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SCIENTIFIC OPINION

Scientific Opinion on the pest categorisation of *Rhagoletis cingulata* (Loew)[1]

EFSA Panel on Plant Health (PLH)[2,3]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

The Panel on Plant Health undertook a pest categorisation of *Rhagoletis cingulata* for the European Union (EU). This pest is a member of a complex of five North American species, of which *Rhagoletis indifferens* is the only other crop pest. The two pest species have morphologically distinct adults, but similar larvae and both attack cherries. *R. cingulata* is currently present in eight Member States but its presence in eastern North America from Mexico to Canada implies that all the risk assessment area where its hosts occur is suitable for establishment. Adults have a limited capacity for flight, and spread is mainly by larvae present in traded fruit and pupae in soil. *R. cingulata* attacks all cultivated and wild cherries but is particularly damaging to late-maturing varieties, especially sour cherries. Even small infestations can cause losses because the quality requirements for marketing of cherry fruits indicate a threshold below 4 % for "worm-eaten" fruit in accordance with Commission Regulation 214/2004. The limited control measures available are similar to those for the native cherry fruit fly, *R. cerasi*, and are primarily based on insecticide sprays timed to kill adults, along with some cultural methods (e.g. netting and trapping). *R. cingulata* is listed in Annex IAI of Council Directive 2000/29/EC and its hosts are regulated in Annex IIIA with prohibitions for introduction in the Member States, in Annex IVAI with special requirements on soil and dwarfed plants that need to be considered and in Annex V indicating that host plants intended for planting are subject to plant health inspection before entry or movement within the EU.

KEY WORDS

cherry fruit fly, mouche des cerises, *Prunus* spp., quarantine pest, regulated non-quarantine pest, *Rhagoletis cingulata* complex

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1 On request from the European Commission, Question No EFSA-Q-2014-00272, adopted on 24 September 2014.
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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p. 1).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union, the list of harmful organisms whose introduction into or spread within the Union is prohibited and the control measures to be carried out at the outer border of the Union on arrival of plants and plant products.

The Commission is currently carrying out a revision of the regulatory status of organisms listed in the Annexes of Directive 2000/29/EC. This revision targets mainly organisms which are already locally present in the EU territory and that in many cases are regulated in the EU since a long time. Therefore it is considered to be appropriate to evaluate whether these organisms still deserve to remain regulated under Council Directive 2000/29/EC, or whether, if appropriate, they should be regulated in the context of the marketing of plant propagation material, or be deregulated. The revision of the regulatory status of these organisms is also in line with the outcome of the recent evaluation of the EU Plant Health Regime, which called for a modernisation of the system through more focus on prevention and better risk targeting (prioritisation).

In order to carry out this evaluation, a recent pest risk analysis is needed which takes into account the latest scientific and technical knowledge on these organisms, including data on their agronomic and environmental impact, as well as their present distribution in the EU territory. In this context, EFSA has already been asked to prepare risk assessments for some organisms listed in Annex IIAII. The current request concerns 23 additional organisms listed in Annex II, Part A, Section II as well as five organisms listed in Annex I, Part A, Section I, one listed in Annex I, Part A, Section II and nine organisms listed in Annex II, Part A, Section I of Council Directive 2000/29/EC. The organisms in question are the following:

Organisms listed in Annex II, Part A, Section II:

- *Ditylenchus destructor* Thorne
- *Circulifer haematoceps*
- *Circulifer tenellus*
- *Helicoverpa armigera* (Hübner)
- *Radopholus similis* (Cobb) Thorne (could be addressed together with the IIAI organism *Radopholus citrophilus* Huettel Dickson and Kaplan)
- *Paysandisia archon* (Burmeister)
- *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis et al.
- *Erwinia amylovora* (Burr.) Winsl. et al. (also listed in Annex IIB)
- *Pseudomonas syringae* pv. *persicae* (Prunier et al.) Young et al.
- *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye
- *Xanthomonas campestris* pv. *pruni* (Smith) Dye
- *Xylophilus ampelinus* (Panagopoulos) Willems et al.
- *Ceratocystis fimbriata* f. sp. *platani* Walter (also listed in Annex IIB)
- *Cryphonectria parasitica* (Murrill) Barr (also listed in Annex IIB)
- *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili
- *Verticillium albo-atrum* Reinke and Berthold
- *Verticillium dahliae* Klebahn
- Beet leaf curl virus
- Citrus tristeza virus (European isolates) (also listed in Annex IIB)
- Grapevine flavescence dorée MLO (also listed in Annex IIB)

- Potato stolbur mycoplasma
- *Spiroplasma citri* Saglio et al.
- Tomato yellow leaf curl virus

Organisms listed in Annex I, Part A, Section I:

- *Rhagoletis cingulata* (Loew)
- *Rhagoletis ribicola* Doane
- Strawberry vein banding virus
- Strawberry latent C virus
- Elm phloem necrosis mycoplasm

Organisms listed in Annex I, Part A, Section II:

- *Spodoptera littoralis* (Boisd.)

Organisms listed in Annex II, Part A, Section I:

- *Aculops fuchsiae* Keifer
- *Aonidiella citrina* Coquillet
- Prunus necrotic ringspot virus
- Cherry leafroll virus
- *Radopholus citrophilus* Huettel Dickson and Kaplan (could be addressed together with IIAII organism *Radopholus similis* (Cobb) Thorne
- *Scirtothrips dorsalis* Hendel
- *Atropellis* spp.
- *Eotetranychus lewisi* McGregor
- *Diaporthe vaccinii* Shaer.

TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a pest risk assessment of *Ditylenchus destructor* Thorne, *Circulifer haematoceps, Circulifer tenellus, Helicoverpa armigera* (Hübner), *Radopholus similis* (Cobb) Thorne , *Paysandisia archon* (Burmeister), *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis et al., *Erwinia amylovora* (Burr.) Winsl. et al., *Pseudomonas syringae pv. persicae* (Prunier et al.) Young et al. *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye, *Xanthomonas campestris* pv. *pruni* (Smith) Dye, *Xylophilus ampelinus* (Panagopoulos) Willems et al., *Ceratocystis fimbriata* f. sp. *platani* Walter, *Cryphonectria parasitica* (Murrill) Barr, *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili, *Verticillium alboatrum* Reinke and Berthold, *Verticillium dahliae* Klebahn, Beet leaf curl virus, Citrus tristeza virus (European isolates), Grapevine flavescence dorée MLO, Potato stolbur mycoplasma, *Spiroplasma citri* Saglio et al., Tomato yellow leaf curl virus, *Rhagoletis cingulata* (Loew), *Rhagoletis ribicola* Doane, Strawberry vein banding virus, Strawberry latent C virus, Elm phloem necrosis mycoplasma, *Spodoptera littoralis* (Boisd.), *Aculops fuchsiae* Keifer, *Aonidiella citrina* Coquillet, Prunus necrotic ringspot virus, Cherry leafroll virus, *Radopholus citrophilus* Huettel Dickson and Kaplan (to address with the IIAII *Radopholus similis* (Cobb) Thorne), *Scirtothrips dorsalis* Hendel, *Atropellis* spp., *Eotetranychus lewisi* McGregor and *Diaporthe vaccinii* Shaer., for the EU territory.

In line with the experience gained with the previous two batches of pest risk assessments of organisms listed in Annex II, Part A, Section II, requested to EFSA, and in order to further streamline the preparation of risk assessments for regulated pests, the work should be split in two stages, each with a specific output. EFSA is requested to prepare and deliver first a pest categorisation for each of these 38 regulated pests (step 1). Upon receipt and analysis of this output, the Commission will inform EFSA for which organisms it is necessary to complete the pest risk assessment, to identify risk reduction options and to provide an assessment of the effectiveness of current EU phytosanitary requirements (step 2). *Clavibacter michiganensis* spp. *michiganensis* (Smith) Davis et al. and

Xanthomonas campestris pv. *vesicatoria* (Doidge) Dye, from the second batch of risk assessment requests for Annex IIAII organisms requested to EFSA (ARES(2012)880155), could be used as pilot cases for this approach, given that the working group for the preparation of their pest risk assessments has been constituted and it is currently dealing with the step 1 "pest categorisation". This proposed modification of previous request would allow a rapid delivery by EFSA by May 2014 of the first two outputs for step 1 "pest categorisation", that could be used as pilot case for this request and obtain a prompt feedback on its fitness for purpose from the risk manager's point of view.

As indicated in previous requests of risk assessments for regulated pests, in order to target its level of detail to the needs of the risk manager, and thereby to rationalise the resources used for their preparation and to speed up their delivery, for the preparation of the pest categorisations EFSA is requested, in order to define the potential for establishment, spread and impact in the risk assessment area, to concentrate in particular on the analysis of the present distribution of the organism in comparison with the distribution of the main hosts and on the analysis of the observed impacts of the organism in the risk assessment area.

ASSESSMENT

1. Introduction

1.1. Purpose

This document presents a pest categorisation prepared by the EFSA Scientific Panel on Plant Health (hereinafter referred to as the Panel) for the species *Rhagoletis cingulata* (Loew) in response to a request from the European Commission.

