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Strategies to develop effective, innovative and practical approaches to protect major European fruit crops from pests and pathogens

Work package 1. Pathways of introduction of fruit pests and pathogens

Deliverable 1.3.

PART 4 - REPORT on VACCINIUM – Fruit pathway and Alert List

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DROPSA DELIVERABLE
REPORT on VACCINIUM – Fruit pathway and Alert List

1. Introduction

The genus *Vaccinium* was selected to establish an Alert List of pests that may present a risk to cultivated species or varieties, or to wild species, in the EU (see *Analysis of fruit production and imports in the EU to select species for pathway studies*). There is an increasing trade of *Vaccinium* berries from outside the EU, as well as a substantial cropping within the EU. In addition, some wild *Vaccinium* species occur in the EU, which are important for biodiversity, as well as local economy and populations. In order to better target searches, a short review was made to obtain an overview of the pathway(s). This section is not an exhaustive study of the pathway '*Vaccinium* fruit', but is intended to outline the different *Vaccinium* species concerned by trade and present in the EU, the countries from which *Vaccinium* are imported into the EU, and some characteristics of the pathway, for the purpose of better targeting searches and the further screening of pests.

1.1 Background on *Vaccinium*

There are approximately 450 species of *Vaccinium* worldwide (Powell and Kron, 2002 citing Vander Kloet, 1990), originating on all continents except Oceania. The genus *Vaccinium* encompasses, in particular, species commonly called 'blueberries', 'bilberries', 'cranberries', 'lingonberries', 'huckleberries' and 'whortleberries'. The taxonomy of *Vaccinium* is complex and subject to debate (Vander Kloet and Dickinson, 1999). Depending on sources, species may be allocated to different genera. Among species of commercial importance, cranberries are considered by some as belonging to a sub-genus *Oxycoccus* of *Vaccinium* (as per the original classification), and by others to a separate genus, *Oxycoccus*. Cranberries were kept here because they are widely considered as being part of *Vaccinium*, and are covered in Eurostat statistical data in the category 'Cranberries, bilberries, other *Vaccinium* (fresh)'.

The diversity of *Vaccinium* species seems higher in North America and Asia than in Europe or other parts of the Americas. In Ontario (Canada), there are 11 species of *Vaccinium* (Northern Ontario Flora, 2014). In China, there are 92 *Vaccinium* species (of which 51 are endemic), although some may belong to other genera (Flora of China, 2014). In Japan, there are 18 wild *Vaccinium* species, not used for commercial production (Tamada, 2006). The *Vaccinium* species of Europe according to Flora Europaea (2014) are all listed in Table 1. In Colombia, 5 species are reported, two of which known to be edible (Magnitskiy et al., 2011).

Many *Vaccinium* species have edible fruit. Berries are eaten fresh or processed. *Vaccinium* fruits have become increasingly popular in recent decades due to their taste and nutritional properties (including their vitamin C and minerals content). Various health properties are associated with *Vaccinium*, which have traditionally been used as medicine (Abreu, 2014). Recent investigations relate to properties of *Vaccinium* fruits as antioxidant, antidiabetic, antimicrobial, anti-cell proliferation, to name only a few. Traditionally, fruits were collected from the wild. Later a limited number of *Vaccinium* species were put in cultivation. Wild species (including species that are also cultivated) are sometimes exploited commercially, either with some level of management (e.g. *V. angustifolium* in North America) or without (e.g. *V. myrtillus* in Europe). Some species are used both from the wild and in cultivation (e.g. *V. angustifolium*, *V. vitis-idaea*). The main cultivated species are currently blueberries (several species/hybrids, see Table 1), cranberry (*V. macrocarpon*) and lingonberry (*V. vitis-idaea*) (Debnath, 2009). The demand for berries worldwide is met by increasing cropping and trade (e.g. Tamada, 2009; Strik, 2014). Breeding and selection of *Vaccinium* is an active field and uses many different species (Prodorutti et al., 2007).

Cultivation still focuses on a few species, but attempts have been made to cultivate others, on their own or as hybrids, or to improve their management and use from the wild. This is especially triggered by the identification of health benefits for berries so far collected from the wild, for example *V. oldhamii* in Japan (Tsuda et al., 2013), or *V. floribundum*, a South American species (Abreu et al., 2014). It is not excluded that some wild species may be cultivated in the future.

Data on production and trade of cultivated *Vaccinium* are given in section 1.2. The largest part of traded fruit likely originates from the few species that are currently widely used commercially (cultivated or in wild stands). Most traded blueberries are probably *V. corymbosum*, *V. ashei* or *V angustifolium* (or derived species), as reported in Retamales and Hancock (2012). In North America, the term 'wild' on marketed blueberries is used for fruit harvested from managed native stands of *V. angustifolium* (not planted or selected, but with a certain level of management, such as pruning, pest management). Li and Hong (2009) mention that in China fruit of *V. uliginosum* and *V. vitis-idaea* are collected from the wild and exported to Europe.

There is a wide diversity in *Vaccinium* plants (from low to tall, 10 cm to 4 m) and berries (small to large, commonly 0.5 to 1.5 cm depending on species). This must have an influence on the pests associated with the different *Vaccinium* plants (i.e. some wood borers may need a substantial branch or stem size for their development) and with fruit. It may be that the biggest life stages of pests feeding on fruit are less likely to remain associated and may be detected at harvest (e.g. a 5-cm long caterpillar on a 1-cm berry). Similarly, leaves are small and close to fruit; even pests feeding only on leaves may become associated with fruit. The highest risk of entry would be pests of small dimension, which would remain inconspicuous in fruit consignments. However, it was not possible to conduct the analysis of pests at this level of details; this would require detailed knowledge of the different *Vaccinium* species and information on the pests, beyond those that were available for the screening conducted here.

Table 1 lists some *Vaccinium* species ordered according to their broad groups (recognizing that there is not always a clear-cut separation between those), focusing on species:
- occurring in the EU;
- cultivated, or managed or traded from the wild in different regions according to the literature available;
- used in hybrids;
- identified as hosts in the review of *Vaccinium* pests.

This list is not exhaustive: other species may be grown on a smaller scale in some countries or berries collected from the wild may be traded. Finally, *Vaccinium* are generally attractive bushes, and many species, used or not for fruit, may be grown as ornamentals in the EU.

Preventing the introduction of exotic *Vaccinium* pests into the EU is important to protect the commercial production of *Vaccinium* berries and also wild *Vaccinium* species. Some of these have a high economic and social importance where they occur (especially *V. myrtillus*, *V. microcarpon*, *V. oxycoccos*, *V. vitis-idaea*).

Literature searches targeted all *Vaccinium*, but focused on cultivated species, also because publications mostly deal with pests of economic importance to crops. Pests of wild *Vaccinium* are less documented (except possibly in North America).

It is clear from Table 1 that the use of common names varies. Many publications use only common names, and it is sometimes difficult to know which species they refer to.

Common names in other languages used in searches (found in various publications from non-EU countries)
Portuguese (Brazil): 'mirtilo' 'mirtileiro' (for blueberries)
Spanish (South America): 'arándano' (apparently both for blueberries and cranberries)
French (Canada): 'myrtille' (for blueberry, may be used for several species), 'bleuet' (for blueberry), 'canneberge', 'atoca', 'airelle' (for cranberry).

Table 1. Selected species of *Vaccinium* (ordered by broad common names groups)

- Species cultivated for fruit are in **bold**.
- Allocation to botanic groups is somewhat arbitrary, especially for blueberries, bilberries and huckleberries. For example, bilberries are commonly referred to as blueberries. In several languages, the name for bilberries and blueberries is the same. Blueberries are all native to North America and have clusters of berries, while berries are single or in pairs on bilberry.
- # Sub-regional details (North America): C = Centre; N = North; S = South, E = East, W = West (from Retamales and Hancock, 2012).

Group/Species		Broad origin#	Cultivated for fruit?	Used in Europe	References
Cranberries					
V. oxycoccos (*Oxycoccus palustris*)	common cranberry, northern cranberry	North America, Europe, Asia	In Russia, possibly North America, but also collected from the wild.	Yes (at least wild)	Klein (2003) Matthews (1992)
V. microcarpon (*O. microcarpus*)	small cranberry	North America, Europe, Asia (northern part)	No data found	Yes (wild, widespread)	Flora Europaea (2014)
V. macrocarpon **(*O. macrocarpus*)**	**large cranberry, American cranberry**	**North America**	**Yes (fruit)**	**Yes (cultivated for fruit)**	**Debnath (2009)**
Bilberries					
V. caespitosum (*V. arbusculum*)	Dwarf bil-/blue-/whortle-/huckleberry	North America	No (used from the wild)	No data found	Tirmenstein (1990)
V. myrtillus	European bilberry, dwarf bilberry	North America, Europe, Asia	No (used from the wild). But attempts made for semi-cultivation practices/cultivation (Martinussen et al., 2009)	Yes (wild, widespread)	Flora Europaea (2014) Retamales and Hancock (2012), Tirmenstein (1990)
V. ovalifolium	oval-leafed bilberry, ovalleaf huckleberry	North America (NW), Asia (incl. Siberia)	No (used from the wild; also as ornamentals or in gardens)	No data found	Vander Kloet and Dickinson (1999) Tirmenstein (1990)
V. uliginosum	**bog bil-/blue-/whortle-/huckleberry**	**North America, Europe, Asia**	**Yes, from managed wild plants (also collected from the wild and used for hybrids)**	**Yes (wild)**	**Flora Europaea (2014), Yarborough (2014), Li and Hong (2009), New Brunswick (2010) Matthews (1992)**
Blueberries					
V. angustifolium	**lowbush blueberry**	**North America (NE)**	**Yes (also extensively collected from wild stands in North America, managed or not; esp. NE USA, E Canada)**	**Yes (cultivated)**	**Debnath (2009), Starast et al. (2014), Tirmenstein (1991)**
***V. ashei (V. virgatum*)**	**rabbiteye blueberry**	**North America (SE)**	**Yes**	**Yes**	**Debnath (2009) Considered as a synonym of *V. corymbosum* in Lim (2011), but mentioned independently in many publications**
V. boreale	Northern blueberry	North America (NE)	No (in the wild)	No data found	USDA-ARS (2015)
V. calycinum	ʻōhelo	Hawaii (endemic)	No (collected from the wild)	No data found	Bishop Museum (2015)
V. corymbosum	**northern highbush blueberry**	**North America**	**Yes, the most cultivated blueberry species, large number of cultivars, also in the wild in North America**	**Yes (cultivated)**	**Debnath (2009) New Brunswick (2010). Note: *V. australe* appears in some publications, and is considered a synonym in Lim (2011)**
V. crassifolium	Creeping blueberry	North America (SE)	As ornamental, apparently not for fruit		USDA-ARS (2015)
V. cylindraceum	**Azores blueberry**	**Azores**	**Yes (Azores)**	**No data found**	**Flora Europaea (2014), Hummer et al. (2009)**
V. darrowii	**evergreen blueberry, Southern highbush blueberry**	**North America (SE)**	**Yes (also used to produce hybrids)**	**No data found**	**Chavez and Lyrene (2009), Prodorutti et al. (2007)**
V. elliottii	**mayberry**	**North America (SE)**	**Possibly**	**No data found**	**Prodorutti et al. (2007)**
V. floribundum	Andean blueberry	South America	No (collected from the wild), but domestication investigated	No data found	Abreu et al. (2014), Magnitskiy et al. (2011)
V. meridionale (*V.*	Colombian blueberry	South America	Managed in the wild,	No data found	Ligaretto et al. (2011),

