of citrus. However, it became an economically important pest of citrus since the use of the organophosphorus insecticides triazophos and isofenphos used for the control of *Scirtothrips aurantii* (Faure) (Thysanoptera: Thripidae) was restricted (Honiball, 1998). Heavy infestations in orchards carrying green fruits may result in chlorotic spots, protrusions and dark spots on the surface of maturing fruits, making them unacceptable for export (Dupont and Dennill, 1996; Bedford et al., 1998). On citrus, Honiball (1998) reported marked fruits ranging from 19% to 57% in Valencia and Navel orchards, respectively. However, the percentage of fruit culled in the packinghouse ranged from 0% to 2.6%. Often injuries become less conspicuous in mature fruits (Begemann and Schoeman, 2000). Studying *P. bella* in orange orchards in South Africa in 1989–1994, Begemann and Schoeman (2000) reported 0.16% of navel oranges and 0.01% of Valencia oranges were rejected for export at packing houses due to damage by *P. bella*.

On avocado, damage was caused during the earlier stages of fruit development (Du Toit et al., 1993; Dupont and Dennill, 1996). In case of ‘Hass’ avocado fruits, damage can make them unacceptable for export (Du Toit et al., 1993; Bruwer, 1996).

There is lack of evidence that *P. bella* is harmful to crops in Israel where it was first reported in 1974.

*P. bella* was first described in 2012 in the region of Algarve, in Portugal, during a survey in 30 citrus orchards. Circular yellow spots were observed on the fruits, mainly on sweet orange (*Citrus sinensis*), with no reports of economic damage (Zina et al., 2013).

When analysing citrus pests, leafhoppers, namely *A. decedens*, were reported as being potential pests always below economic injury level by experts in Italy, Turkey and Montenegro, while rated as occasional pests that may reach economic level in southern Spain (Jacas et al., 2010). García-Mari and Ferragut Pérez (2020) also consider leafhoppers as occasional minor pests of citrus.

*P. bella*, as for other leafhoppers, could potentially vector phytoplasmas; however, no specific literature was found reporting *P. bella* as a vector.

### 3.6. Available measures and their limitations

**Are there measures available to prevent the pest entry, establishment, spread or impacts such that the risk becomes mitigated?**

**Yes.** Although the existing phytosanitary measures identified in Section 3.3.2 do not specifically target *P. bella*, they mitigate the likelihood of its entry into, establishment and spread within the EU (see also Section 3.6.1).

#### 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).

Additional potential risk reduction options and supporting measures are shown in Sections 3.6.1.1 and 3.6.1.2.

##### 3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 10.
### Table 10: Selected control measures (a full list is available in EFSA PLH Panel, 2018) for pest entry/establishment/spread/impact in relation to currently unregulated hosts and pathways. Control measures are measures that have a direct effect on pest abundance

| Control measure/risk reduction option (Blue underline = Zenodo doc, Blue = WIP) | RRO summary | Risk element targeted (entry/establishment/spread/impact) |
|---|---|---|
| Require pest freedom | Pest-free place of production (e.g. place of production and its immediate vicinity is free from pest over an appropriate time period, e.g. since the beginning of the last complete cycle of vegetation, or past 2 or 3 cycles). Pest-free production site. | Entry/spread |
| Growing plants in isolation | Place of production is insect proof originate in a place of production with complete physical isolation. | Entry/spread |
| Managed growing conditions | Used to mitigate likelihood of infestation at origin. | Entry (reduce contamination/infestation)/spread |
| Biological control and behavioural manipulation | The eggs of *P. bella* are parasitised by seven Chalcidoidea species (Annecke, 1965) resulting in 50% parasitism and satisfactory natural control (Annecke, 1964). No further information on natural enemies is available for other regions. | Spread/impact |
| Chemical treatments on crops including reproductive material | Used to mitigate likelihood of infestation of pests susceptible to chemical treatments. | Entry/establishment/spread/impact |
| Chemical treatments on consignments or during processing | Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage e.g. fumigation; spraying/dipping pesticides; surface disinfectants | Entry/spread |
| Heat and cold treatments | Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself. | Entry/spread |
| Controlled atmosphere | Treatment of plants by storage in a modified atmosphere (including modified humidity, O₂, CO₂, temperature, pressure). Used to mitigate likelihood of infestation of pests susceptible to modified atmosphere (usually applied during transport) hence to mitigate entry. Controlled atmosphere storage can be used in commodities such as fresh and dried fruits. | Entry/spread (via commodity) |