1.2. Scope

This pest categorisation is for *Rhagoletis cingulata* (Loew).

The risk assessment area for *R. cingulata* is the territory of the European Union (hereinafter referred to as the EU) with 28 Member States (hereinafter referred to as MSs), restricted to the area of application of Council Directive 2000/29/EC,.

2. Methodology and data

2.1. Methodology

The Panel performed the pest categorisation for *R. cingulata* following guiding principles and steps presented in the EFSA Guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standards for Phytosanitary Measures (ISPM) No 11 (FAO, 2013) and ISPM No 21 (FAO, 2004).

In accordance with the Guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work is initiated as result of the review or revision of phytosanitary policies and priorities. As explained in the background of the European Commission request, the objective of this mandate is to provide updated scientific advice to the European risk managers for their evaluation of whether these organisms listed in the Annexes of the Directive 2000/29/EC still deserve to remain regulated under Council Directive 2000/29/EC, or whether they should be regulated in the context of the marketing of plant propagation material, or be deregulated. Therefore, to facilitate the decision making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for quarantine pest according to ISPM 11 (FAO, 2013) but also for regulated non-quarantine pest according to ISPM 21 (FAO, 2004) and includes additional information required as per the specific terms of reference received by the European Commission. In addition, for each conclusion the Panel provides a short description of its associated uncertainty.

Table 1 presents the ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria against which the Panel provides its conclusions. It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation[4]), therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, in agreement with the Guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

[4] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. Official Journal of the European Communities L 31/1, 1.2.2002, p. 1–24.

Table 1: International Standards for Phytosanitary Measures ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria under evaluation

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest
Identity of the pest	The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible	The identity of the pest is clearly defined
Presence (ISPM 11) or absence (ISPM 21) in the PRA area	The pest should be **absent from all or a defined part of the PRA area**	The pest is **present** in the PRA area
Regulatory status	If the pest is present but not widely distributed in the PRA area, it should be under official control or expected to be under official control in the near future	The pest is under official control (or being considered for official control) in the PRA area with respect to the specified plants for planting
Potential for establishment and spread in the PRA area	The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest and, where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area	–
Association of the pest with the plants for planting and the effect on their intended use	–	Plants for planting are a pathway for introduction and spread of this pest
Potential for consequences (including environmental consequences) in the PRA area	There should be clear indications that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area	–
Indication of impact(s) of the pest on the intended use of the plants for planting	–	The pest may cause severe economic impact on the intended use of the plants for planting
Conclusion	If it has been determined that the pest has the potential to be a quarantine pest, the PRA process should continue. If a pest does not fulfil all of the criteria for a quarantine pest, the PRA process for that pest may stop. In the absence of sufficient information, the uncertainties should be identified and the PRA process should continue	If a pest does not fulfil all the criteria for a regulated non-quarantine pest, the PRA process may stop

In addition, in order to reply to the specific questions listed in the terms of reference, three issues are specifically discussed only for pests already present in the EU: the analysis of the present EU distribution of the organism in comparison with the EU distribution of the main hosts; the analysis of the observed impacts of the organism in the EU; and the pest control and cultural measures currently implemented in the EU.

The Panel will not indicate in its conclusions of the pest categorisation whether to continue the risk assessment process as it is clearly stated in the terms of reference that at the end the pest categorisation the European Commission will indicate if further risk assessment work is required following their analysis of the Panel's scientific opinion.

2.2. Data

2.2.1. Literature search

A literature search on *R. cingulata* was conducted at the beginning of the mandate. The search was conducted for the synonyms of the scientific name of the pest together with the most frequently used common names on the ISI Web of Knowledge database, and CAB Abstracts, and web-based search engines such as Google Scholar. Further references and information were obtained from experts, from citations within the references and from grey literature. The datasheet on *R. cingulata* provided by the PERSEUS project (PERSEUS, in preparation) was also used as a source of references.

2.2.2. Data collection

To complement the information concerning the current situation of the pest provided by the literature and online databases on pest distribution, damage and management, the PLH Panel sent a short questionnaire on the current situation at country level, based on the information available in the European and Mediterranean Plant Protection Organization (EPPO) Plant Quarantine Retrieval (PQR) system, to the National Plant Protection Organisation (NPPO) contacts of the 28 EU Member States, and of Iceland and Norway. Iceland and Norway are part of the European Free Trade Association (EFTA) and are contributing to EFSA data collection activities, as part of the agreements EFSA has with these two countries. A summary of the pest status based on EPPO PQR and NPPO replies is presented in Table 2.

In its analyses the Panel also considered the Pest Risk Analysis prepared by the UK Food and Environment Research Agency in 2011 (FERA, 2011).

3. Pest categorisation

3.1. Identity and biology of *Rhagoletis cingulata*

3.1.1. Taxonomy

Rhagoletis cingulata is a complex of five species (Bush, 1966), of which two are important cherry pests (*R. cingulata* and *R. indifferens*) and two attack wild species of Oleaceae: *R. osmanthi* Bush and *R. chionanthi* Bush (Bush, 1969; White and Elson-Harris, 1992; Smith and Bush, 1997, 2000). Within *Rhagoletis,* Jukes–Cantor distances for the species in the complex were 0.000 (i.e. no differences were found in the pairwise COII sequence comparisons of these four species; Smith and Bush (1997)). The other species is *R. turpiniae* Hernández-Ortiz, which is, according to Smith and Bush (2000), part of the *cingulata* group and has only recently been described (Hernández-Ortiz, 1993; Aluja et al., 2001). This species is found in temperate cloud and tropical evergreen rainforests in Mexico.

According to Bush (1966, 1969), *R. cingulata* and *R. indifferens* are allopatrically isolated from one another in the eastern and western parts of North America, respectively. However, there is a small area of overlap (see section 3.2.1). While *R. indifferens* can readily be distinguished morphologically from the other three species (*R. cingulata*, *R. osmanthi* and *R. chionanthi*, which are sympatric in the south-east of North America), these three species are very similar morphologically but infest different host plants.

Synonyms: *Trypeta* (*Rhagoletis*) *cingulata* Loew and *Trypeta cingulata* Loew.

Most applied common names: Cherry fruit fly, cherry maggot, eastern cherry fruit fly, white-banded cherry fruit fly, mouche des cerises and trypète des cerises.

Taxonomic position:

- Domain: Eukaryota
  - Kingdom: Metazoa
    - Phylum: Arthropoda
      - Subphylum: Uniramia
        - Class: Insecta
          - Order: Diptera
            - Family: Tephritidae
              - Genus: *Rhagoletis*
                - Species: *Rhagoletis cingulata*

3.1.2. Biology of *Rhagoletis cingulata*

R. cingulata is native to eastern North America: from southern Ontario to northern Florida and west to Iowa (Bush, 1966).

The life cycle of *R. cingulata* comprises the stages: egg, larva, pupa and adult. It is primarily univoltine (Bush, 1966). Most of the *Rhagoletis* species have a similar biology. Eggs are laid separately below the skin of the cherries through slits made by the females. According to Frick et al. (1954), the duration of preoviposition, oviposition, fecundity and adult survival of *R. cingulata* depends on fruit maturity and temperature. For example, the average number of eggs deposited was 386 at 27 °C and 17 at 15.6 °C. At 25 °C, *R. cingulata* passed through three larval stages in about 11 days and hatched in six days. Pupation, the overwintering stage, occurs in the soil under the host plant. If a cover crop is present in the orchard, the emergence is delayed because of the lower soil temperatures. Adults are capable of emerging in loose sandy soil in tubes from a depth of ca. 90 cm. Peaks of emergence were recorded usually one to three days after peaks in daily mean temperature (Frick et al., 1954; Egartner et al., 2010). In Pennsylvania, adults emerge in June (Jubb and Cox, 1974), whereas in the Yakima Valley, Washington, they emerge from the third week of May to mid-July (Frick et al., 1954). Adults may live for up to 40 days under field conditions (CABI, 2014a) with a maximum survival rate observed by Frick et al. (1954) at 16 °C and 100 % mortality in five days at 38 °C.

3.1.3. Intraspecific diversity

Recent results obtained by Smith et al. (2014) on host-related genetic differences among *R. cingulata* populations do not support the existence of host-associated races. The authors suggest that for pest management purposes these flies should be considered as a single population.

3.1.4. Detection and identification of *Rhagoletis cingulata*

White and Elson-Harris (1992) give a detailed morphological description of the larvae and adults. Drosopoulou et al. (2011) conducted a genetic analysis of the salivary gland polytene chromosomes of *R. cingulata* and provided the mitotic karyotype and detailed photographic maps. The genus can be identified by the antennal sensory organ. According to the authors, any *Rhagoletis* larvae found in cherry and having at least 21 tubules in each anterior spiracle is likely to be *R. cingulata*. An updated description of the larva of *R. cingulata* can be found in Carroll et al. (2006a).