Group/Species		Broad origin#	Cultivated for fruit?	Used in Europe	References
caracasanum)			investigated as potential crop		Abreu et al. (2014)
V. myrsinites	Ground/low/dwarf blueberry	North America (SE)	No data found	No data found	Tirmenstein (1990), USDA-ARS (2015)
V. myrtilloides	**sour top, Canadian blueberry, velvetleaf blueberry**	**North America (C)**	**Yes, also collected from wild stands in North America (managed or not)**	**No data found**	**Debnath (2009) New Brunswick (2010) Tirmenstein (1990)**
V. pallidum	hillside blueberry, Blue Ridge blueberry	North America	No, mostly collected from wild stands	No data found	Tirmenstein (1991)
V. reticulatum	‘ōhelo ‘ai	Hawaii (endemic)	No (collected from the wild), but potential as berry crop in Hawaii	No data found	Follett and Zee (2011), Bishop Museum (2015)
V. simulatum	upland highbush blueberry	North America (SE)	As ornamental in NZ, used for hybrids	No data found	Scalzo et al. (2009)
V. tenellum	Small black blueberry, small cluster blueberry	North America (SE)	No data found	No data found	USDA-ARS (2015)
Huckleberries					
V. arboreum	Tree sparkleberry, tree huckleberry	North America (SE)	As rootstock (*V. corymbosum* cited). Fruit unedible for humans	No data found	Tirmenstein (1991)
V. ovatum	evergreen huckleberry, box blueberry	North America (NW)	As ornamental, possibly for fruit (also collected from the wild)	No data found	Tirmenstein (1990)
V. parvifolium	red huckleberry	North America (NW)	As ornamental. Also collected from the wild	No data found	Tirmenstein (1990)
V. stamineum	Deerberry, highbush huckleberry	North America (C, E)	Apparently not. Has been considered as potential crop	No data found	Ballington (1996)
Lingonberries					
V. vitis-idaea	**lingonberry**	**Europe, Asia, North America**	**Yes, also extensively collected from the wild**	**Yes (also important from the wild)**	**Debnath (2009), Penhallegon (2009)**
Whortleberries					
V. arctostaphylum	Caucasian whortleberry	Eurasia	No data found	Yes (wild: South-East Eur., Turkey)	Flora Europaea (2014), Celik and Islam (2014)
Others (group not known)					
V. bracteatum		Asia	No data found. Apparently not in China (Flora of China, 2015 http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200016624).	No data found	USDA-ARS, 2015
V. consanguineum	Costa Rican blueberry	Central America	Possibly (for fruit and as ornamental), also collected from the wild	No data found	USDA-ARS, 2015
V. crenatum		South America	No data found	No data found	USDA-ARS, 2015
V. exul		Southern Africa	No data found	No data found	Iziko, 2015
V. hirtum (V. usunoki)		Asia	No data found	No data found	USDA-ARS, 2015
V. oldhamii		Asia	No data found	No data found	USDA-ARS, 2015
V. rapae		Pacific?	No data found	No data found	
V. smallii		Asia (incl. Russian Far-East)	No data found	No data found	USDA-ARS, 2015
Hybrids (examples)					
V. corymbosum* x *V. darrowi*, x *V. ashei*, x *V. arboreum					**Debnath (2009), USDA (2014)**
southern highbush blueberry hybrids x *V. simulatum*					**USDA (2014)**
half-high (hybrids of highbush/lowbush)					**Debnath (2009)**

Species mentioned in publications but not found: *V. nikkoensis*

1.2 Data on production and trade of *Vaccinium* fruit

Vaccinium berries are not identified as such in production data in Eurostat, but fall in the category of 'berries (excluding strawberries)' and possibly 'other berries'. Data is available for trade of 'Cranberries, bilberries, other *Vaccinium* (fresh)' and show important increases since 2002.

General data on production and trade of *Vaccinium* are given in *Analysis of fruit production and imports in the EU to select species for pathway studies*. Imports from non-EU origins for the period 2002-2012 are detailed in Annex 1 (data available referred to EU 27). The data available seems to indicate the following:

- Imports came from all regions of the world except the Caribbean. Some countries show small and irregular exports.
- Considering quantities over 100 kg, fruits were imported from 20 countries in 2002, 24 in 2008 and 22 in 2011. For 19 countries, imports were recorded every year from 2008 to 2011.
- There was a general shift of origins, with major exporting countries close to the EU (esp. Russia or Belarus) being replaced by countries on other continents (see Table 2). In particular, imports from South America have greatly increased (representing over 2/3 of imports in 2011), as well as imports from Africa.

Table 2. Percentages of exports by continent in 2002, 2008 and 2011

	2002	2008	2011
North America	9	16	9
South America	4	71	69
Central America	0,01	0	0
Africa	0,7	2,9	13
Asia	0,6	0,4	0
Near East	0,01	0,00	0
Oceania	1,1	1,1	0,5
Europe (non-EU)	84	9	9

- From South America, Chile and Argentina are the main exporters (respectively over 8800 and 4800 t), but exports from Uruguay had increased (over 1200 tonnes). There was a substantial increase (3000 t) from Chile between 2011 and 2012.
- From Africa, imports from Morocco were multiplied by 9 in 2008-2011, reaching 1800 t, with another considerable increase in 2011-2012 (to reach 2900 t). South Africa was the second largest exporter with over 900 t. Irregular imports were also recorded from 7 other African countries.
- From North America, imports from the USA were stable over 1000 tonnes, while imports from Canada varied, with a maximum of 600 t. Significant imports from Mexico appeared for the first time in 2012.
- From Asia, imports were minor and irregular. Although data is lacking for China in 2010 and 2011, the surface cultivated in *Vaccinium* has greatly increased, from 24 ha at the beginning 2000s to over 17.000 ha expected in 2010 (Li and Hong, 2009), with blueberries mostly exported to Japan, and *V. uliginosum* and *V. vitis-idaea* to Europe.
- Imports from the Near East and Central America were small and irregular.
- From Oceania, *Vaccinium* were imported mainly from Australia, and imports seem to have increased in 2011 (over 100 t). Imports from New Zealand have decreased since 2010 (only about 10 t in 2011).
- From non-EU European countries, Belarus and Ukraine were the main exporters with, respectively, over 1000 and 600 t in 2011. Russia was a major exporter until the mid-2000s, but exports have dropped until 2011. However, there seems to be a significant increase again from 2011 to 2012, from 1.5 to 400 t.

Additional data on fruit trade provided by some EPPO countries mention the following species: *V. corymbosum*, *V. macrocarpon*, *V. vitis-idaea*, *V. myrtillus*. These are probably the main species traded, but the list is possibly incomplete (only few countries provided data; most data is recorded as '*Vaccinium*' or broader categories).

1.3 Characteristics of the pathway 'Vaccinium fruit'

The following characteristics of the pathway have an importance for the presence of the pest on the fruit:
- *Fruit is generally not accompanied with green parts.* Boyette et al. (2014) note that attached stems are considered a defect and, as defective berries, would be subject to thresholds. GDV (2014) mentions that stems and leaves should be avoided in order to avoid mechanical damage. It is expected that this would also apply to other *Vaccinium* species. Consequently, fruit is expected to generally not be accompanied by leaves, stems and other green parts, and only pests that may be associated with fruit may be associated with fruit consignments (there may be a limited number of dried flower parts, fruit stalk or leaves as debris in the fruit).

- *Packaging and sorting of berries at harvest.* Blueberries are sensitive to damage by pressure, and are therefore packed in small packaging, and not in bulk. For the same reason, handling at harvest is limited to the strict minimum. Blueberries are traditionally hand-picked, in which case sorting (debris or defective berries) occurs at picking to avoid the need for further handling for sorting. Where mechanical harvesters are used, additional sorting machinery is also used to eliminate debris and fruit of non-acceptable quality (Boyette et al., 2014). The handling and packing constraints of *Vaccinium* fruit may increase the risk of contamination: a number of pests, including some normally feeding on *Vaccinium* leaves, are reported as common contaminants of harvested *Vaccinium* fruit at harvest; similarly, a number of pests of other crops, or non-pests, where common contaminants of *Vaccinium* fruit. Mechanically-harvested blueberries are generally considered unfit for the fresh market and frozen for processing (Boyette et al., 2014). It is therefore expected that most blueberries for the fresh market would have been hand-picked. It is not sure how the absence of pests is checked for in this context. Some pests may be noticed at harvest.
- *Duration of storage and conditions of transport.* Blueberries are perishable and need to be transported and sold rapidly. GDV (2014) mentions (based on various sources) maximum durations of storage ranging from a few to 42 days. Mitcham et al. (1998) mentions 1-2 weeks. Consequently transport and storage duration of blueberries is expected to be short, and to not affect pest survival in consignments. Optimal temperatures for blueberries are indicated to be just above freezing point (0±0.5°C Mitcham et al, 1998; Boyette et al., 2014). For cranberries, the optimal temperature is higher (3±1°C; Mitcham et al., 1998) but Mitcham et al. (1998) mention storage durations of 2-4 months. Pests are expected to survive in blueberry at such temperature and duration of transport, while this may be different for cranberries.
- *Existing EU phytosanitary requirements influencing association of the pests with the pathway, and EU regulated pests in broad categories.* There are currently no requirements regarding fruit of *Vaccinium* in the EU Directive 2000/29 that would influence association of the pests with this pathway. Regarding regulated pests, the following broad categories are regulated in EU Directive 2000/29 (Annex I/A1), and any species under them should be considered as being already regulated in the EU: 'Tephritidae (non-European) such as', 'Cicadellidae (non-European) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*) such as'). Vectors of *X. fastidiosa* are also addressed under emergency measures in Commission Implementing Decision (EU) 2015/789 of 18 May 2015. Other general categories of regulated pests in the EU Directive do not apply to *Vaccinium*.