#### 3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 11.
Table 11: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance.

| Supporting measure (Blue underline = Zenodo doc, Blue = WIP) | Summary | Risk element targeted (entry/establishment/spread/impact) |
|-------------------------------------------------------------|---------|----------------------------------------------------------|
| **Inspection and trapping**                                 | Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. | Entry/spread/impact |
| **Laboratory testing**                                     | Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests. | Entry/spread |
| **Sampling**                                               | According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing. | Entry |
| **Phytosanitary certificate and plant passport**           | An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) (a) export certificate (import) (b) plant passport (EU internal trade) | Entry/spread |
| **Certified and approved premises**                        | Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by the NPPO in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries. | Entry/spread |
| **Certification of reproductive material (voluntary/official)** | Plants come from within an approved propagation scheme and are certified pest free (level of infestation) following testing; used to mitigate against pests that are included in a certification scheme | Entry/spread |
3.6.1.3. Biological or technical factors limiting the effectiveness of measures

Eggs may not be easily detectable as they are laid individually in a superficial envelope formed by the tissue of either leaves or fruits.

3.7. Uncertainty

The main source of uncertainty regards the magnitude of potential impact within the EU. No reports of damage are up to now known from Portugal where it was first recorded in Europe in 2012, despite the fact that Algarve, where the species was first detected, is the Portuguese region where avocados and citrus are mostly grown. Likewise, no evidence of impact has been reported in Spain; however, there the insect was only recently reported (2020).

4. Conclusions

Except for having uncertain economic or environmental impacts as a result of its introduction, *P. bella* satisfies all the other criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union QP without any major uncertainties (Table 12).

To date, *P. bella* has not been reported as causing economic damage in Algarve (Portugal). There is also a lack of evidence that *P. bella* is harmful to crops in Israel where it was first reported in 1974. This creates uncertainty as to the magnitude of potential impact that *P. bella* could cause in citrus and avocado crops in the EU.

Table 12: 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 the species is established and *Penthimiola bella* (Stål) is the accepted name. Morphological identification methods are available. | None |
| Absence/presence of the pest in the EU (Section 3.2) | *P. bella* is present in Portugal and Spain. | None |
| Pest potential for entry, establishment and spread in the EU (Section 3.4) | *P. bella* is able to further enter, become established and spread within the EU territory, especially in the southern EU MSs. The main pathways are citrus fruits and plants for planting. | None |
| Criterion of pest categorisation | Panel’s conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest | Key uncertainties |
|---------------------------------|-------------------------------------------------|------------------|
| Potential for consequences in the EU (Section 3.5) | Uncertain. There is conflicting information regarding the effects of introduction when *P. bella* has spread internationally. There are reports of damage from South Africa but not from Israel, Lebanon, Portugal or Spain. | No damage has been reported from Portugal where it was first recorded in 2012. |
| Available measures (Section 3.6) | There are measures available to prevent further entry, establishment and spread of *P. bella* within the EU. Risk reduction options include inspections, chemical and physical treatments on consignments of fresh plant material from infested countries and the production of plants for import in the EU in pest-free area. | None |
| Conclusion (Section 4) | Except for having uncertain economic or environmental impacts as a result of its introduction, *P. bella* satisfies all the other criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union OP. | |
| Aspects of assessment to focus on/scenarios to address in future if appropriate | It would be useful to clarify the economic impact of *P. bella* as well as its capacity to transmit phytopathogens | |

### References

Annecke DP, 1964. The Encyrtid and Aphelinid Parasites (Hymenoptera: Chalcidoidea) of Soft Brown Scale, *Coccus hesperidum* Linnaeus (Hemiptera: Coccidae) in South Africa. Department of Agricultural Technical Services, South Africa.

Annecke DP, 1965. A new species of *Centrodora* Foerster (Hymenoptera: Aphelinidae) parasitic in the eggs of a cicadellid injurious to citrus in South Africa. South African Journal of Agricultural Science, 8(4), 1133–1138.

Bedford ECG, Van den Berg MA and De Villiers EA, 1998. Citrus pests in the Republic of South Africa, 2.

Baker RHA, 2002. Predicting 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.

Bale JS, 1991. Insects at low temperature: a predictable relationship? Functional Ecology, 5(2), 291–298.