The characteristic features of adults of the *R. cingulata* species complex are a predominantly black thorax and abdomen and a scutellum with a black base. The apical band of the wing is forked, or an upper arm of the fork is separated by a clear area, leaving an isolated dark spot at the wing tip. The fore coxa of *R. cingulata* are usually yellow whereas those of *R. indifferens* are shaded black on the posterior surface, and the anterior apical crossband on the wing is rarely reduced to an isolated spot (CABI, 2014a). In the case of identification after interception, the origin of the consignments can be helpful information, especially if only larvae are found, since *R. cingulata* occurs in eastern North America and *R. indifferens* in western North America, with only a small area of origin in common (section 3.2.1). An updated description of the adult of *R. cingulata* can be found in Carroll et al. (2006b).

On attacked fruit, oviposition holes are visible, usually surrounded by some discoloration. More distinct symptoms are seen only when the maggot is nearly fully grown when sunken spots appear. Symptoms on fruits are: discoloration, extensive mould, gummosis, internal feeding, lesions (black or brown scab or pitting), obvious exit holes, odour and ooze. Subsequent to infestation, secondary infestations by fungi can develop. The third larval instar bores up to three holes, about 1 mm in diameter, into the skin of the cherry before emerging from the fruit in order to pupate in the soil (Frick et al., 1954; CABI, 2014a).

Many studies have been conducted on different trap types. Yellow panels are generally effective for trapping *R. cingulata* (Reissig, 1976). Folded into a 45 ° angle with the adhesive outside they were found to be as effective as a standard vertical flat rectangle but significantly more selective. Spheres baited with a 50 % ammonium acetate solution were attractive to *R. cingulata*. Baited panels were more effective than unbaited panels for *R. cingulata*. Prokopy (1977) found that more captures were obtained with sticky-coated red spheres of 7.5 cm in diameter than with spheres of other dimensions. In addition, the vertical position of the traps influences their efficiency, with the maximum results obtained at the highest positions, i.e. 4.6 m in the trial conducted by Pelz-Stelinski et al. (2006). In a study by Liburd et al. (2001), the unbaited Rebell trap was the most effective and selective. In Germany, the first record of *R. cingulata* was obtained with a Malaise trap (Merz and Niehuis, 2001), but significantly more flies were captured on unbaited Pherocon AM traps hung at 4.6 m in the canopy of cherry trees than on traps posted at a lower height (Pelz-Stelinski et al., 2006).

Concerning detection and identification at the place of production, as mentioned in section 3.4.2, *R. cingulata* has the same host species as *R. cerasi*, which is phylogenetically distant and belongs to a different species group, but is native to Europe (Schuler et al., 2013). Therefore, unless care is taken in identifying the fruit flies attacking European cherry crops, outbreaks of *R. cingulata* may be overlooked.

3.2. Current distribution of *Rhagoletis cingulata*

3.2.1. Global distribution

R. cingulata is native to north-eastern America (CABI, 2014a).

In Canada, *R. cingulata* is present in Nova Scotia, Ontario, Quebec and Saskatchewan, with an unconfirmed report from the Maritime province of New Brunswick (Bush, 1966; Harris, 1989; CABI/EPPO, 2009; EPPO, 2013; CABI, 2014a).

In the USA, the distribution of the pest is concentrated in the eastern states where it generally has a restricted distribution. It is reported in Arizona, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New Mexico, New York, Ohio, Pennsylvania, with unconfirmed reports from Alabama, Arkansas, North Carolina, South Carolina, Tennessee, Texas, Virginia and Wisconsin (Harris, 1989; Foote et al., 1993; CABI/EPPO, 2009; EPPO, 2013). Western records of this species were mostly based on misidentifications of *R. indifferens* (CABI, 2014a). There is a small overlap between the distribution of *R. cingulata* and *R. indifferens* in Arizona and New Mexico (Foote et al., 1993).

In Central America, the pest is present in Mexico with a restricted distribution (Foote, 1981; EPPO, 2013). There are no records from South America, Africa, Asia and Oceania, but *R. cingulata* is reported in many European countries (see section 3.2.2).

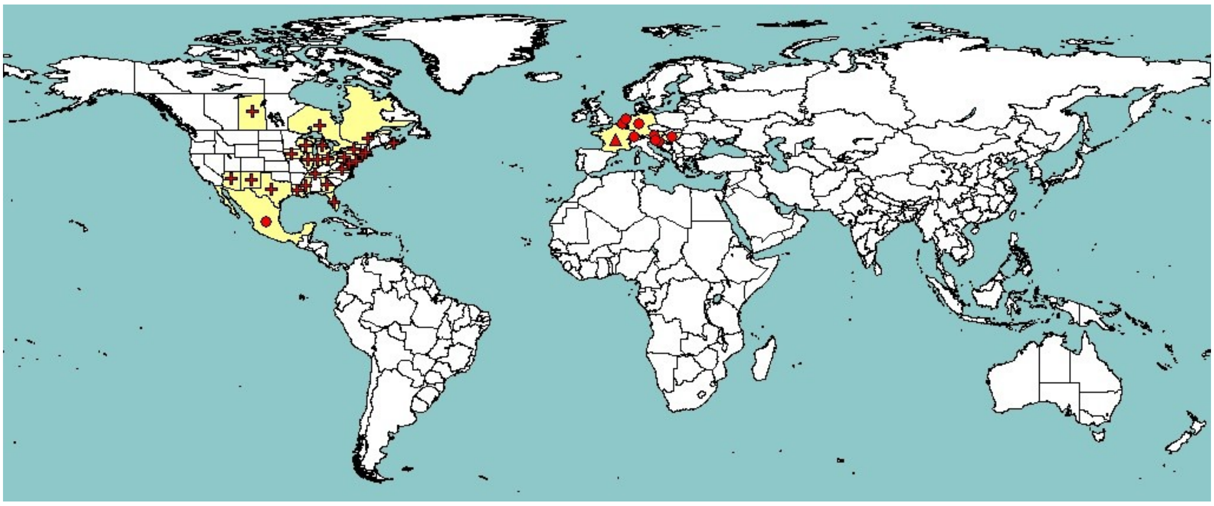


Figure 1: Global distribution of *Rhagoletis cingulata* (extracted from EPPO PQR, version 5.3.1, accessed on 22 July 2014). Red circles represent pest presence from national records, red crosses show pest presence from sub-national records and red triangles represent transient pest populations

3.2.2. Distribution in the EU

The pathway of introduction of *R. cingulata* into Europe from North America is unknown (FERA, 2011). The first findings were in Ticino, Switzerland, in 1983 (Boller and Mani, 1994; Mani et al., 1994). Initially reported as *R. indifferens*, it has since been identified as *R. cingulata*. Most pre-1966 literature does not make a distinction between *R. cingulata* and *R. indifferens* while the misidentification of individuals captured in Europe has led to some confusion regarding the distribution of the two species (Ali-Niazee, 1973; Lampe et al., 2005). For instance, in 2001, the occurrence of *R. indifferens* on naturalised *Prunus serotina* was published then later confirmed to be *R. cingulata*. There have been further findings in other European countries. The current distribution of *R. cingulata* in the risk assessment area, including Iceland and Norway, based on the answers received via email from the NPPOs, is reported in Table 2. The species is already present in eight MSs. Only a little information is available on the within-county distribution and the level of abundance reached in the different areas where the species is established.

In Germany, the first specimens were caught in 1999 in Rheinland-Pfalz. A few specimens were caught in 2003, but, since 2004, the number of insects caught in cherry-growing areas increased considerably and the species started to be found in other parts of the country. High abundance has been found in some regions.

In Belgium, the pest was first reported in 2004 (Baugnée, 2006). In 2013 a national survey was conducted for *Rhagoletis* flies (Fly Alert, SPF/FOD, 2013-2015), with 72 pheromone traps placed in commercial fruit production sites involved in fruit trade, non-commercial orchards, private gardens and natural areas. As a result, four adult specimens of *R. cingulata* were trapped: a male and a female, found in two natural areas in the province of Namur near wild *Prunus avium*, and two females, trapped in non-commercial orchards in Vlaams-Brabant and Liège (Fassotte et al., 2014, EPPO, 2014).