2. Methods as used for *Vaccinium*

2.1 Step 1

The *Methods for the preparation of alert lists of pests for individual fruit species*[1] (M*ethods* thereafter) were used, with the following adjustments:

- A threshold of presence in the EU was applied to exclude a pest from further consideration: 3 EU countries or more.
- Some species were listed even if belonging to broad categories not to be listed at Step 1 (e.g. Nematoda, Scolytidae – see *Methods*), because the *Vaccinium* list was developed before these categories were fully decided in the *Methods*.
- The column 'parts of plant attacked' was not used (this information was instead given either in the pathways columns or under 'other information').
- Not all Tephritidae were rated as already regulated in the EU (NO1) at Step 1. Only the species mentioned by name in the EU Directive were excluded, and all others were kept to examine whether any were emerging.
- For Cicadellidae, the fact that they were vector of *Xyllella fastidiosa* was generally identified only at Step 2, and they were rated as NO1 at Step 1 only if listed by names in the EU Directive.
- Many publications use only common names of plants, and it was sometimes difficult to know which species are attacked. For example 'highbush blueberry' commonly refers to *V. corymbosum* (Northern highbush blueberry), but may also refer to *V. darrowii* (Southern highbush blueberry). Wordings such as '*Vaccinium* (as blueberries)' have often be used, and sometimes the common names were left.

2.2 Step 2

The *Methods* were used, with the following adjustments:

- The level of polyphagy (criterion C) was rated.
- *Vaccinium* are new crops in some regions (e.g. South America, Oceania), and some pests have passed recently onto *Vaccinium* from their other hosts. The sub-rating 'n' was used for such pests (criterion C).

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[1] Available at https://upload.eppo.int/download/103o7b00f8216

- Many pests appeared to occur on *Vaccinium* in the wild in North America. No evidence was found that they are associated with cultivated or semi-managed species of *Vaccinium*. For most, no details were found on their biology or damage. In most cases, it was not possible to rate whether life stages could be associated with fruit. They were considered unlikely to be associated with traded fruit because there was no evidence of any association with cultivated or semi-managed *Vaccinium*. The sub-rating 'w' was used (criterion A).
- Several pests were clearly associated with *Vaccinium* fruit in trade, with frequent interceptions on this commodity, but proved to not be pests of *Vaccinium*. The sub-rating 'c' (contaminants) was used (criterion A).
- Six Tephritidae (covered in EU Directive 2000/29 as 'non-European Tephritidae') were not excluded because already regulated in the EU (as NO1), but rated at Step 2. This is because some seemed to be emerging pests and because fruit is clearly the main pathway for most fruit flies (larvae in fruit).

As explained in the *Methods*, the search for information stopped as soon as a pest did not meet basic criteria, or a rating was attributed that would exclude the pest from the Alert List (e.g. A3 – associated with green parts; B2 – present in 3 EU countries or more etc.). Consequently, the data gathered for pests other than those retained for the Alert List is still preliminary and partial (in particular the distribution data or host list may be incomplete or erroneous). There may be inconsistencies between pests as to in which column the data is mentioned. This is especially the case for pests not rated A1/A2 (not associated with the fruit itself), but also those rated A1/A2 that would not be retained for the Alert List (e.g. E3 – low economic impact). Finally, editing and consistency adjustments were done only for the pests retained for the Alert List.

Ratings in the Step 2 List may seem inconsistent between species, but they were based on the information available. For example, some *Exobasidium* spp. (fungi) are clearly associated to fruit, while for others it seemed from the little information available that they were not. Whether this is the case, or whether the information was not found, was impossible to judge

Finally it should be underlined that different information may lead to different ratings. This also means that assessors working on different fruits may have rated pests differently, if they used different sources of information. Only for the pests retained in several Alert Lists was all information cross-checked and the consistency between Alert Lists was checked.

2.3 Step 3

The selection system described in the *Methods* was applied to select pests for the Alert List, with the following adjustments:

- The level of polyphagy (criterion C) was not taken into account (i.e. a polyphagous pest was not given more importance than an oligophagous one).
- The climatic similarity (criterion D) was not used (as it did not allow excluding pests).
- For pests present in the EU in fewer than 3 countries (B1b), pests that appeared to be important were identified (see section 3.2.3).
- Some pests falling into Part 2 of the Alert List were new to *Vaccinium* (Cn) and possibly emerging, and they were separated into a Part 3 of the Alert List.
- Five pests from categories that were not retained in the *Methods* (especially because of a lower likelihood of transfer) appeared to be emerging pests of *Vaccinium* where they occur. They were 'handpicked' and added to Part 3.

The combinations of criteria used to build the *Vaccinium* Alert List are presented in Annex 2. It corresponds to that described in the *Methods*, adjusted to add a Part 3.

3. Results and their discussion

3.1 Considerations on pests listed at Step 1 and Step 2, and selected for the Alert List

3.1.1 Step 1 List

729 pests were listed at Step 1.

The following were excluded from further consideration (some for several reasons, but only one is mentioned below):

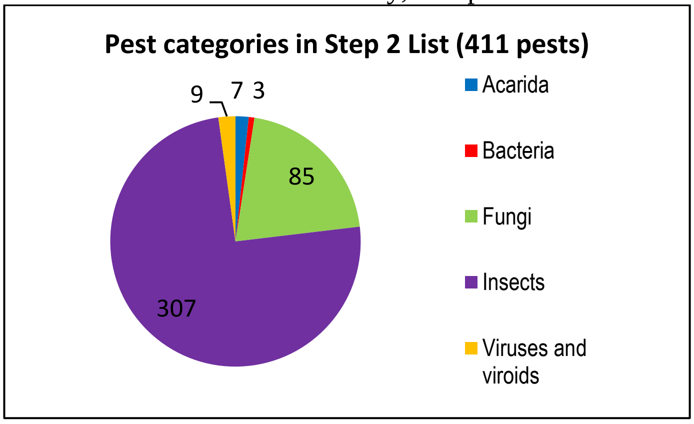
23 already quarantine pests for the EU (category NO1)
30 no possibility of association with the fruit pathway (category NO2)
220 present in 3 EU countries or more (category NO3)
13 not pests of *Vaccinium* (category NO4)

67 other reasons (e.g. natural enemy, not a pest of any crop, or pests mentioned at genus level in interceptions, or cases impossible to analyse) (category NO5)

➡ Consequently, **376** pests remained for consideration at Step 2.

3.1.2 Step 2 List

At Step 2, several of the 376 pests retained were identified as being synonymous, and additional pests were found in the literature. Eventually, **411** pests were rated at Step 2, belonging to the following pest groups:



The following pests were excluded from consideration for the Alert List:

6 already regulated in the EU (NO1). These are all Cicadellidae vector of *Xyllella fastidiosa*, covered in the EU Directive 2000/29 as 'Cicadellidae (non-European) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*)' or in emergency measures.

124 no possibility of transport on the fruit pathway (category NO2). Many of these were associated to leaves or stems. At Step 1, these pests had not been excluded because the association with fruit often requires more check than the 1-2 publications available. At Step 2, association with fruit was further checked.

36 present in 3 EU countries or more (category NO3) (see also section 3.2.3).

6 not pests of *Vaccinium* (category NO4)

18 other reasons (especially pests mentioned at genus level in interceptions, or cases impossible to analyse) (category NO5)

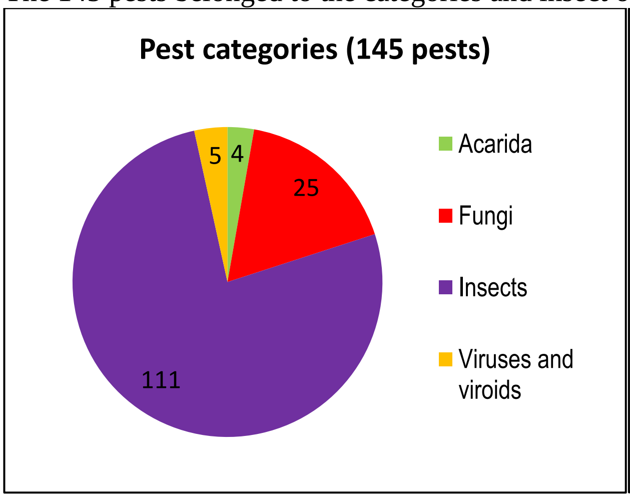
56 wild (marked A'w'), associated with fruit or unknown (of those, 6 wild pests associated to green parts were rated as NO2)

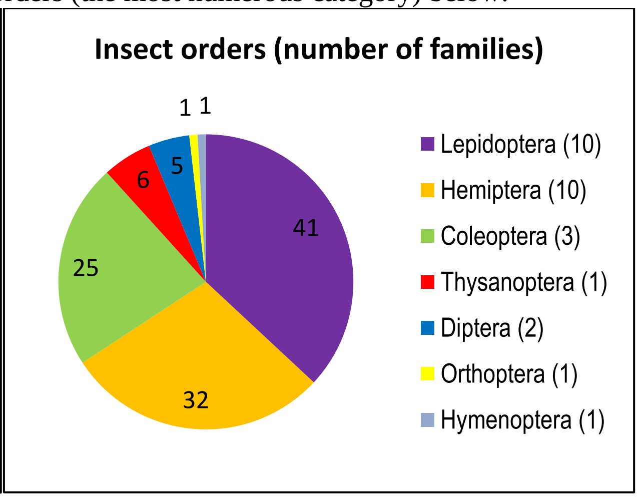
8 contaminants (marked A'c') (but associated to *Vaccinium* fruit in trade, and therefore briefly discussed in section 3.2.6).

18 present in fewer than 3 EU countries (see section 3.2.3).

➡ Consequently, **145** pests remained for consideration for the Alert List, all having some likelihood of association with *Vaccinium* fruit (see list in Annex 3 and Vaccinium deliverable xls file).

The 145 pests belonged to the categories and insect orders (the most numerous category) below.





Among the 145 pests retained, 'special' categories were:

16 having passed recently onto *Vaccinium* (marked 'n')
7 that had a higher economic importance in the past (marked 'h').
9 that are known vectors of pathogens (marked 'v').

All pests excluded from further consideration at Step 1 or Step 2 are listed in Annex 4. This includes all No categories, but also wild, contaminant and pests present in fewer than 3 EU countries. This list is also given in the Vaccinium deliverable xls file.

3.1.3 Alert List

The selection system in section 2.3 was applied in order to select pests for the Alert List.

➡ Consequently, **36** pests were selected on the Alert List (see Annex 5).

The 36 pests are divided in the three parts of the Alert List as follows:

8 Part 1 - Pests with high economic importance and more likely to transfer
17 Part 2 - Pests with lesser economic importance and more likely to transfer, or high economic importance but less likely to transfer
11 Part 3 - New pests of *Vaccinium*, possibly emerging (including 5 handpicked pests).

3.1.4 Possible gaps in data and pests missing from the lists

A large number of organisms were identified when listing pests at Step 1 and additional organisms were identified at Step 2. The study is not a complete list of pests of *Vaccinium* that do not occur in the EU, and it is certain that some pests have not been found. In particular, the searches relied extensively on the Internet to find information, and some earlier publications, or publications from some areas may be less accessible.