Begemann GJ and Schoeman AS, 2000. The citrus leafhopper, *Penthimiola bella* Stål (Homoptera: Cicadellidae) in central Northern Province orchards. Deciduous Fruit Grower, 50(1), S1–S6 (abst.). https://www.cabdirect.org/cababstract/abstract/20001113037

Bruwer IJ, 1996. Die Hemiptera-plaagkompleks op avokados in die Kiepersolgebied. South African Avocado Growers’ Association Yearbook, 19, 33–35.

Du Toit WJ, Steyn WP and De Beer MS, 1993. Occurrence of protrusions on avocado fruit and the causative agent. South African Avocado Growers’ Association Yearbook, 16, 100–102.

Du Preez FMAS and Dennill GB, 1996. An ecological study of the damage done to avocado fruits by citrus leafhopper *Penthimiola bella* Stål (Cicadellidae) and coconut bug *Pseudotheraptus wayi* (Coreidae) in South Africa. International Journal of Pest Management, 42(2), 107–112.

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, Saffert M, Kertesz V, Kozelska S, Mannino MR, Mosbach-Schulz O, Pautasso M, Stancanelli G, Tramontini S, Vas S and Gioli 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 PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques M-A, Jaques Miret JA, Justesen AF, MacLeod AF, Magunsson CS, Milanos P, Navas-Cortes JA, Parnell S, Potting R, Reinaugt PL, Thulke H-H, Van der Werf W, Civera AV, Zappala L, Gomez P, Lucchi U, Urek G, Tramontini S, Mosbach-Schulz O, de la Pena E and Yuen J, 2021. Scientific Opinion on the commodity risk assessment of *Persea americana* from Israel. EFSA Journal 2021;19(2):6354, 195 pp. https://doi.org/10.2903/j.efsa.2021.6354

EFSA Scientific Committee, Hardy A, Benford D, Halldorsson T, Jeger M3, Knutsen HK, More S, Naegeli H, Noteborn H, Ockleford C, Ricci A, Rychen G, Schlatter JR, Silano V, Solecki R, Turk D, Benfenati E, Chaudhry QM, Craig P, Frampton G, Greiner M, Hart A, Hogstrønad C, Lambre C, Luttik R, Makowski D, Siani A, Wahlstroem H, Aguiler J, Dorne J-L, Fernandez Dumont A, Hempen M, Valtuena Martinez 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
Penthimiola bella: Pest categorisation

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: 9 July 2022].

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/

Garcia-Mari F, 2012. Citrus Pests: Integrated Pest Management in Mediterranean Countries. Phytoma España, Valencia, Spain (in Spanish).

Garcia-Mari F and Ferragut Pérez F, 2020. Las Plagas Agrícolas. Phytoma, Valencia, Spain, 496 pp.

Ghauri MSK, 1983. A case of long-distance dispersal of a leafhopper. In: Knight WJ, Pant NC, Robertson TS and Wilson MR (eds.). Proceedings of the 1st International Workshop on Leafhoppers and Planthoppers of Economic Importance. CIE, London, pp. 249–255.

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

Honiball F, 1998. Leafhoppers on citrus. In: Bedford EGG, van den Berg MA and de Villiers EA (eds.). Citrus Pests in the Republic of South Africa. 2nd Edition, Institute for Tropical and Subtropical Crops (ARC-LNR), Nelspruit, South Africa. pp. 87–91.

Jacas J, Karanaouina F, Vercher R and Zappaia L, 2010. Citrus pest management in the Northern Mediterranean basin (Spain, Italy and Greece). In: Ciancio A and Mukerji KG (eds.). Integrated Management of Arthropod Pests and Insect Borne Diseases. Springer, Dordrecht. pp. 3–26. ISBN: 978-90-481-2463-3.

Kottek M, Grieser J, Beck C, Rudolf B and Rubel F, 2006. World map of the Köppen–Geiger climate classification updated. Meteorologische Zeitschrift, 15, 259–263. https://doi.org/10.1127/0941-2948/2006/0130

Liebhold AM and Tobin PC, 2008. Population ecology of insect invasions and their management. Annual Review of Entomology, 53, 387–408.

Lindberg H, 1958. Hemiptera insularum caboverdensium. Systematik, ökologie und Kapverdischen Inseln. Ergebnisse der zoologischen expedition von Professor Hakan Lindberg nach den Kapverde-Inseln im winter 1953–1954, Nr. 22. Commentationes Biologicae Societas Scientiarum Fennica, 19(1), 1–246.

Linnauvori R, 1977. Revision of Ethiopian Cicadellidae (Hemiptera-Homoptera): Penthimiae. Etudes du Continent Africain (Belgium). No. 4.