Table 2: Current distribution of *Rhagoletis cingulata* in the 28 EU Member States, Iceland and Norway, based on the answers received via email from the NPPOs or, in absence of reply, on information from EPPO PQR and other sources

Country	NPPO Answer	NPPO Comments	Other sources
Austria	Present, few occurrences		
Belgium	Present, few occurrences, not in production orchards	Findings in 2004 (Baugnée, 2006) A research project, Fly-Alert (2013-2015), is currently going on and has led to 4 observations in 2013 (partly reported by Fassotte et al., 2014). The survey will continue within the project.	EPPO, 2014
Bulgaria	Absent, confirmed by survey		
Croatia	Present only in some areas		
Cyprus	-		
Czech Republic	Absent, no record		
Denmark	Not known to occur		
Estonia	Absent, no pest records		
Finland	Absent, no pest records		
France	Transient, under eradication		
Germany	Present, restricted distribution		
Greece[(a)]	–		
Hungary	Present in all parts of the country		
Ireland	Absent, no pest record		
Italy	Never reported in Italy		Possible observations in northern Italy, misidentified as *R. indifferens*, in 1998 (Norrbom et al., 1999; Lampe et al. , 2005; EPPO, 2006)
Latvia[(a)]	–		
Lithuania[(a)]	–		
Luxembourg[(a)]	–		
Malta	Absent, no pest records		
Netherlands	Present, in *Prunus serotina*; incidental findings in *P. avium* confirmed by survey		
Poland	Present, restricted distribution	Detection of this organism has not been confirmed by SPHSIS (Central Laboratory of Polish Plant Health and Seed Inspection Service)	
Portugal	No records		
Romania[(a)]	–		
Slovak Republic	Absent, no pest record		
Slovenia	Present, only in some areas at low pest prevalence (eastern part)		
Spain	Absent		
Sweden	Absent, no pest record		
United Kingdom	Absent	Confirmed by general PHSI (Plant Health and Seeds Inspectorate) surveys, not a pest specific survey	
Iceland[(a)]	–		
Norway[(a)]	–		

(a): When no information was made available to EFSA, the pest status in the EPPO PQR (2012) was used.
–: No information available
EPPO PQR, European and Mediterranean Plant Protection Organization Plant Quarantine Data Retrieval System;
NPPO, National Plant Protection Organization.

3.3. Regulatory status of *Rhagoletis cingulata*

3.3.1. Council Directive 2000/29/EC

Rhagoletis cingulata:
This species is a regulated harmful organism in the EU and listed in Council Directive 2000/29/EC in Annex IAI as shown in Table 3.

Table 3: *Rhagoletis cingulata* in Annex IAI of Council Directive 2000/29/EC

Annex I, Part A—Harmful organisms whose introduction into, and spread within, all Member States shall be banned
Section I—Harmful organisms not known to occur in any part of the Community and relevant for the entire Community
(a) Insects, mites and nematodes, at all stages of their development
25. Tephritidae (non-European) such as: [...] (p) *Rhagoletis cingulata* (Loew)

Host plants of Rhagoletis cingulata
The host plants of *R. cingulata* are species of the genus *Prunus* (see section 3.4.1) and are regulated in the Annexes of Council Directive 2000/29/EC. *Prunus* species are addressed in Annex IIIA with prohibitions for introduction in the MSs. Special requirements are laid down in Annex IVAI concerning soil and dwarfed plants that could be relevant to *R. cingulata* host species. In addition, according to Annexes VAI and VBI, host plants intended for planting must be subject to a plant health inspection before entry or movement within the EU.

Regarding the marketing of fruits, the quality requirements for marketing of cherry fruits indicate a threshold below 4 % for "worm-eaten" fruit in accordance with Commission Regulation 214/2004[5].

3.3.2. Regulation on *Rhagoletis cingulata* outside the risk assessment area

Below, some examples of regulation outside the EU are mentioned.

In the NAPPO (North American Plant Protection Organization) countries, no national regulations exist for any fruit host of *R. cingulata* in Canada, USA or Mexico. However, in the USA, Idaho has a quarantine status for the "*Rhagoletis cingulata* complex" on cherry (except for cherries that are commercial fruit) (ISDA, 2013) and for all *Rhagoletis* species (FDACS, 2013; Yee et al., 2013).

Rhagoletis species are regulated on *Prunus cerasus* in the MERCOSUR (Mercado Común del Sur) countries of Argentina, Brazil, Paraguay and Uruguay by the MERCOSUR/GMC/RES 300/00[6].

3.4. Elements to assess the potential for establishment and spread in the EU

3.4.1. Host range

R. cingulata mainly attacks cherries (*Prunus* species). In the USA, the pest's distribution largely follows that of its most important wild native host, *P. serotina* (White and Elson-Harris, 1992; Foote et al., 1993; Teixeira et al., 2009; CABI, 2014a). *P. serotina* was first brought to Europe in the early 17th century. It was used as an ornamental plant in parks and gardens, and it was then tested for timber production in forestry with little success.

Major cultivated host plants of the pest are *P. avium* (sweet/wild cherry), *P. cerasus* (sour, pie or tart cherry) and *P. salicina* (Japanese plum) (Bush, 1966; CABI, 2014b). Some authors suggest that, of the

[5] Commission Regulation (EC) No 214/2004 of 6 February 2004 laying down the marketing standard for cherries. OJ L 36, 7.2.2004, p. 6.

[6] MERCOSUR/GMC/RES. No 30/00. Sub-estándar 3.7.42/00- "Requisitos fitosanitarios generales y específicos para *Prunus cerasus* (cerezo ácido o guindo, cereja ácida) según país de destino y origen, 4 pp.

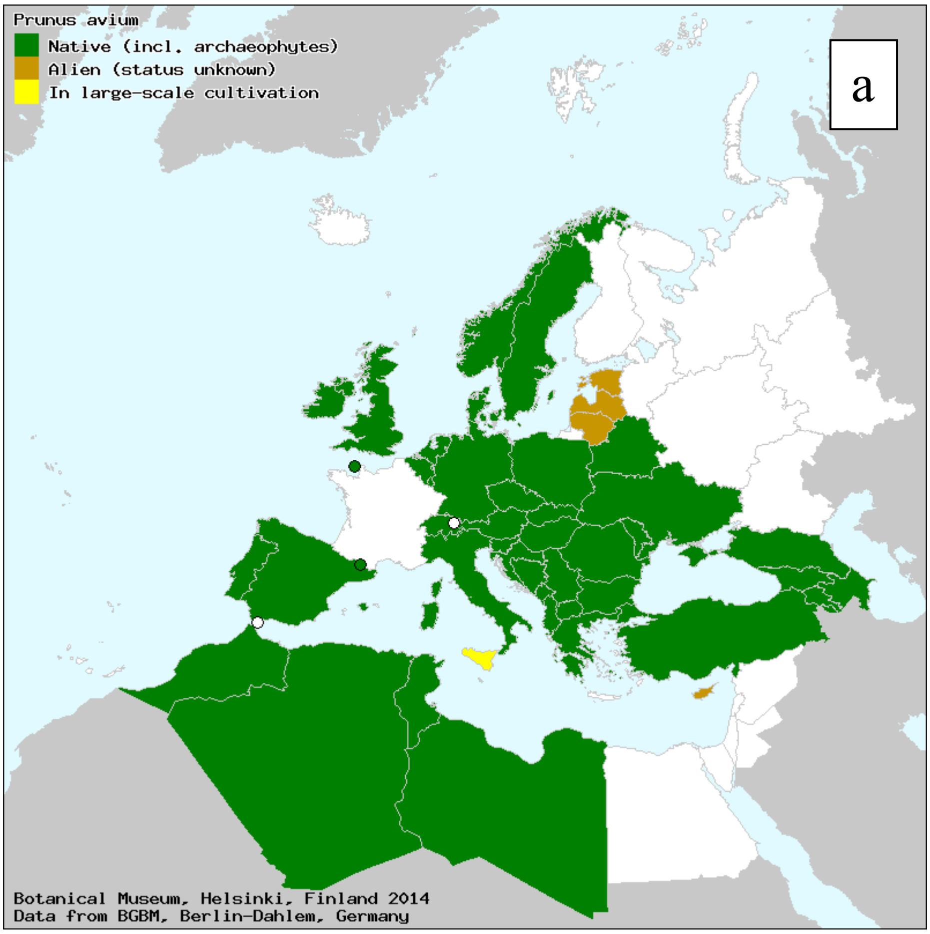
cultivated cherry species (sweet and sour), *P. cerasus*, the sour cherries, are particularly hard hit (Compton et al., 2005).