Among the pests categories considered, there was a good coverage of all groups in terms of compiling a list of pests, but it was difficult to find basic information for some species (especially fungi, for which taxonomic difficulties also complicate the analysis). In addition, very little information was available for some fungi that were extracted from Farr and Rossman (2015) because they had *Vaccinium* among their hosts.

The world coverage, in terms of identifying pests of *Vaccinium*, was clearly more complete for North America and Oceania, as well as for Argentina and Chile (which are also the main exporting countries in South America). The overall geographical coverage of sources is outlined below (apart from CABI CPC and PQR, which cover most regions). The type of sources only refer to those specific to countries; in all cases pests may also have been be covered across regions in global databases (e.g. fruit flies, fungi, thrips, tortricids, etc.).

Table 3. Coverage of the lists of pests

Region	Coverage	Type of sources
North America	Good, for cultivated and wild species for Canada and USA. Mexico covered mostly through publications for the USA.	Numerous scientific publication, cropping advice, pest management advice, books on *Vaccinium* and on insects, databases
South America	Good for cultivated species (introduced) in Argentina, Chile (main exporters), Uruguay, Brazil. *Vaccinium* cropping is recent and is an important export crops. Partial for the rest of South America (where some exports are mentioned from Colombia, Ecuador, Peru). Some fungi, but very little information on them.	Scientific publications, inventories of *Vaccinium* pests, cropping advice, pest management advice, information from growers' associations, PRAs from other regions
Central America	Probably incomplete	USA PRA on Central and South America. Also mentions in publications on other regions.
Caribbean	Probably incomplete	Only through publications on other regions
Africa	Probably good for South Africa. Partial for the rest of Africa. Little information for some countries such as Uganda, Madagascar, Cameroon, Zimbabwe. No pest was identified in North Africa that is not already in the EU.	PRA from other region for South Africa, scientific articles on individual pests, information on other crops for polyphagous pests.
Asia	Partial. Data lacking for China (where *Vaccinium* cropping is increasing, and where berries are also picked from the wild), Japan (not exporting) and the rest of Asia.	Scientific publications, publications on other regions, PRAs from other regions
Oceania	Good for Australia and New Zealand, incomplete for others.	Scientific publications, cropping/pest management/gardening advice
Europe	Pests in non-EU European countries (e.g. Belarus, Ukraine and Serbia, exporting to the EU) were assumed to be similar to those in the EU and no specific searches were conducted. Data is	-

Region	Coverage	Type of sources
	possibly lacking for Russia (esp. Asian part – but it is not known where the Russian production comes from)	

3.2 Other findings of interest during the preparation of Alert Lists

The following elements do not relate directly to the risk of introduction of pests with *Vaccinium* fruits, but arose in the framework of the study.

3.2.1 Pests already regulated in the EU

Many pests regulated in the EU were identified at Step 1, including some that are considered as major pests of *Vaccinium* where they occur, such as *Conotrachelus nenuphar*, *Cydia packardi*, *Rhagoletis mendax*. In the EU Directive 2000/29 (with subsequent amendments), commodities of *Vaccinium* fruit from third countries are subject to a requirement for inspection prior to export (Annex V Part B. I.3), but there are no pest specific requirements.

Non-European Tephritidae are regulated in the EU as a group. 11 species where identified as being associated with *Vaccinium*, only 5 of which are mentioned by name in EU Directive 2000/29. Among others, one belongs to the non-frugivorous genus Trupanae, and others attack fruit. It is worth noting that two species, *Anastrepha pseudoparallela* and *A. barbiellini*, both originating from South America, have recently been found in *Vaccinium* crops in Brazil, to date without economic damage. Their status on *Vaccinium* is to date unclear, and they may or may not gain importance on *Vaccinium* in the future. It may be interesting to monitor the situation in the future.

Finally, 6 out of 27 Cicadellidae were vectors of *Xylella fastidiosa* and not considered further as covered in EU Directive 2000/29 (as Cicadellidae (non-European) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*)) and emergency measures. These include the major pest *Homalodisca vitripennis* (on EPPO A1 List – see 3.2.2).

3.2.2 Pests recommended for regulation by EPPO

The following species of the Step 2 List (not all associated with fruit) are on the EPPO A1 or A2 Lists of pests recommended for regulation (although not necessarily because of their association with *Vaccinium*) and are currently not regulated in the EU: *Blueberry scorch virus* (EPPO A2), *Oemona hirta* (EPPO A1), *Orgyia pseudotsugata* (EPPO A1). In addition, *Homalodisca vitripennis* (EPPO A1) is covered in the EU Directive in the general category of non-European Cicadellidae known to be vectors of Pierce's disease (caused by *Xylella fastidiosa*), but is not named in the EU Directive.

3.2.3 Pests already present in the EU

The study identified major *Vaccinium* pests that have already been introduced into the EU in recent years. The assessment of whether a pest was absent from the EU, or present in fewer than 3 countries, or in 3 countries or more, was not always straightforward. For example for minor pests, it may be that the distribution is wider than found; they may not have attracted specific attention where introduced and their presence may not be recorded. In addition, a level of uncertainty is attached to the assessment of presence in the EU in case of taxonomic difficulties. In general, many sources had to be consulted to ascertain the presence in the EU. Most difficulties arose for fungi, especially for species either recently described or with taxonomic difficulties attached. For insects, the assessment of presence relied heavily on Fauna Europaea (which does not indicate sources) and for fungi on Farr and Rossman (2015). In both cases, additional searches were made in case of ambiguity (especially when only few countries were indicated).

Pests present in 3 countries or more were excluded from further consideration at Step 1 or Step 2. Some have already spread to a large part of the EU, such as *Drosophila suzukii*. Others still have a limited distribution in the EU, such as *Dasineura oxycoccana*, *Halyomorpha halys*, *Blueberry scorch virus* (EPPO A2 List; see 3.2.2).

18 pests (not falling under any NO categories) were assessed as present in fewer than 3 EU countries (sometimes with an uncertainty). These pests may present an interest for EU countries where they do not occur. Details for those which seemed most interesting are given in Annex 6.

3.2.4 New pests in new *Vaccinium* growing areas or emerging pests that may not have acquired their full importance

Some pests are reported as new to the crop, in areas where the cropping of *Vaccinium* is new (such as South America, but also others). There is often no indication of damage. In some cases it may be that the pest is new to the crop, in others that the pest causes only minor damage.

A number of such pests associated with fruit were added to Part 3 of the Alert List. Others were not, such as:

- *Scirtothrips ruthveni* (Thysanoptera: Thripidae), which feeds on blueberry fruit, seems to cause moderate damage, but was considered in the USA in the mid-2000 as an emerging pest of blueberries (together with other thrips species); the information available did not allow to retain it on the Alert List.
- *Cyclocephala longula* (Coleoptera: Scarabaeidae) has recently become a pest of southern highbush blueberries in California; because it is associated with roots, it was excluded.

More information may become available on such pests in the future.

3.2.5 Other pathways for *Vaccinium* pests

Plants for planting are a potential pathway for virtually all pests on the Alert List and Step 2 List. Many pests listed are associated with leaves. A number of pests are associated with wood, for example insects such as *Oemona hirta* (EPPO A1 List of pests recommended for regulation), *Dexicrates robustus* (Coleoptera: Bostrichidae; also a contaminant of blueberry fruit – see section 3.2.6), *Oberea* spp. (Coleoptera: Cerambycidae) or *Uraecha angusta* (Coleoptera: Cerambycidae). Some major fungi are also associated to stems and wood, among others polyphagous species such *Neofusicoccum nonquaesitum* and *N. vitifusiforme*. Finally, some pests are associated to roots; this includes a number of insects whose adults feed on fruit, and larvae on roots.

Some pests or individual life stages are currently covered under general requirements in the EU Directive 2000/29. This is the case for life stages associated with soil, because import of soil on its own is prohibited and there are also requirements regarding the growing media associated with plants (Annex IV, 34). Requirements for trees and shrubs (Annex IV, 39) provide, among others, for freedom from flowers and fruit, and for inspection for the presence of pests and treatment. Requirement for deciduous trees and shrubs (Annex IV, 40), provides that the plants should be dormant and free from leaves. However, not all life stages would be covered (e.g. stages associated with wood), and inspections would not target specific pests.

A few major *Vaccinium* pests likely to be transported on pathways other than fruit are highlighted below. It is not excluded that some pests that were not assessed as being associated with fruit may occasionally become associated to fruit consignments; however, no evidence was found of such association.

Finally, several pests appeared to be important in relation to other crops, and the risk of introduction is higher on their other hosts. These pests are presented in the document *Other pests of interest identified during the study of selected crops*.

Table 4. *Vaccinium* pests that may be transported on pathways other than *Vaccinium* fruit

Pest (taxonomic group)	Distribution	Basic information
Insects		
Altica sylvia (Coleoptera: Chrysomelidae)	USA, Canada	Larvae feed on leaves. May cause severe damage
Catinathrips spp. (Thysanoptera: Thripidae)	North America	Especially *C. kainos*, but also *C. similis* and *C. vaccinicolus*, feed and produce galls on leaves. Reduce quality and quantity of fruits produced, through damage on other plant parts.
Chrysoteuchia topiaria (Lepidoptera: Crambidae)	USA, Canada	Larvae in soil, feed on roots, lead to death of plants.
Croesia curvalana (Lepidoptera: Tortricidae)	Canada	Larvae feed on flower and leaf buds and leaves, and may cause extensive damage.
Iridopsis ephyraria (Lepidoptera: Geometridae)	Canada, USA	May feed on new shoots of *Vaccinium*, causing defoliation. No prior history of outbreak, but has caused high levels of defoliation of *Tsuga canadensis*, resulting in mortality of up to 40% of mature hemlock in some stands.
Limotettix vaccinii (Hemiptera: Cicadellidae)	North America	Vector of cranberry false-blossom phytoplasma (see below). Was more important in the past, as vector of this disease, which threatened the cranberry industry in the 1900s
Macaria argillacearia, *M. sulphurea* (Lepidoptera;	Canada, USA	Larvae feed on buds, leaves and flowers. May cause important damage in respectively blueberries and cranberries.

Geometridae)		
Orthorhinus cylindrirostris (Coleoptera: Curculionidae)	Australia	Native to Australia, has passed onto crops, including *Vaccinium* and grapevine. A main pest of blueberry in New South Wales. Larvae feed on stems, crowns and roots of their host plants. Known Interception, in a container of oranges.
Pathogens		
Dothichiza caroliniana (Ascomycota)	Argentina, USA	Mainly on leaves, may also infect succulent stems, causing dieback. Severe defoliation reported.
Blueberry necrotic ring blotch virus (Bromoviridae: blunervirus - - proposed)	USA	A new disease (leaf blotch and defoliation) in South-Eastern USA in southern highbush blueberries, whose agent was described in 2013. Reports were sporadic in the mid-2000s, but it has been found at more locations and States since then.
Blueberry stunt phytoplasma	North America	Causes a serious and widespread disease of blueberry. Vectored by *Scaphytopius magdalensis* and *Scaphytopius* sp.
Cranberry false blossom phytoplasma	USA	In the 1920s-30s, almost eliminated the cranberry industry in New Jersey and caused major problems in Massachusetts. In the 1990s, reappeared and spread sporadically in many cranberry farms, with increasing incidence. Its re-appearance may be due to an increase of vector populations or emergence of new, more virulent, populations of the phytoplasma. Vectored by *Limotettix vaccinii*, *Scaphytopius magdalensis*, *Euscelis striatulus*.