Medler J, 1980. Insects of Nigeria-Check List and Bibliography Memoirs of the American Entomological Institute. Department of Entomology, Wisconsin University, Madison, USA.

Mifsud D, Cocquerpont C, Mühlenthaler R, Wilson R and Streito JC, 2010. Other Hemiptera Sternorrhyncha (Aleyrodidae, Phyloxeroidae, and Psylloidea) and Hemiptera Auchenorrhyncha. Chapter 9.4. In: Roques A, Kenis M, Lees D, Lopez-Vaamonde C, Rabitsch W, Rasplus JY and Roy DB (eds.). Alien Terrestrial Arthropods of Europe. Volume 4, BioRisk. pp. 511–552. https://doi.org/10.3897/biorisk.4.63

Prinsloo GL, 1986. Chaetomymar gracile Sp. N. and C. lepidum [Hymenoptera: Mymaridae]: Egg parasitoids of a cicadellid injurious to Citrus in South Africa. Entomopha, 31(4), 347–350.

Raccah B and Bar-Joseph M, 1975. New citrus pest in Israel: the leafhopper, Penthimia bella. Hassadeh, 55, 937–939.

Sayers EW, Cavanaugh M, Clark K, Pruitt KD and Karsch-Mizrachi I, 2020. Genbank. Nucleic Acids Research, 48. Database issue. https://doi.org/10.1093/nar/gkz956

Smart MC and Benyahia H, 2018. Alerte ! Nouvelle cicadelle Penthimia bella sur l’avocatier au Maroc. Agriculture du Maghreb, 115, 85–87.

Suffert M, Wilstermann A, Petter F, Schrader G and Grosset F, 2018. Identification of new pests likely to be introduced into Europe with the fruit trade. EPPO Bulletin, 48(1), 144–154.

Toy SJ and New ES, 1988. EPPO codes: a brief description. Available online: https://gd.eppo.int/C19

Zahniser JN, 2022. An online interactive key and searchable database of Deltocephalinae (Hemiptera: Cicadellidae). Available online: http://zahniser.speciesfile.org/ [Accessed: 31 August 2022].

Zina V, Borges da Silva E, Quartau JA and Franco JC, 2013. First report of the citrus leafhopper Penthimia bella (Stål) (Hemiptera, Cicadellidae) in Europe. Phytoparasitica, 41(5), 521–527.
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
PZ Protected Zone
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.
Hitchhiker An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy and Newfield, 2010).
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 – *Penthimiola bella* host plants/species affected

Source: EPPO Global Database (EPPO, online)

| Host status         | Host name         | Plant family | Common name |
|---------------------|-------------------|--------------|-------------|
| Cultivated hosts    | *Citrus paradisi* | Rutaceae     | Grapefruit  |
|                     | *Citrus sinensis* | Rutaceae     | Sweet orange|
|                     | *Persea americana*| Lauraceae    | Avocado     |
Appendix B – Distribution of *Penthimiola bella*

Distribution records based on EPPO Global Database (EPPO, online) plus additional records.

| Region                | Country                          | Status                                  |
|-----------------------|----------------------------------|-----------------------------------------|
| Africa                | Burkina Faso                     | Present, no details                     |
|                       | Cameroon                         | Present, no details                     |
|                       | Cape Verde                       | Present, no details                     |
|                       | Central African Republic         | Present, no details                     |
|                       | Congo, Democratic republic of the| Present, no details                     |
|                       | Cote d’Ivoire                    | Present, no details                     |
|                       | Liberia                          | Present, no details                     |
|                       | Madagascar                       | Present, no details                     |
|                       | Morocco                          | Present, restricted distribution        |
|                       | Nigeria                          | Present, no details                     |
|                       | South Africa                     | Present, no details                     |
|                       | Sudan                            | Present, no details                     |
|                       | Uganda                           | Present, no details                     |
| South America         | Argentina                        | Absent, unreliable record               |
| Asia                  | Israel                           | Present, no details                     |
|                       | Lebanon                          | Present, no details                     |
| EU (27)               | Portugal                         | Present, restricted distribution        |
|                       | Spain*                           | Present                                 |

*: [https://observation.org/species/998838/observations/](https://observation.org/species/998838/observations/), [https://www.biodiversidadvirtual.org/insectarium/Penthimiola-bella-](https://www.biodiversidadvirtual.org/insectarium/Penthimiola-bella-)*