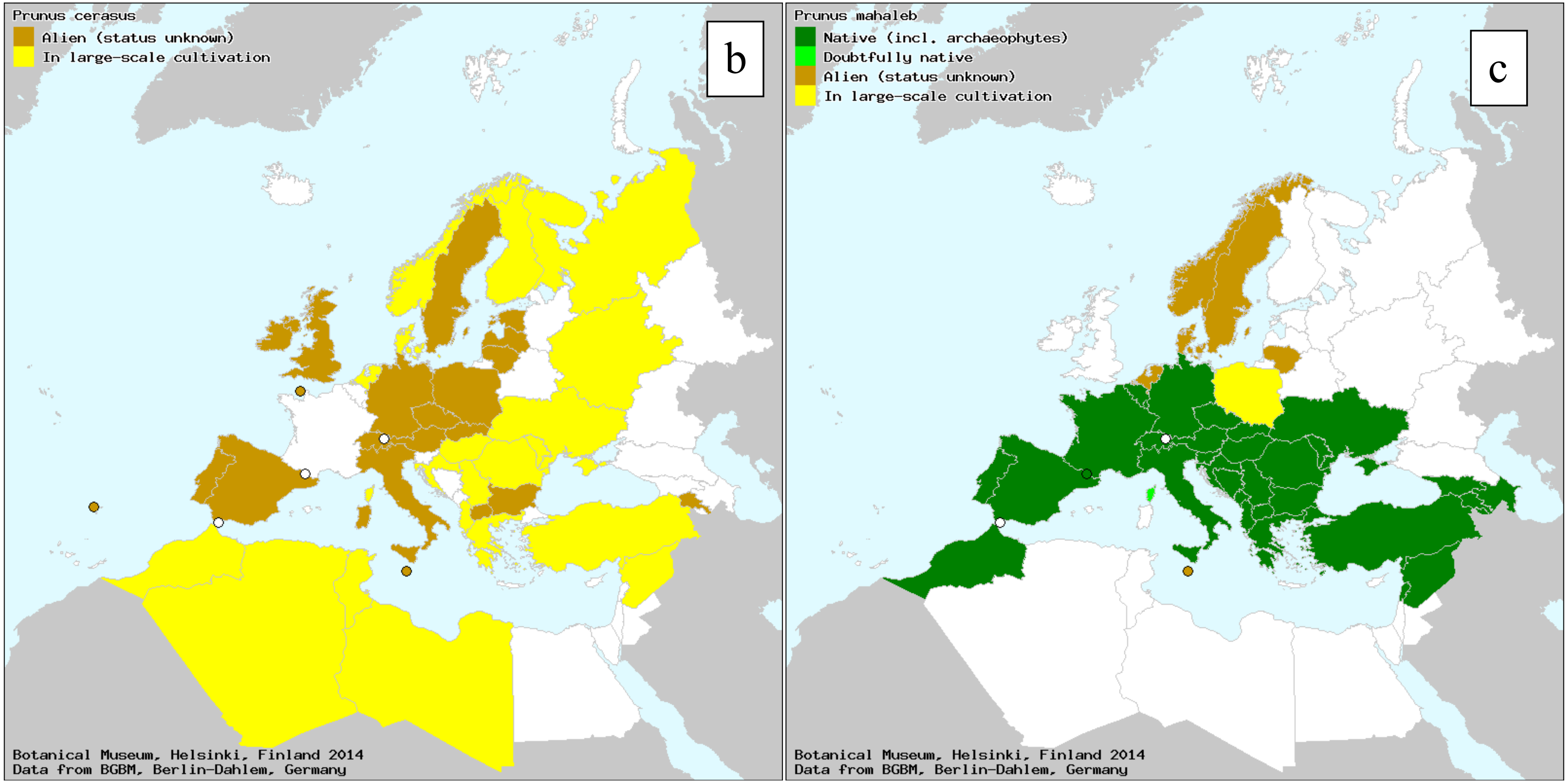
Minor hosts are reported to include *P. virginiana* (common choke cherry tree) and *P. mahaleb* (Mahaleb cherry). *R. cingulata* has also been occasionally observed on other *Prunus* species.

No published evidence was found showing that *R. cingulata* can attack *P. marginata*, the main host of *R. indifferens*.

3.4.2. EU distribution of main host plants

The most important wild host plant of *R. cingulata* is *P. serotina*, a species that is widespread and invasive in Europe (EPPO, 2005). In the risk assessment area, however, *R. cingulata* mainly infests sour cherries and wild sweet cherries, which are grown in most of the MSs for fruit production (Table 4). These two crop species are also hosts of the native European cherry fruit fly (*R. cerasi*) (Schuler et al., 2013) (section 3.1.4). The distribution of the cultivated host plants (ornamental and fruit trees) together with other *Prunus* species common in deciduous woodland and hedges guarantees a continuity in the distribution of the host plants across Europe (Figure 2).




Prunus cerasus
Alien (status unknown)
In large-scale cultivation
b
Botanical Museum, Helsinki, Finland 2014
Data from BGBM, Berlin-Dahlem, Germany
Prunus mahaleb
Native (incl. archaeophytes)
Doubtfully native
Alien (status unknown)
In large-scale cultivation
c
Botanical Museum, Helsinki, Finland 2014
Data from BGBM, Berlin-Dahlem, Germany

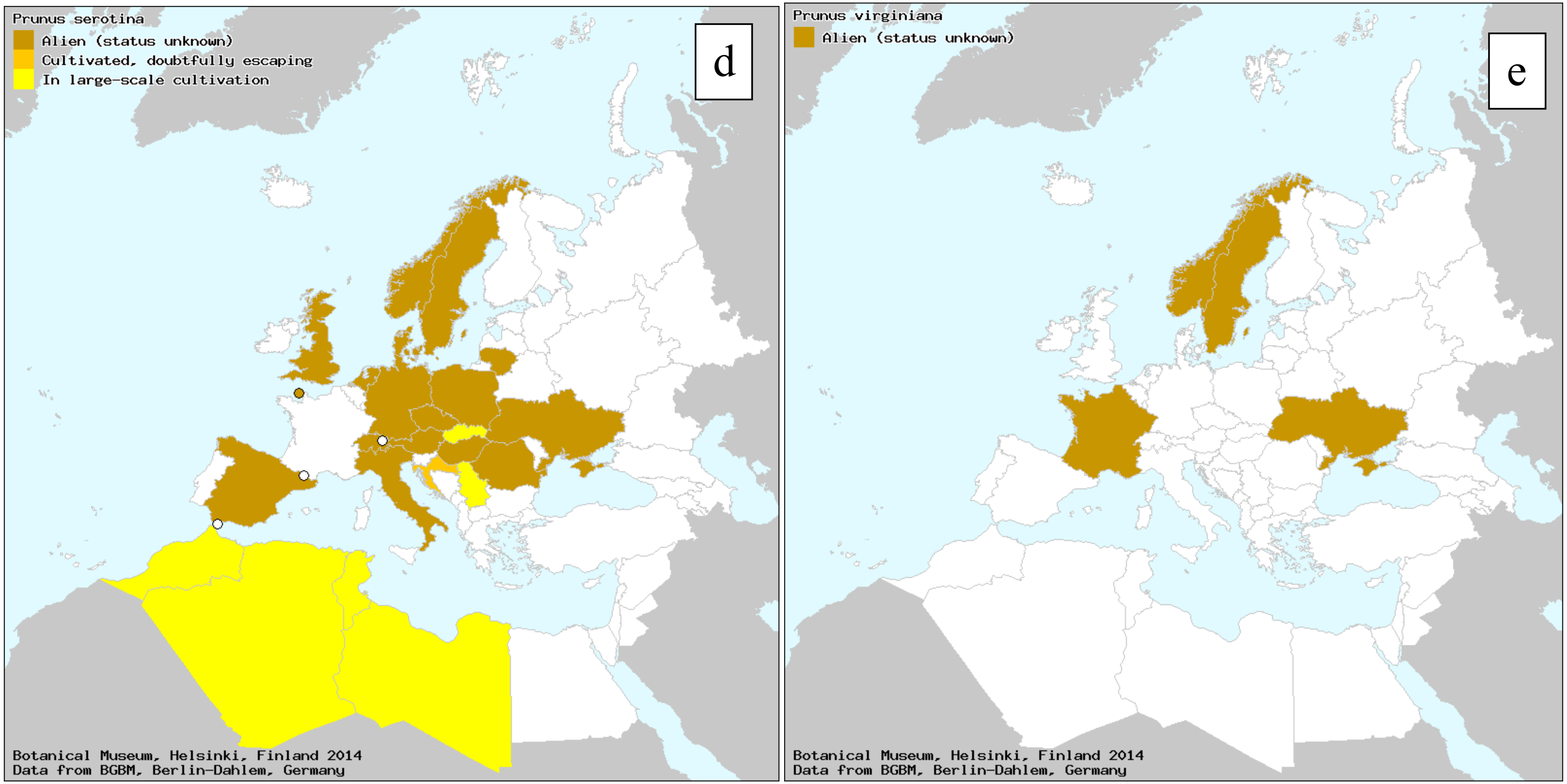


Figure 2: European distribution of the main hosts of *Rhagoletis cingulata*: (a) *Prunus avium*, (b) *Prunus cerasus*, (c) *Prunus mahaleb*, (d) *Prunus serotina* and (e) *Prunus virginiana* (Botanic Garden and Botanical Museum Berlin-Dahlem, 2006). The maps are based on information from Flora Europaea, Med-Checklist, the Flora of Macaronesia and from regional and national floras and checklists from the area as well as additional taxonomic and floristic literature

Table 4: Harvested area (hectares) of sour cherries and cherries in EU Member States and Norway in 2011 and 2012 based on FAOSTAT data

Country	Item	2011		2012	
Austria	Cherries, sour	1 450	F	1 450	F
	Cherries	15 000	F	14 500	F
Belgium	Cherries	1 200		1 100	
Bulgaria	Cherries, sour	2 823		2 417	
	Cherries	13 957		14 443	
Croatia	Cherries, sour	3 434		2 990	*
	Cherries	762		800	*
Cyprus	Cherries	251		260	
Czech Republic	Cherries, sour	1 542		1 586	
	Cherries	1 074		1 108	
Denmark	Cherries, sour	1 403		1 300	
	Cherries	120		120	
Estonia	Cherries	275		250	
France	Cherries	9 643		9 577	
Germany	Cherries, sour	2 855		2 279	
	Cherries	5 338		5 181	
Greece	Cherries, sour	120	F	100	
	Cherries	9 800		10 400	
	Cherries	24 967		24 000	F
Hungary	Cherries, sour	13 388		13 253	
	Cherries	2 270		2 311	
Italy	Cherries, sour	1 493	Im	1 350	F
	Cherries	30 207		29 736	
Latvia	Cherries	120		84	
Lithuania	Cherries	1 116		1 100	
Luxembourg	Cherries	4		4	
Netherlands	Cherries	708		700	
Poland	Cherries, sour	33 982		33 731	
	Cherries	11 555		11 610	
Portugal	Cherries, sour	432	Im	432	F
	Cherries	5 659		5 700	
Romania	Cherries	6 853		6 829	
Slovenia	Cherries, sour	14		15	
	Cherries	124		136	
Slovakia	Cherries, sour	273	Im	273	F
	Cherries	1 184	Im	1 200	F
Spain	Cherries, sour	600	*	600	F
Sweden	Cherries	180	F	200	F
United Kingdom	Cherries	499	Im	609	
Norway	Cherries	221		211	

*, unofficial figure; F, FAO estimate; Im, FAO data based on imputation methodology.