3.2.6 Contaminants

At Step 2, eight pests were contaminants of *Vaccinium* fruit in trade (i.e. not pests of *Vaccinium* but intercepted in consignments of *Vaccinium* fruit). Such cases were identified from South America, where their presence in *Vaccinium* fruit hinders exports to the USA. Among these, Table 5 lists 5 pests of other plants; records of interceptions in the USA on fruit other than *Vaccinium* exist for most of them. 3 other organisms were found contaminating fruit, but are apparently not pests. Most notably *Kushelina decorata* (Coleoptera: Chrysomelidae) presents many interceptions (e.g. on *Vaccinium* and raspberry).

Table 5. Contaminants of *Vaccinium* fruit

Pest (taxonomic group)	Distribution	Basic information
Athlia rustica (Coleoptera: Scarabaeidae)	Chile	Larvae cause damage by feeding on roots of *Triticum* and grasses, adults sometimes on leaves of grapevine.
Blapstinus punctulatus (Coleoptera: Tenebrionidae)	Central and South America	A pest of *Helianthus* (larvae and adults in soil feeding on roots).
Dexicrates robustus (Coleoptera: Bostrichidae)	Chile	A wood borer of many fruit species, whose adults may contaminate fruit
Frankliniella australis (Thysanoptera: Thripidae)	South America	A polyphagous thrips, of quarantine concern because of interceptions, but not associated with *Vaccinium* and does not seem to have economic importance on its other hosts.
Naupactus xanthographus (Coleoptera: Curculionidae)	South America	A polyphagous pest of *Vitis vinifera* (major host) and various others (e.g. *Citrus*, *Malus domestica*, *Prunus*, *Pyrus communis*, *Solanum lycopersicum*, *Solanum tuberosum*). Larvae feed on roots of hosts, and adults may contaminate fruit. There was an uncertainty on whether *Vaccinium* is a host, but in the absence of evidence, it was considered as a contaminant.

3.2.7 Other considerations

- The level of polyphagy was not taken into account in the Alert List's selection system, but there seems to be differences between *Vaccinium* and other fruits studied: relatively many pests of *Vaccinium* are restricted to that genus or to Ericaceae, representing 21% of the pests for which the level of polyphagy was rated at Step 2. The proportion is similar for Alert List pests (7 out of 36).
- The screening process focused on the most widely grown or traded species, such as *V. corymbosum* or *V. macrocarpon*, which was considered more appropriate for an early warning system. However, it also took account of other *Vaccinium* species. It should be noted that host lists are not always complete with regards to individual *Vaccinium* spp. Many publications mention only common names (e.g. blueberry, cranberry), which may refer to different species (see 1.1). In most cases where a pest is reported on one or few *Vaccinium*, it is difficult to judge if this reflects its full host range, or whether it is not reported on other *Vaccinium* species because these are not present where the pest occurs.
- Recent descriptions of new pest species or division of species may lead to situations where the exact distribution of pests is not known. Such pests may be more widespread than currently recorded. This is the case for several fungi and viruses on the Step 2 List.

3.2.8 Were major pests identified?

A number of *Vaccinium* pests had already been identified in the EPPO Alert List or by the analysis made in the Netherlands of *Vaccinium* pests (NVWA, 2012); some others have already been introduced in the EU. The screening for the Alert List allowed to identify more pests, and to prepare an Alert List of some that may be associated with fruit in trade. The process followed was time-consuming, but did allow identifying a larger number of pests from various origins, including possibly emerging ones (although there are many uncertainties). It should also be noted that too little information was available from some areas, especially Asia, and that some important pests are probably missing from the Alert List. However, the countries which export fruit to the EU (see Annex 1) seem to be reasonably covered. Finally, the process followed was a screening, and some pests listed on the Alert List may not become associated to fruit for reasons that would become clear only if a pest risk analysis was conducted (e.g. if only a mobile life stage of a pest is associated with *Vaccinium* fruit).

4. Conclusion

- A large number of pests were identified as being potentially associated with *Vaccinium* and *Vaccinium* fruit, much higher than anticipated at the start of the study.
- The large number of pests associated to green parts may justify a requirement that consignments of *Vaccinium* fruit should be free from leaves. An in-depth analysis was not conducted to check whether current practices in exporting countries already ensure this to a sufficient extent.
- The large number of pests associated to either green parts, wood or roots would justify phytosanitary requirements for plants for planting of *Vaccinium.*
- 36 pests were retained for the Alert List for *Vaccinium*, but a much larger number were potentially associated with *Vaccinium* fruit. This may justify the need for a phytosanitary certificate for *Vaccinium* fruit.
- It would be useful that countries record intercepted non-regulated pests on *Vaccinium* fruit, so that PRAs/specific requirements may be considered for some pests
- DROPSA Alert List will be used in the framework of EPPO to raise awareness of pests that may be associated with fruit consignments. Relevant information will be presented to EPPO Panels and included in EPPO Global Database.
- The likelihood of transfer from *Vaccinium* consignments to other hosts are higher if infested fruit consignments are imported into facilities close to where plants are grown. The analysis was not made of whether this is a common practice in the EU. This may be less of a problem for *Vaccinium* than for other fruit, as they are imported in small size packages, but some repacking may nevertheless occur in the EU. However, as in the case of the EPPO tomato study, this emphasizes the need to separate import and packing facilities from facilities where plants are produced, and the need to have appropriate management of waste if fruit have to be discarded after import.
- A number of pests already regulated in the EU were identified. The present study did not consider in detail the host status of *Vaccinium*, nor if measures would be appropriate in relation to *Vaccinium* for those pests. Such analysis would be interesting to determine if existing phytosanitary requirements appropriately protect the EU against the introduction of these pests on *Vaccinium* commodities (plants, fruit etc. depending on the pests). *Vaccinium*, as minor crops whose commodities are not subject to many specific requirements, may favour the entry of major pests of other crops. The study also identified a few pests that are on EPPO Lists of regulated pests, but not yet regulated in the EU.
- Several Cicadellidae and Tephritidae were identified, regulated in the EU under general categories. It could be envisaged whether major species should be listed by name in the Plant Health Regulation, especially *Homalodisca vitripennis*.

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ANNEX 1. Detailed data on Vaccinium trade

(Source: Eurostat) 0 represent quantities below 100 kg

Table 1 imports to the EU 27 by broad origins (100 kg).

	2002	2004	2006	2008	2009	2010	2011	2012
Eu28_Intra	118.160	103.487	158.850	224.898	308.082	319.119	414.968	425.956
EPPO Non-EU	107.584	82.435	60.478	13.851	20.206	28.500	38.407	47.409
Non-EPPO	19.913	26.803	72.159	122.979	119.301	148.000	182.257	205.543
Total	**245.657**	**212.725**	**291.487**	**361.728**	**447.589**	**495.619**	**635.632**	**678.908**

Table 2 Imports to the EU-27 of 'Cranberries, bilberries and other fruits of the genus vaccinium (fresh)' (in 100 kg). * EPPO countries

	2002	2004	2006	2008	2009	2010	2011	2012 (incomplete)
North America	**11.871**	**10.182**	**21.631**	**21.791**	**18.120**	**15.179**	**19.246**	**16.817**
Canada	1.461	425	2.400	9.182	5.535	2.091	6.297	3.588
Mexico	:	16	121	10	33	118	41	754
United States	10.410	9.741	19.110	12.599	12.552	12.970	12.908	12.475
South America	**4.940**	**14.181**	**45.674**	**97.313**	**92.772**	**124.724**	**151.906**	**176.874**
Argentina	1.389	4.812	16.240	31.169	31.941	39.959	48.509	44.761
Brazil	50	136	85	88	79	61	53	9
Chile	3.483	9.183	28.445	59.628	53.642	72.544	88.980	118.944
Colombia	10	12	98	352	588	:	0	37
Ecuador	:	:	:	:	96	:	:	68
Peru	8	:	:	:	3	21	41	406
Uruguay	:	38	806	6.076	6.423	12.139	14.323	12.649
Central America	**13**	**0**	**14**	**0**	**0**	**21**	**0**	**0**
Costa Rica	:	:	0	:	:	:	:	:
Guatemala	13	:	13	:	:	21	:	:
Honduras	:	:	1	:	:	:	:	:
Africa	**925**	**1254**	**1356**	**4019**	**12074**	**20054**	**28605**	**41093**
Burundi	:	:	:	:	0	:	:	:
Cameroon	:	:	:	:	:	:	:	4
Congo, Dem. Rep.	:	:	:	:	0	0	:	:
Egypt	:	:	:	18	8	2	9	:
Ghana	:	:	:	1	:	:	:	:
Kenya	1	:	:	24	:	:	:	:
Madagascar	:	:	:	:	192	:	:	:
Morocco*	:	:	:	2.149	6.257	12.646	18.670	29.279
South Africa	908	1.252	1.356	1.814	5.599	7.403	9.833	11.802
Uganda	:	1	:	13	18	3	93	2
Zambia	0	:	:	:	:	:	:	:
Zimbabwe	16	1	:	:	:	:	:	6
Asia	**740**	**1**	**53**	**493**	**1075**	**0**	**0**	**2**
China	740	1	53	493	1.068	0	0	0
India	:	:	:	:	:	:	:	0
Indonesia	:	:	:	:	:	:	:	2
Malaysia	0	:	:	:	:	:	:	:
Thailand	:	0	0	:	7	:	:	:
Vietnam	:	:	:	:	:	:	0	:
Near East	**10**	**92**	**61**	**1**	**0**	**1**	**0**	**0**
Iran	:	2	2	:	:	:	:	:
Israel*	10	0	0	:	:	0	:	0
Lebanon	:	:	:	1	:	:	:	:
Turkey*	:	90	59	:	:	1	0	:
Oceania	**1424**	**1183**	**1767**	**1511**	**1517**	**668**	**1170**	**36**
Australia	861	806	515	549	891	584	1.071	:
New Zealand	563	377	1.252	962	626	84	99	36
Europe (non-EU)	**107.574**	**82.345**	**62.081**	**11.702**	**13.949**	**15.853**	**19.737**	**18.130**
Belarus*	11.308	12.596	21.871	3.237	6.179	2.578	11.017	2.425
Bosnia and Herzeg.*	55	219	465	458	311	667	796	396
Iceland	:	:	2	:	:	:	:	:
Macedonia FYR*	:	:	:	0	196	2.058	937	481
Montenegro	:	:	1.660	:	:	:	:	:
Norway*	163	279	265	17	207	80	115	583
Russia*	44.827	41.186	25.149	0	146	100	15	4.274
Serbia*	:	:	447	2.764	1.762	3.126	706	2.037
Switzerland*	:	118	27	10	5	10	2	:
Ukraine*	51.221	27.947	12.195	5.216	5.143	7.234	6.149	7.934

ANNEX 2. Categories of pests retained on the Alert List

A detailed description of categories and ratings can be found in the *Methods*.

Ratings retained on the Alert List (all pests are absent from the EU, i.e. B1a)

Sub-ratings are covered in the ratings below (e.g. E1 covers E1u, E1h, E1d) except if explicitly excluded.

Place on Alert List	Combination of ratings covered in each part	Description (all pests below may be associated with fruit (A1 or A2) - applies to each description)
Part 1 - Pests with high economic importance and more likely to transfer	• A1t/A2t + E1 (except E1u, E1h) + any other	• pests able to transfer, with a high economic impact currently (not uncertain high impact or high impact in the past)
Part 2 - Pests with lesser economic importance and more likely to transfer, or with high economic importance but less likely to transfer	• A1/A2 or A1ut/A2ut + E1 + any other	• pests less able to transfer (or with an uncertainty on transfer), with a high economic impact currently
	• A1t/A2t + E1u or E1h + any other (not Cn)	• pests able to transfer, with a high economic impact (but either with an uncertainty, or in the past), and not newly recorded on the crop
	• A1t/A2t + E2+ (F1 or G1), but not Cn)	• pests able to transfer, with a moderate economic impact currently, but intercepted, spreading/invasive (and not newly recorded on the crop).
	• A1t + E2 + any other (not Cn)	• non-mobile life stage associated with the fruit, pest able to transfer, with a moderate recorded impact currently
	• A1t/A2t + E3v or EUv + (F1 or G1), but not Cn	• pests able to transfer, known vector, with a low or unknown recorded impact currently, and intercepted, spreading/invasive (and not newly recorded on the crop)
	• A1t/A2t + EU+ (F1 or G1), but not Cn	• pests able to transfer, with an unknown recorded impact currently, but intercepted, spreading/invasive (and not newly recorded on the crop)
Part 3 – New pests of *Vaccinium*, possibly emerging	• A1t/A2t + + Cn + (E1u or E1h or E2 or E3v or EU) + any other	• pests able to transfer, newly recorded on the crop, and economic impact high (uncertain or in the past), or moderate, or low if vector, or uncertain
	• Relevant handpicked	• Pests in categories not retained for the Alert List, but with interesting features and possibly emerging

Not retained on the Alert List

- B1b (present in the EU in fewer than 3 countries)
- Aw (wild)
- Ac (contaminant)
- NO categories
- Combinations of ratings not fulfilling any of the combinations above

ANNEX 3. List of pests remaining for consideration for the Alert List at Step 2

This list includes all pests retained for consideration, i.e. except 'wild', 'contaminant', 'present in less than 3 EU countries' and all NO categories.

Alert List pests are in bold

Type of pests: A = arachnida; **I** = insecta, F = fungi, V = viruses and viroids

Name	Type	Taxonomy
Acalitus vaccinii	**A**	**Acarida: Eriophyidae**
Accuminulia buscki	**I**	**Lepidoptera: Tortricidae**
Acleris minuta	**I**	**Lepidoptera: Tortricidae**
Acrobasis vaccinii	**I**	**Lepidoptera: Pyralidae**
Aegorhinus superciliosus	**I**	**Coleoptera: Curculionidae**
Amphipyra pyramidoides	I	Lepidoptera: Noctuidae
Anastrepha barbiellinii	I	Diptera: Tephritidae
Anastrepha pseudoparallela	I	Diptera: Tephritidae
Anthonomus musculus	I	Coleoptera: Curculionidae
Argyrotaenia citrana	**I**	**Lepidoptera: Tortricidae**
Argyrotaenia mariana	I	Lepidoptera: Tortricidae
Argyrotaenia sphaleropa	**I**	**Lepidoptera: Tortricidae**
Aroga trialbamaculella	**I**	**Lepidoptera: Gelechiidae**
Asteridiella exilis	F	Ascomycota
Atichia lopesii	F	Ascomycota
Blueberry latent spherical virus	V	Unknown
Blueberry latent virus	V?	Unknown
Blueberry mosaic virus	V	Ophioviridae: Ophiovirus
Blueberry shock virus	V	Bromoviridae: Ilarvirus
Blueberry virus A	V	Closteroviridae: closterovirus
Cacoscelis melanoptera	I	Coleoptera: Chrysomelidae
Caedicia simplex	I	Orthoptera: Tettigoniidae
Caeporis stigmula	I	Coleoptera: Chrysomelidae
Callophrys augustinus	I	Lepidoptera: Lycaneidae
Callophrys henrici	I	Lepidoptera: Lycaneidae
Capnofrasera dendryphioides	F	Ascomycota
Chaetosiphon thomasi	I	Hemiptera: Aphididae
Chaetothyrium petchii	F	Ascomycota
Chileulia stalactitis	I	Lepidoptera: Tortricidae
Choristoneura parallela	**I**	**Lepidoptera: Tortricidae**
Cingilia catenaria	**I**	**Lepidoptera: Geometridae**
Clarkeulia bourquini	**I**	**Lepidoptera: Tortricidae**
Clarkeulia deceptiva	**I**	**Lepidoptera: Tortricidae**
Colaspis costipennis	I	Coleoptera: Chrysomelidae
Colaspis pseudofavosa	I	Coleoptera: Chrysomelidae
Colaspis varia	I	Coleoptera: Chrysomelidae
Costelytra zealandica	I	Coleoptera: Scarabaeidae
Cryptocephalus incertus	I	Coleoptera: Chrysomelidae
Ctenopseustis obliquana	**I**	**Lepidoptera: Tortricidae**
Dasineura cyanococci	I	Diptera: Cecidomyiidae
Diaporthe australafricana	**F**	**Ascomycota**
Diaporthe passiflorae	F	Ascomycota
Diaspidiotus forbesi	I	Hemiptera: Diaspididae
Diptacus bracteatus	A	Acarida: Diptilomiopidae
Disonychodes exclamationis	I	Coleoptera: Chrysomelidae
Duplaspidiotus claviger	I	Hemiptera: Diaspididae
Ematurga amitaria	I	Lepidoptera: Crambidae
Epiglaea apiata	**I**	**Lepidoptera: Noctuidae**
Eupithecia miserulata	I	Lepidoptera: Geometridae
Eutrapela clemataria	I	Lepidoptera: Geometridae
Exobasidium maculosum	**F**	**Basidiomycota**
Exobasidium talamancense	F	Basidiomycota
Fiorinia vacciniae	I	Hemiptera: Diaspididae
Frankliniella bispinosa	**I**	**Thysanoptera: Thripidae**
Frankliniella gemina	I	Thysanoptera: Thripidae
Frankliniella vaccinii	I	Thysanoptera: Thripidae
Gliocephalotrichum bulbilium	**F**	**Ascomycota**
Graphocephala versuta	I	Hemiptera: Cicadellidae
Grapholita conversana	I	Lepidoptera: Tortricidae
Grapholita libertina	**I**	**Lepidoptera: Tortricidae**
Greeneria uvicola	F	Ascomycota
Hemadas nubilipennis	I	Hymenoptera: Pteromalidae
Hemiberlesia oxycoccus	I	Hemiptera: Diaspididae
Hylamorpha elegans	**I**	**Coleoptera: Scarabaeidae**
Hyphantus sulcifrons	I	Coleoptera: Curculionidae
Illinoia pepperi	I	Hemiptera: Aphididae
Largus rufipennis	I	Hemiptera: Largidae
Leptocoris trivittatus	I	Hemiptera: Rhopalidae
Leptoglossus chilensis	I	Hemiptera: Coreidae
Leptoglossus impictus	I	Hemiptera: Coreidae
Leptoglossus phyllopus	I	Hemiptera: Coreidae
Leptoglossus quadricollis	I	Hemiptera: Coreidae
Lexiphanes coenobita	I	Coleoptera: Chrysomelidae
Liothula omnivora	I	Lepidoptera: Psychidae
Lygaeus alboornatus	I	Hemiptera: Lygaeidae
Macaria truncataria	I	Lepidoptera: Geometridae
Macrodactylus subspinosus	I	Coleoptera: Scarabaeidae
Macrosteles quadrilineatus	I	Hemiptera: Cicadellidae
Melanchra picta	I	Lepidoptera: Noctuidae
Meliola nidulans	F	Ascomycota
Mesolecanium nigrofasciatum	I	Hemiptera: Coccidae
Monilinia polycodii	F	Ascomycota
Mycosphaerella nigromaculans	F	Ascomycota
Naohidemyces fujisanensis	F	Basidiomycota
Nemocestes incomptus	I	Coleoptera: Curculionidae
Neochlamisus cribripennis	I	Coleoptera: Chrysomelidae
Nysius simulans	I	Hemiptera: Lygaeidae
Ochropleura implecta	**I**	**Lepidoptera: Noctuidae**
Oiketicus platensis	I	Lepidoptera: Psychidae
Orgyia leucostigma	I	Lepidoptera: Lymantriidae
Orthosia hibisci	**I**	**Lepidoptera: Noctuidae**
Paraulacizes irrorata	I	Hemiptera: Cicadellidae
Paria fragariae	I	Coleoptera: Chrysomelidae
Pawiloma victima	I	Hemiptera: Cicadellidae
Pestalotiopsis clavispora	F	Ascomycota
Phlyctinus callosus	**I**	**Coleoptera: Curculionidae**
Phomopsis columnaris	F	Ascomycota
Phyllosticta vaccinii	F	Ascomycota
Phyllosticta vacciniicola	F	Ascomycota
Plagiognathus fulvaceus	I	Hemiptera: Miridae
Plagiognathus obscurus	I	Hemiptera: Miridae
Plagiognathus repetitus	**I**	**Hemiptera: Miridae**
Platynota idaeusalis	I	Lepidoptera: Tortricidae
Platynota meridionalis	I	Lepidoptera: Tortricidae
Proeulia auraria	**I**	**Lepidoptera: Tortricidae**
Proeulia chrysopteris	**I**	**Lepidoptera: Tortricidae**
Proeulia triquetra	**I**	**Lepidoptera: Tortricidae**