3.4.3. Analysis of the potential distribution of *Rhagoletis cingulata* in the EU

The species is already present in eight MSs (Table 2). The climatic requirements of the species include the following categories according to the Köppen–Geiger classification: C (temperate/mesothermal climate), Cf (warm temperate climate, wet all year), Cs (warm temperate climate with dry summer), and Cw (warm temperate climate with dry winter) (CABI, 2014a). These climates are present in northern, central and parts of southern Europe so the climatic requirements for potential establishment can be considered as suitable.

In all the areas where climatic requirements are suitable, both cultivated and wild host plants are available and therefore the species has the potential to establish in most EU MSs. The species is still spreading and has a considerable potential to expand its distribution in Europe. Among the other factors influencing establishment are the high reproductive potential, the high infestation levels (reaching more than 20 %), the survival of its pupae that emerge the following year and its capacity to adapt to different environments (CABI, 2014a).

3.4.4. Spread capacity

Two types of movement are described in adult fruit flies: dispersive and non-dispersive. The latter is typical of *Rhagoletis* spp. under normal crop conditions and occurs in association with feeding, mating and oviposition but rarely takes individuals very far from their host plants (Boller and Prokopy, 1976). Therefore, Frick et al. (1954) recorded a dispersal of about 40 m of *R. cingulata* adults from the orchards to surrounding trees and shrubs with a maximum of 550 m. Dispersive flights have been observed in *R. completa*, *R. cerasi* and *R. pomonella*, mostly in situations in which flies were deprived of suitable fruit for oviposition because the crop was destroyed by frost or early harvest, but no information is available on *R. cingulata* (Boller and Prokopy, 1976). Laboratory data have shown that flies are capable of flying several kilometres in 24 hours, but it is suggested that these distances are not flown in nature (Boller and Prokopy, 1976).

Infestations from nearby wild trees and/or abandoned domesticated cherry orchards can represent an important source of new outbreaks in cultivated crops (Smith et al., 2014). However, the transport of infected fruits is the major means of movement and dispersal to previously uninfected areas, as well as pupae within soil or potted plants (Egartner et al., 2010; CABI, 2014a). In international trade, the major means of dispersal is the transport of fruits containing live larvae and eggs that are difficult to identify/detect as a commodity contaminant. There is also a risk of both short- and long-distance dispersal because of the transport of puparia in growing media accompanying plants or host plants used for forestry (e.g. *P. serotina*), ornamental purposes and horticulture (CABI, 2014a).

Since the host plants are widespread and many cultivated and wild host species are available, this enhances the potential for spread across Europe.

3.5. Elements to assess the potential for consequences in the EU

3.5.1. Potential effects of *Rhagoletis cingulata*

R. cingulata is “a severe pest of cherries” (CABI, 2014a) as there is a zero tolerance in consumers, fruit processors, local and export markets for fly larvae in cherries (Compton et al., 2005; Texeira et al., 2007). Attacked fruit may be pitted with a small dimple forming around oviposition punctures in late-maturing varieties but the egg-laying scar can be inconspicuous. The fruits do not drop prematurely and infested fruits generally appear normal until the larvae are nearly fully grown, when sunken spots, caused by the larval breathing holes, appear. Larval feeding can separate the stone from the pulp, which turns brown, and the skin may shrivel over the wound (Compton et al., 2005). Infested fruit are more susceptible to fungi, such as *Monilinia* (Compton et al., 2005).

3.5.2. Observed impact of *Rhagoletis cingulata* in the EU

In Europe, most reports of pest damage refer to the cultivated cherries, *P. avium* and *P. cerasus*. However, *P. mahaleb*, which is native to warm locations of Southern and Central Europe and is used as rootstock for sour cherries and as an ornamental plant, has also been attacked (EPPO, 2010). In Germany, *R. cingulata* emerges three to four weeks later than the native species, *R. cerasi*, and, because of this, it attacks late-maturing cherry varieties, mainly sour cherries, for example the widely planted variety “Schattenmorellen”, on which *R. cerasi* is not an important pest (Vogt et al., 2009). This has been shown using fruit samples, from which pupae were obtained and *R. cingulata* adults emerged in the following year (CABI, 2014a). Vogt et al. (2009) reported infestation levels of up to 30 % on cherries in Germany. This has also been shown using fruit samples, from which pupae were obtained and *R. cingulata* adults emerged in the following year. Lampe et al. (2005) noted that mixed populations of *R. cerasi* and *R. cingulata* can extend the period of high infestation pressure because of a different, but largely overlapping, period of first emergence. Although females of both species use pheromones to prevent repeated oviposition in the same fruit, they do not recognise each other's pheromones (Prokopy et al., 1976). Even low infestation levels can lead to high losses, as a maximum threshold of only 4 % "worm eaten" cherry fruit can be marketed in accordance with Commission Regulation 214/2004.

Environmental impacts caused by damage to the wild cherries are very unlikely, as the viability of the cherry seed is unaffected and the fruit remains suitable as food for animals. Impact on ornamental trees (cultural services) may occur in areas where cherry trees are grown in private gardens. The magnitude of this impact is expected to be very low for the same reasons already discussed for wild cherries.

3.6. Currently applied control methods in the EU

R. cingulata damages cultivated cherries together with the EU-native fruit fly *R. cerasi* (section 3.5.2). For this reason, and because of the limited level of tolerance for "worm-eaten" cherry fruit (Commission Regulation 214/2004), the control methods applied against *R. cerasi* are likely to be the same as those used to control *R. cingulata*. Daniel and Grunder (2012) provides a review of the control methods against *R. cerasi* applied in Switzerland and Europe and these can be summarised as follows:

- Conventional products: neonicotinoids and pyrethroids. Because larvae hide inside the fruit, the main target for insecticide applications are adults, with two to three spray treatments per season in order to prevent female oviposition by continually migrating populations (Teixeira et al., 2009; Smith et al., 2014).
- Organic products and biocontrol agents: azadirachtin; *Beauveria bassiana* (Daniel and Wyss, 2010).
- Cultural practices: covering the soil with nets; mass trapping by yellow sticky traps (only for private gardens); harvesting early and completely; removing infested cherries; keeping a high ground cover plants until after harvest.

In addition, Hoffmeister (1993) provides a list of parasitoid complexes observed on some species of fruit flies in Central Europe. Although *R. cingulata* was not included in the study, some parasitoids are expected to be of relevance for this pest too, as larval ectoparasitoids (e.g. *Pteromalus* spp.), larval endoparasitoids (e.g. *Opius* spp., *Halticoptera laevigata*) or puparium parasitoids (e.g. *Phygadeuon* spp.).

According to Frick et al. (1954), the size of the cherries can influence the parasitisation capacity of biocontrol agents. In wild cherries, 50 % of larvae were found to be parasitised, whereas it was only up to 3 % in cultivated cherries, which are larger and where the ovipositor of the parasitoids cannot reach the feeding larvae.

3.7. Uncertainty

Uncertainty is mainly related to the lack of information on the situation in the risk assessment area concerning pest distribution, impact and control.

CONCLUSIONS

Table 5 summarises the Panel's conclusions on the key elements addressed in this scientific opinion in consideration of the pest categorisation criteria defined in ISPM 11 and ISPM 21 and of the additional questions formulated in the terms of reference.

Table 5: The Panel's conclusions on the pest categorisation criteria defined in the International Standards for Phytosanitary Measures No 11 and No 21 and on the additional questions formulated in the terms of reference

<table>
<tr><th>Criterion of pest categorisation</th><th>Panel's conclusions on ISPM11 criterion</th><th>Panel's conclusions on ISPM21 criterion</th><th>Uncertainties</th></tr>
<tr><td>Identity of the pest</td><td colspan="2">Is the identity of the pest clearly defined? Do clearly discriminative detection methods exist for the pest?

R. cingulata is a member of a complex of five North American species. R. indifferens, the only other crop pest in the complex, has morphologically distinct adults and occurs in western North America, whereas R. cingulata is present in the east of this continent. As the larvae cannot be reliably distinguished and both species attack cherries, the origin of the consignment can be helpful in identification unless it is from Arizona and New Mexico where the species distributions overlap</td><td>Despite initial uncertainty concerning the identity of the species found in the EU, only the presence of R. cingulata has been confirmed.
However, a new invasion by R. indifferens could be overlooked unless the identity of adults is carefully checked</td></tr>
<tr><td>Absence/presence of the pest in the risk assessment area</td><td>Is the pest absent from all or a defined part of the risk assessment area?

R. cingulata is established in eight EU member states. These are primarily in central Europe</td><td>Is the pest present in the risk assessment area?

R. cingulata is established in the EU</td><td>Information is missing or not up to date for some MSs.
The distribution of R. cingulata may be masked by the presence of R. cerasi, which causes similar damage (though it attacks crops earlier in the year)</td></tr>
<tr><td>Regulatory status</td><td colspan="3">Mention in which annexes of 2000/29/EC and the marketing directives the pest and associated hosts are listed without further analysis.

In Council Directive 2000/29/EC, R. cingulata is listed in Annex IAI. Its host plants, Prunus species, are addressed in Annex IIIA. Special requirements are laid down in Annex IVAI, concerning soil and dwarfed plants that could be relevant to R. cingulata host species. Finally, according to Annexes V-parts A and B, host plants intended for planting must be subject to a plant health inspection before entry or movement within the EU. In addition, regarding the marketing of fruit, Commission Regulation 214/2004 is particularly relevant as it establishes the threshold of tolerance for "worm-eaten" cherry fruit at not more than 4 %</td></tr>
</table>

Criterion of pest categorisation	Panel's conclusions on ISPM11 criterion	Panel's conclusions on ISPM21 criterion	Uncertainties
Potential establishment and spread	*Does the risk assessment area have ecological conditions (including climate and those in protected conditions) suitable for the establishment and spread of the pest?* *Indicate whether the host plants are also grown in areas of the EU where the pest is absent.* *And, where relevant, are host species (or near relatives), alternate hosts and vectors present in the risk assessment area?* Its *Prunus* (cherry) hosts occur as crops and wild plants throughout the EU. Although it is likely that the climate will be suitable for *R. cingulata* wherever the hosts are present, it has not previously been found in areas with a Mediterranean climate, apart from Croatia and Slovenia, that do not have very hot dry summers	*Are plants for planting a pathway for introduction and spread of the pest?* The pest can spread as pupae (strictly pupariae) with soil attached to plants for planting but movement within fruit is considered to be the most likely pathway. There is no evidence of long distance natural spread	Information is missing or not up to date for some MSs. Climatic requirements of this species are not sufficiently known, particularly in relation to the suitability of the Mediterranean climate
Potential for consequences in the risk assessment area	*What are the potential for consequences in the risk assessment area?* *Provide a summary of impact in terms of yield and quality losses and environmental consequences* Severe losses have already been recorded in some EU MSs, particularly for sour cherries. Even low infestation levels can lead to high losses since a maximum threshold of 4 % "worm-eaten" fruit is allowed to be marketed under Commission Regulation 214/2004	*If applicable is there indication of impact(s) of the pest as a result of the intended use of the plants for planting?* Further spread and damage can be expected as a result of the trade in plants for planting	Detailed information on impacts in the EU is missing
Conclusion on pest categorisation	The pest is established in eight MSs and is transient and under eradication in France. Severe damage has been recorded in some EU MSs. A considerably larger area of the EU is endangered and the pest can spread rapidly with trade	Spread within the EU can occur both in soil associated with plants for planting and in fruit	Information is missing or not up to date for some MSs

Criterion of pest categorisation	Panel's conclusions on ISPM11 criterion	Panel's conclusions on ISPM21 criterion	Uncertainties
Conclusion on specific Terms of Reference questions	*Provide a brief summary of* - *the analysis of the present distribution of the organism in comparison with the distribution of the main hosts, and the distribution of hardiness/climate zones, indicating in particular if in the risk assessment area, the pest is absent from areas where host plants are present and where the ecological conditions (including climate and those in protected conditions) are suitable for its establishment,* *R. cingulata* is present in eight MSs, predominantly in central Europe. Its presence in eastern North America from Mexico to Canada implies that all areas of the EU where its *Prunus* hosts occur are suitable for establishment. However, establishment in areas with a Mediterranean climate is uncertain, as there are records from only Croatia and Slovenia in this climate zone. Adults have a limited capacity for flight and spread is mainly by larvae present in traded fruit and pupae (strictly impariae) in soil associated with plants for planting - *and, the analysis of the observed impacts of the organism* *R. cingulata* attacks all cherries, whether cultivated or uncultivated but is particularly damaging to late-maturing varieties, especially sour cherries. Even small infestations can cause losses because of the low threshold (4 %) for "worm-eaten" fruit in marketed produce. The limited control measures available are similar to those for the native cherry fruit fly, *R. cerasi*, and are primarily based on insecticide sprays timed to kill adults with some cultural method (e.g. netting and trapping)		

References

AliNiazee MT, 1973. Cherry Fruit Fly in Oregon: A Nomenclature Problem. Bulletin Entomological Society of America, 19, 103–104.

Aluja M, Lozada N, Piñero J, Birke A, Hernández-Ortiz V and Díaz-Fleischer F, 2001. Basic behavior of *Rhagoletis turpiniae* (Diptera: Tephritidae) with comparative notes on the sexual behavior of *Rhagoletis pomonella* and *Rhagoletis zoqui*. Annals of the Entomological Society of America, 94, 268–274.

Baugnée JY, 2006. Contribution à la connaissance des Tephritidae de Belgique (Diptera: Brachycera). Notes faunistiques de Gembloux, 59, 2. 63–113.

Boller EF and Prokopy RJ, 1976. Bionomics and management of *Rhagoletis*. In: Annual review of entomology. Volume 21. Eds Smith RF, Mittler TE and Smith CN. Annual Reviews Inc., Palo Alto, CA, USA, 223–246.

Boller, EF and Mani E, 1994. Two North American *Rhagoletis* spp. in Europe. IOBC WPRS Bulletin, 17, pp. 83.

Botanic Garden and Botanical Museum Berlin-Dahlem, 2006. Euro+Med PlantBase—the information resource for Euro-Mediterranean plant diversity. Available online: http://ww2.bgbm.org/EuroPlusMed/

Bush GL, 1966. The taxonomy, cytology and evolution of the genus *Rhagoletis* in North America (Diptera: Tephritidae). Bulletin of the Museum of Comparative Zoology, 134, 431–526.

Bush GL, 1969. Mating behavior, host specificity, and the ecological significance of sibling species in frugivorous flies of the genus *Rhagoletis* (Diptera-Tephritidae). The American Naturalist, 103, 669–672.

CABI, 2014a. Report—*Rhagoletis cingulata*—Report generated on 20/06/2014. Invasive species Compendium. CAB International, Wallingford, UK, 30 pp.

CABI, 2014b. Reports of –*Prunus avium* and *Prunus cerasus*–Reports generated on 03/07/2014. Crop Protection Compendium. CAB International, Wallingford, UK.

CABI/EPPO, 2009. *Rhagoletis cingulata* (Loew)-Distribution Maps of Plant Pests. Map No. 159 2nd revision Issued December 2009. Compiled by CAB International in association with the European and Mediterranean Plant Protection Organization (EPPO).

Carroll LE, White IM, Freidberg A, Norrbom AL, Dallwitz MJ and Thompson FC, 2006b. *Rhagoletis cingulata* (Loew). In: Pest fruit flies of the world. Version: 8th December 2006. Available from: http://delta-intkey.com/ffa/www/rha_cing.htm

Compton JM, Cowgill JrWP and Tietjen WH, 2005. A review of cherry fruit fly: The Eastern USA perspective. ISHS Acta Horticulturae 667: 4th International Cherry Symposium, 489–493.

Daniel C and Grunder J, 2012. Integrated management of European cherry fruit fly *Rhagoletis cerasi* (L.): situation in Switzerland and Europe. Insects, 3, 956–988.

Daniel C and Wyss E, 2010. Field applications of *Beauveria bassiana* to control the European cherry fruit fly *Rhagoletis cerasi*. Journal of Applied Entomology, 134, 675–681.

Drosopoulou E, Augustinos AA, Nakou I, Koeppler K, Kounatidis I, Vogt H, Papadopoulos NT, Bourtzis K and Mavragani-Tsipidou P, 2011. Genetic and cytogenetic analysis of the American cherry fruit fly, Rhagoletis cingulata (Diptera: Tephritidae). Genetica, 139, 1449–1464.

EFSA PLH Panel (EFSA Panel on Plant Health), 2010. PLH Guidance on a harmonised framework for pest risk assessment and the identification and evaluation of pest risk management options by EFSA. EFSA Journal 2010;8(2):1495, 66 pp. doi:10.2093/j.efsa.2010.1495

Egartner A, Zeisner N, Hausdorf H and Blümel S, 2010. First record of *Rhagoletis cingulata* (Loew) (Dipt., Tephritidae) in Austria. Bulletin OEPP/EPPO Bulletin, 40, 158–162.