Name	Type	Taxonomy
Pseudaonidia trilobitiformis	I	Hemiptera: Diaspididae
Pseudococcus cribata	I	Hemiptera: Pseudococcidae
Pseudotracylla dentata	F	Ascomycota
Pseudotracylla falcata	F	Ascomycota
Pulvinaria urbicola	I	Hemiptera: Coccidae
Pyrrhalta vaccinii	I	Coleoptera: Chrysomelidae
Reticana lineada	I	Hemiptera: Cicadellidae
Rhabdospora oxycocci	F	Ascomycota
Rhadopterus picipes	I	Coleoptera: Chrysomelidae
Rhagoletis sp. nr *tabellaria*	I	Diptera: Tephritidae
Rhyephenes humeralis	I	Coleoptera: Curculionidae
Scaphytopius acutus	I	Hemiptera: Cicadellidae
Scaphytopius frontalis	I	Hemiptera: Cicadellidae
Scaphytopius magdalensis	I	Hemiptera: Cicadellidae
Scaphytopius verecundus	I	Hemiptera: Cicadellidae
Sciopithes obscurus	I	Coleoptera: Curculionidae
Scirtothrips ruthveni	I	Thysanoptera: Thripidae
Serica tristis	I	Coleoptera: Scarabaeidae
Sparganothis reticulatana	I	Lepidoptera: Tortricidae
Sparganothis sulfureana	**I**	**Lepidoptera: Tortricidae**
Sparganothis unifasciana	I	Lepidoptera: Tortricidae
Spintherophyta semiaurata	I	Coleoptera: Chrysomelidae
Syncharina lineiceps	I	Hemiptera: Cicadellidae
Synchronoblastia crypta	F	Ascomycota
Synchytrium vaccinii	F	Chytridiomycota
Systena frontalis	**I**	**Coleoptera: Chrysomelidae**
Teia anartoides	**I**	**Lepidoptera: Lymantriidae**
Tetranychus desertorum	A	Acarida: Tetranychidae
Thekopsora minima	**F**	**Basidiomycota**
Thrips imaginis	I	Thysanoptera: Thripidae
Thrips obscuratus	**I**	**Thysanoptera: Thripidae**
Tolype innocens	**I**	**Lepidoptera: Lasiocampidae**
Tomoplagia sp.	I	Diptera: Tephritidae
Tortrix excessana	**I**	**Lepidoptera: Tortricidae**
Tretogonia notatifrons	I	Hemiptera: Cicadellidae
Tydeus tuttlei	A	Acarida: Tydeidae
Xylena nupera	**I**	**Lepidoptera: Noctuidae**
Zasmidium oxycocci	F	Ascomycota

ANNEX 4. Organisms excluded from further consideration at Step 1 and Step 2

The table includes the following categories: contaminant, wild, present in fewer than 3 EU countries, all NO categories (for those, one organism may fall under several NO categories, but only one was used to exclude it, and not all are indicated) (i.e. a pest may have been excluded because it is regulated in the EU or because it is widespread in the EU, but it may be that *Vaccinium* is not a host, or that it is not associated with fruit).

Warning: this is not a list of *Vaccinium* pests: the host status was not necessarily verified for pests in NO categories excluded for other reasons (e.g. present in the EU, associated to wood, regulated in the EU etc.).

Type of pests: A = Arachnida, B = Bacteria (incl. phytoplasma), C = Chromista, F = Fungi, G = Gastropoda, I = Insecta, N = Nematoda, V = Viruses and viroids. U = unknown (taxonomic group not be found)

Species		Taxonomy	Conclusion
Amplicephalus sp.	I	Hemiptera: Cicadellidae	contaminant
Arhyssus tricostatus	I	Hemiptera: Rhopalidae	contaminant
Athlia rustica	I	Coleoptera: Scarabaeidae	contaminant
Blapstinus punctulatus	I	Coleoptera: Tenebrionidae	contaminant
Dexicrates robustus	I	Coleoptera: Bostrichidae	contaminant
Frankliniella australis	I	Thysanoptera: Thripidae	contaminant
Kuschelina decorata	I	Coleoptera: Chrysomelidae	contaminant
Naupactus xanthographus	I	Coleoptera: Curculionidae	contaminant
Acanthococcus azaleae	I	Hemiptera: Eriococcidae	present in the EU (fewer than 3 countries)
Blueberry red ringspot virus	V	Caulimoviridae: soymovirus	present in the EU (fewer than 3 countries)
Blueberry shoestring virus	V	Sobemovirus	present in the EU (fewer than 3 countries)
Calonectria colhounii	F	Ascomycota	present in the EU (fewer than 3 countries)
Ceroplastes cirripediformis	I	Hemiptera: Coccidae	present in the EU (fewer than 3 countries)
Colletotrichum karstii	F	Ascomycota	present in the EU (fewer than 3 countries)
Diaspidiotus ancylus	I	Hemiptera: Diaspididae	present in the EU (fewer than 3 countries)
Epiphyas postvittana	I	Lepidoptera: Tortricidae	present in the EU (fewer than 3 countries)
Gloeosporium minus	F	Ascomycota	present in the EU (fewer than 3 countries)
Neopestalotiopsis clavispora	F	Ascomycota	present in the EU (fewer than 3 countries)
Oligonychus ilicis	A	Acarida: Tetranychidae	present in the EU (fewer than 3 countries)
Pestalotia vaccinii	F	Ascomycota	present in the EU (fewer than 3 countries)
Pestalotiopsis adusta	F	Ascomycota	present in the EU (fewer than 3 countries)
Phyllosticta capitalensis	F	Ascomycota	present in the EU (fewer than 3 countries)
Phyllosticta elongata	F	Ascomycota	present in the EU (fewer than 3 countries)
Prodiplosis vaccinii	I	Diptera: Cecidomyiidae	present in the EU (fewer than 3 countries)
Pseudococcus maritimus	I	Hemiptera: Pseudococcidae	present in the EU (fewer than 3 countries)
Zaprionus indianus	I	Diptera: Drosophilidae	present in the EU (fewer than 3 countries)
Abagrotis brunneipennis	I	Lepidoptera: Noctuidae	wild
Acleris albicomana	I	Lepidoptera: Tortricidae	wild
Acleris macdunnoughi	I	Lepidoptera: Tortricidae	wild
Acleris maculidorsana	I	Lepidoptera: Tortricidae	wild
Acleris submaccana	I	Lepidoptera: Tortricidae	wild
Acronicta lanceolaria	I	Lepidoptera: Noctuidae	wild
Acronicta tritona	I	Lepidoptera: Noctuidae	wild
Amorbia humerosana	I	Lepidoptera: Tortricidae	wild

Species		Taxonomy	Conclusion
Apharetra dentata	I	Lepidoptera: Noctuidae	wild
Apotomis vaccini	I	Lepidoptera: Tortricidae	wild
Archips argyrospilus	I	Lepidoptera: Tortricidae	wild
Archips georgiana	I	Lepidoptera: Tortricidae	wild
Chaetaglaea cerata	I	Lepidoptera: Noctuidae	wild
Chaetaglaea sericea	I	Lepidoptera: Noctuidae	wild
Chaetaglaea tremula	I	Lepidoptera: Noctuidae	wild
Choristoneura zapulata	I	Lepidoptera: Tortricidae	wild
Chrysanympha formosa	I	Lepidoptera: Noctuidae	wild
Colias interior	I	Lepidoptera: Pieridae	wild
Cyclophora myrtaria	I	Lepidoptera: Geometridae	wild
Diarsia rubifera	I	Lepidoptera: Noctuidae	wild
Drasteria adumbrata	I	Lepidoptera: Noctuidae	wild
Drasteria occulta	I	Lepidoptera: Noctuidae	wild
Eueretagrotis attenta	I	Lepidoptera: Noctuidae	wild
Eupsilia tristigmata	I	Lepidoptera: Noctuidae	wild
Euxoa redimicula	I	Lepidoptera: Noctuidae	wild
Filatima vaccinii	I	Lepidoptera: Gelechiidae	wild
Frankliniella caudiseta	I	Thysanoptera: Thripidae	wild
Glena cognataria	I	Lepidoptera: Geometridae	wild
Harrisimemna trisignata	I	Lepidoptera: Noctuidae	wild
Lacinipolia lorea	I	Lepidoptera: Noctuidae	wild
Lycaena mariposa	I	Lepidoptera: Lycaneidae	wild
Mesothea incertata	I	Lepidoptera: Geometridae	wild
Metarranthis obfirmaria	I	Lepidoptera: Geometridae	wild
Metaxaglaea semitaria	I	Lepidoptera: Noctuidae	wild
Olethreutes appendicea	I	Lepidoptera: Tortricidae	wild
Pandemis limitata	I	Lepidoptera: Tortricidae	wild
Phlyctaenia tertialis	I	Lepidoptera: Crambidae	wild
Polia nimbosa	I	Lepidoptera: Noctuidae	wild
Psectraglaea carnosa	I	Lepidoptera: Noctuidae	wild
Rhagoletis - undescribed species	I	Diptera: Tephritidae	wild
Scopula limboundata	I	Lepidoptera: Geometridae	wild
Sideridis maryx	I	Lepidoptera: Noctuidae	wild
Sympistis dentata	I	Lepidoptera: Noctuidae	wild

Species		Taxonomy	Conclusion
Syngrapha octoscripta	I	Lepidoptera: Noctuidae	wild
Syngrapha orophila	I	Lepidoptera: Noctuidae	wild
Tetralopha vacciniivora	I	Lepidoptera: Pyralidae	wild
Xanthotype sospeta	I	Lepidoptera: Geometridae	wild
Xylena thoracica	I	Lepidoptera: Noctuidae	wild
Xylotype capax	I	Lepidoptera: Noctuidae	wild
Zomaria interruptolineana	I	Lepidoptera: Tortricidae	wild
Abagrotis anchocelioides	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Acalymma trivittatum	I	Coleoptera: Chrysomelidae	NO2 (not associated with Vaccinium fruit)
Acharia stimulea	I	Lepidoptera: Limacodidae	NO2 (not associated with Vaccinium fruit)
Acleris hastiana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Acleris lipsiana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Acleris schalleriana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Acronicta impressa	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Actebia fennica	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Adoretus sinicus	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Adoxophyes orana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Agrotis ipsilon	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Agrotis sp.	I	Lepidoptera: Noctuidae	NO5 (other reason)
Allanthophomopsis cytosporea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Allantophomopsis lycopodina	F	Ascomycota	NO3 (present in 3 EU countries or more)
Alternaria alternata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Alternaria japonica	F	Ascomycota	NO3 (present in 3 EU countries or more)
Alternaria tenuissima	F	Ascomycota	NO3 (present in 3 EU countries or more)
Altica sylvia	I	Coleoptera: Chrysomelidae	NO2 (not associated with Vaccinium fruit)
Ametastegia glabrata	I	Hymenoptera: Tenthredinidae	NO3 (present in 3 EU countries or more)
Amphiscepa bivittata	I	Hemiptera: Fulgoridae	NO2 (not associated with Vaccinium fruit)
Amplicephalus curtulus	I	Hemiptera: Cicadellidae	NO4 (not associated with Vaccinium)
Amplicephalus dubius	I	Hemiptera: Cicadellidae	NO4 (not associated with Vaccinium)
Amplicephalus glaucus	I	Hemiptera: Cicadellidae	NO4 (not associated with Vaccinium)
Amplicephalus marginellanus	I	Hemiptera: Cicadellidae	NO4 (not associated with Vaccinium)
Anacampsis sp.	I	Lepidoptera: Gelechiidae	NO5 (other reason)
Anastrepha fraterculus	I	Diptera: Tephritidae	NO1 (regulated in the EU)
Anoplophora chinensis	I	Coleoptera: Cerambycidae	NO2 (not associated with Vaccinium fruit)
Anthonomus signatus	I	Coleoptera: Curculionidae	NO1 (regulated in the EU)
Aphelia paleana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Aphis craccivora	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aphis fabae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aphis gossypii	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aphis spiraecola	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aphis vaccinii	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aphodius tasmaniae	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Apion reconditum	I	Coleoptera: Apionidae	NO2 (not associated with Vaccinium fruit)