EPPO (European and Mediterranean Plant Protection Organization), 2005. *Prunus serotina*. EPPO data sheet on Invasive Plants. 05-11834. 6 pp.

EPPO (European and Mediterranean Plant Protection Organization), 2006. 2006/003—Current situation of *Rhagoletis cingulata* in Germany. EPPO Reporting Service, 1, 3–4.

EPPO (European and Mediterranean Plant Protection Organization), 2010. 2010/130—Situation of *Rhagoletis cingulata* in Germany. EPPO Reporting Service, 7, p. 6.

EPPO (European and Mediterranean Plant Protection Organization), 2013. 2013/055—Current 5 *Rhagoletis cingulata* detected for the first time in Languedoc-Roussillon region (FR). EPPO Reporting Service, 3, p. 6.

EPPO (European and Mediterranean Plant Protection Organization), 2014. Situation of *Rhagoletis cingulata* in Belgium. EPPO Reporting Service 2014, No 8, 2014/145. Available online: http://archives.eppo.int/EPPOReporting/2014/Rse-1408.pdf

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 Standard 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

Fassotte C, Tomme M, Walrant C, Belien T and De Meyer M, 2014. Nouvelles observations de *Ceratitis capitata* (Wiedemann, 1824) et de *Rhagoletis cingulata* (Loew, 1862) en Belgique (Diptera, Tephritidae). Bulletin de la Société royale belge d'Entomologie/Bulletin van de Koninklijke Belgische Vereniging voor Entomologie, 150, 42–45.

FDACS (Florida Department of Agriculture and Consumer Service), 2013. Summary of Florida plant import regulations. Florida Department of Agriculture and Consumer Services. Available online: http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Business-Services/Summary-of-Plant-Regulations

FERA (Food and Environment Research Agency), 2011. *Rhagoletis cingulata*. Summary Report. United Kingdom. 7 pp. Available online: http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/documents/rhagoletisCingulataPRAsummary.pdf

Foote RH, 1981. The genus *Rhagoletis* Loew south of the United States (Diptera: Tephritidae). Technical Bulletin, Science and Education Administration, United States Department of Agriculture, 1607. iv + 75 pp.

Foote RH, Blanc FL and Norrbom AL, 1993. Handbook of the Fruit Flies (Diptera: Tephritidae) of America North of Mexico. Ithaca, USA: Comstock.

Frick KE, Simkover HG and Telford HS, 1954. Technical Bulletin. Agricultural Experiment Station, Washington State Institute of Agricultural Sciences, 13. Pullman, WA, USA, 66 pp.

Harris EJ, 1989. Pest status; Hawaiian Islands and North America, In: Robinson AS, Hooper G, eds. Fruit Flies; their Biology, Natural Enemies and Control. World Crop Pests. Amsterdam, Holland: Elsevier, 3(A). 73–81.

Hernández-Ortiz V, 1993. Description of a new *Rhagoletis* species from tropical Mexico (Diptera: Tephritidae). Proceedings of the Entomological Society of Washington, 95, 418–424.

Hoffmeister T, 1993. The parasitoid complexes of frugivorous fruit flies of Central Europe. In: Fruit flies: biology and management. Eds Aluja M and Liedo P. Springer Verlag, New York, NY, USA, 125–127.

ISDA (Idaho State Department of Agriculture), 2013. Division of Plant Industries. Summaries of external quarantines. Idaho State Department of Agriculture. 18 pp. Available online: http://nationalplantboard.org/docs/summaries/idaho.pdf

Jubb GL Jr and Cox JA, 1974. Seasonal emergence of two cherry fruit fly species in Erie County, Pennsylvania: 25-year summary. Journal of Economic Entomology, 67, 5. 613–615.

Lampe I, Burghause F and Krauthausen HJ, 2005. Introduction and distribution of the American Eastern cherry fruit fly, *Rhagoletis cingulata*, in the Rhine Valley, Germany. Proceedings of the British Crop Protection Council (BCPC) Symposium on ‘Introduction and Spread of Invasive Species’, No 81, Berlin, Germany, 135–140.

Liburd OE, Stelinski LL, Gut LJ and Thornton G, 2001. Performance of various trap types for monitoring populations of cherry fruit fly (Diptera: Tephritidae) species. Environmental Entomology, 30, 82–88.

Mani, E, Merz B, Brunetti R, Schaub L, Jermani M and Schwaller F, 1994. Zum Auftreten der beiden amerikanischen Fruchtfliegenarten Rhagoletis completa CRESSON und Rhagoletis indifferens CURRAN in der Schweiz (Diptera: Tephritidae). Mitteilungen der Schweizerischen Entomologischen Gesellschaft: Bulletin de la Société Entomologique Suisse, 67, 177–182.

Merz B, Niehuis M, 2001. Bemerkenswerte Nachweise von Fruchtfliegen (Diptera, Tephritidae) aus Rheinland-Pfalz (Deutschland). Dipteron, 4, 1. 57–64.

Norrbom AL, Carroll LE, Thompson FC, White IM and Freidberg A, 1999. Systematic Database of Names. In Thompson F.C. (ed.), Fruit Fly Expert, Identification System and Systematic Information Database, Myia 9, 65–299.

Pelz-Stelinski KS, Gut LJ and Isaacs R, 2006. Vertical position of traps influences captures of Eastern cherry fruit fly (Diptera: Tephritidae). Florida Entomologist, 89, 80–82.

PERSEUS, in preparation. Plant health pest surveys for the EU territory: an analysis of data quality and methodologies and the resulting uncertainties for pest risk assessment. Datasheet on *Rhagoletis cingulata*.

Prokopy RJ, 1977. Attraction of Rhagoletis flies (Diptera: Tephritidae) to red spheres of different sizes. Canadian Entomologist, 109, 4. 593–596.

Prokopy RJ, Reissig WH and Moericke V, 1976. Marking pheromones deterring repeated oviposition in *Rhagoletis* flies. Entomologia Experimentalis et Applicata, 20, 170–178.

Reissig WH, 1976. Comparison of traps and lures for Rhagoletis fausta and R. cingulata. Journal of Economic Entomology, 69, 5. 639–643.

Schuler H, Bertheau C, Egan SP, Feder JL, Riegler M, Schlick-Steiner BC, Steiner FM, Johannesen J, Kern P, Tuba K, Lakatos F, Köppler K, Arthofer W and Stauffer C, 2013. Evidence for a recent horizontal transmission and spatial spread of *Wolbachia* from endemic *Rhagoletis cerasi* (Diptera: Tephritidae) to invasive *Rhagoletis cingulata* in Europe. Molecular Ecology, 22, 4101–4111.

Smith JJ and Bush GL, 1997. Phylogeny of the genus *Rhagoletis* Diptera: Tephritidae inferred from DNA sequences of mitochondrial cytochrome oxidase II. Molecular Phylogenetics and Evolution, 7, 33–43.

Smith JJ and Bush GL, 2000. Phylogeny of the subtribe Carpomyina (Trypetinae), emphasizing relationships of the genus *Rhagoletis*. In: Fruit flies (Tephritidae): phylogeny and evolution of behavior. Ed Martin Aluja and Allen Norrbom, 187–217.

Smith JJ, Powell THQ, Teixeira L, Armstrong WO, McClowry RJ, Isaacs R, Hood GR, Feder JL and Gut L, 2014. Genetic structure of cherry fruit fly (*Rhagoletis cingulata*) populations across managed, unmanaged, and natural habitats. Entomologia Experimentalis et Applicata, 150, 157–165.

Teixeira LAF, Gut LJ, Wise JC and Isaacs R, 2009. Lethal and sublethal effects of chlorantraniliprole on three species of *Rhagoletis* fruit flies (Diptera: Tephritidae). Pest Management Science, 65, 137–143.

Teixeira LAF, Isaacs R and Gut LJ, 2007. Habitat-specific flight period in the cherry fruit fly *Rhagoletis cingulata* (Loew) (Diptera :Tephritidae). Population Ecology 36, 6, 1339–1348.

Vogt H, Köppler K, Dahlbender W and Hensel G, 2009. Observations of *Rhagoletis cingulata*, an invasive species from North America, on cherry in Germany. Proceedings of the 7th International Conference on Integrated Fruit Production, Avignon, France, 228–232.

White IM and Elson-Harris MM, 1992. Fruit flies of economic significance. Their identification and bionomics, 1st edition. CAB International, Wallingford, UK, 600 pp.

Yee WL, Hernández-Ortiz V, Rull J and Sinclair BJ, 2013. ST 04: Status of *Rhagoletis* (Diptera: Tephritidae) pests in the NAPPO countries. October, 2013. NAPPO (North American Plant Protection Organization) Science and Technology Documents, Ottawa, ON, Canada, 37 pp.

ABBREVIATIONS

EFSA	European Food Safety Authority
EFTA	European Free Trade Association
EPPO	European and Mediterranean Plant Protection Organization
EPPO-PQR	European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System
ISPM	International Standards for Phytosanitary Measures
MS(s)	Member State(s)
NPPO	National Plant Protection Organization
PLH Panel	Plant Health Panel
PRA	Pest Risk Analysis
RNQP	regulated non-quarantine pest