Species		Taxonomy	Conclusion
Apion sp.	I	Coleoptera: Apionidae	NO5 (other reason)
Aporia crataegi	I	Lepidoptera: Pieridae	NO3 (present in 3 EU countries or more)
Apterygothrips sp.	I	Thysanoptera: Thripidae	NO5 (other reason)
Archips purpurana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Archips rosana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Argyrotaenia velutinana	I	Lepidoptera: Tortricidae	NO4 (not associated with Vaccinium)
Armillaria luteobubalina	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Armillaria mellea	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Aspidiotus nerii	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Asterobemisia carpini	I	Hemiptera: Aleyrodidae	NO3 (present in 3 EU countries or more)
Aulacaspis rosae	I	Hemiptera: Diaspididae	No3
Aulacorthum vaccinii	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Aureobasidium pullulans	F	Ascomycota	NO3 (present in 3 EU countries or more)
Autographa californica	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Bactrocera tryoni	I	Diptera: Tephritidae	NO1 (regulated in the EU)
Belonolaimus longicaudatus	N	Tylenchida: Belonolaimidae	NO2 (not associated with Vaccinium fruit)
Bemisia tabaci	I	Hemiptera: Aleyrodidae	NO3 (present in 3 EU countries or more)
Bergallia confusa	I	Hemiptera: Cicadellidae	NO4 (not associated with Vaccinium)
Bergallia sp.	I	Hemiptera: Cicadellidae	NO5 (other reason)
Bipolaris cynodontis	F	Ascomycota	NO3 (present in 3 EU countries or more)
Blitopertha orientalis	I	Coleoptera: Scarabaeidae	NO1 (regulated in the EU)
Blueberry leaf mottle virus	V	Secoviridae: nepovirus	NO1 (regulated in the EU)
Blueberry necrotic ring blotch virus	V	Bromoviridae: blunervirus (proposed)	NO2 (not associated with Vaccinium fruit)
Blueberry scorch virus	V	Betaflexiviridae: Carlavirus	NO3 (present in 3 EU countries or more)
Blueberry stunt phytoplasma	B	Acholeplasmatales: Acholeplasmataceae	NO2 (not associated with Vaccinium fruit)
Boarmia pampinaria	I	Lepidoptera: Geometridae	NO5 (other reason)
Botryosphaeria australis	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Botryosphaeria corticis	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Botryosphaeria dothidea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botryosphaeria lutea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botryosphaeria obtusa	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botryosphaeria parva	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botryosphaeria ribis	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botryosphaeria sp.	F	Ascomycota	NO5 (other reason)
Botrytis cinerea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Botrytis pseudocinerea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Brachycaudus helichrysi	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Brevipalpus obovatus	A	Acarida: Tenuipalpidae	NO3 (present in 3 EU countries or more)
Bryobia praetiosa	A	Acarida: Tetranychidae	NO3 (present in 3 EU countries or more)
Bufomibcrus sp.	U	Not found	NO5 (other reason)
Burkholderia andropogonis	B	Burkholderiales: Burkholderiaceae	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
Cabera erythemaria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Cadra cautella	I	Lepidoptera: Pyralidae	NO3 (present in 3 EU countries or more)
Caliothrips phaseoli	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Caliroa annulipes	I	Hymenoptera: Tenthredinidae	NO3 (present in 3 EU countries or more)
Calonectria ilicicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Calonectria kyotensis	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Calonectria pyrochroa	F	Ascomycota	NO3 (present in 3 EU countries or more)
Calpodes ethlius	I	Lepidoptera: Hesperiidae	NO2 (not associated with Vaccinium fruit)
Calpodes sp.	I	Lepidoptera: Hesperiidae	NO5 (other reason)
Camnula	I	Orthoptera: Acrididae	NO5 (other reason)
Camnula pellucides	I	Orthoptera: Acrididae	NO2 (not associated with Vaccinium fruit)
Catacauma paramoense	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Catinathrips kainos	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Catinathrips similis	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Catinathrips vaccinicolus	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Catocala andromedae	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Catocala gracilis	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Catocala louiseae	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Catocala sordida	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Ceratitis capitata	I	Diptera: Tephritidae	NO3 (present in 3 EU countries or more)
Cercospora sp.	F	Ascomycota	NO5 (other reason)
Ceroplastes ceriferus	I	Hemiptera: Coccidae	NO2 (not associated with Vaccinium fruit)
Ceroplastes floridensis	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Ceroplastes sinensis	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Chaetosiphon fragaefolii	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Cheimatobia bruceata	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Cherry leaf roll virus	I	Secoviridae: nepovirus	NO1 (regulated in the EU)
Chondrostereum purpureum	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Choristoneura conflictana	I	Lepidoptera: Tortricidae	NO1 (regulated in the EU)
Choristoneura rosaceana	I	Lepidoptera: Tortricidae	NO1 (regulated in the EU)
Chrysoteuchia topiaria	I	Lepidoptera: Crambidae	NO2 (not associated with Vaccinium fruit)
Cladosporium cladosporioides	F	Ascomycota	NO3 (present in 3 EU countries or more)
Cladosporium herbarum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Cladosporium sp.	F	Ascomycota	NO5 (other reason)
Clarkeulia sp.	I	Lepidoptera: Tortricidae	NO5 (other reason)
Clastoptera proteus	I	Hemiptera: Cercopidae	NO2 (not associated with Vaccinium fruit)
Clastoptera saintcyri	I	Hemiptera: Cercopidae	NO2 (not associated with Vaccinium fruit)
Clepsis pallidana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Clepsis persicana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Coccomyces monticola	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Coccus hesperidum	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Coleophoma empetri	F	Ascomycota	NO3 (present in 3 EU countries or more)
Colletothrichum sp.	F	Ascomycota	NO5 (other reason)

Species		Taxonomy	Conclusion
Colletotrichum fioriniae	F	Ascomycota	NO3 (present in 3 EU countries or more)
Coniothyrium sp.	F	Ascomycota	NO5 (other reason)
Conistra vaccinii	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Conoderus rufangulus	I	Coleoptera: Elateridae	NO2 (not associated with Vaccinium fruit)
Conotrachelus nenuphar	I	Coleoptera: Curculionidae	NO1 (regulated in the EU)
Conotrachelus sp.	I	Coleoptera: Curculionidae	NO5 (other reason)
Copitarsia decolora	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Copitarsia sp.	I	Lepidoptera: Noctuidae	NO5 (other reason)
Coptodisca negligens	I	Lepidoptera: Heliozelidae	NO2 (not associated with Vaccinium fruit)
Corynespora cassiicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Cranberry dieback disorder	U	Unknown	NO5 (other reason)
Cranberry false-blossom phytoplasma	B	Acholeplasmatales: Acholeplasmataceae	NO2 (not associated with Vaccinium fruit)
Croesia curvalana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Curvularia inaequalis	F	Ascomycota	NO3 (present in 3 EU countries or more)
Curvularia sp.	F	Ascomycota	NO5 (other reason)
Curvularia trifolii	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Cyclocephala longula	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Cyclocephala signaticollis	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Cyclophora pendulinaria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Cydia packardi	I	Lepidoptera: Tortricidae	NO1 (regulated in the EU)
Cylindrocladium ilicicola	F	Ascomycota	NO5 (other reason)
Cytospora sp.	F	Ascomycota	NO5 (other reason)
Dalaca chiliensis	I	Lepidoptera: Hepialidae	NO2 (not associated with Vaccinium fruit)
Dalaca pallens	I	Lepidoptera: Hepialidae	NO2 (not associated with Vaccinium fruit)
Darapsa choerilus	I	Lepidoptera: Sphingidae	NO2 (not associated with Vaccinium fruit)
Dasineura oxycoccana	I	Diptera: Cecidomyiidae	NO3 (present in 3 EU countries or more)
Datana angusii	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Datana contracta	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Datana drexelii	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Datana major	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Datana ministra	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Davidiella tassiana	F	Ascomycota	NO3 (present in 3 EU countries or more)
Declana floccosa	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Deroceras laeve/leave	G	Sigmurethra: Agrolimacidae	NO3 (present in 3 EU countries or more)
Diabrotica speciosa	I	Coleoptera: Chrysomelidae	NO2 (not associated with Vaccinium fruit)
Dialeurodes citri	I	Hemiptera: Aleyrodidae	NO3 (present in 3 EU countries or more)
Diaporthe ambigua	F	Ascomycota	NO3 (present in 3 EU countries or more)
Diaporthe neotheicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Diaporthe vaccinii	F	Ascomycota	NO1 (regulated in the EU)
Diaspidiotus ostraeformis	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Dichelopa vaccinii	I	Lepidoptera: Tortricidae	NO5 (other reason)
Dichelops furcatus	I	Hemiptera: Pentatomidae	NO4 (not associated with Vaccinium)
Discohainesia oenotherae	F	Ascomycota	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
Discosia artocreas	F	Ascomycota	NO3 (present in 3 EU countries or more)
Discostroma fuscellum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Dothichiza caroliniana	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Draeculacephala spp.	I	Hemiptera: Cicadellidae	NO5 (other reason)
Drechslera dematioidea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Drosophila suzukii	I	Diptera: Drosophilidae	NO3 (present in 3 EU countries or more)
Dyscinetus rugifrons	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Elsinoe veneta	F	Ascomycota	NO3 (present in 3 EU countries or more)
Empoasca fabae	I	Hemiptera: Cicadellidae	NO2 (not associated with Vaccinium fruit)
Eoreuma sp.	I	Lepidoptera: Crambidae	NO5 (other reason)
Epicoccum nigrum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Epicoccum sp.	F	Ascomycota	NO5 (other reason)
Epirrita autumnata	I	Lepidoptera: Geometridae	NO3 (present in 3 EU countries or more)
Ericaphis fimbriata	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Ericaphis scammelli	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Eriococcus texanus	I	Hemiptera: Eriococcidae	NO5 (other reason)
Eriophyes vaccinii	A	Acarida: Eriophyidae	NO5 (other reason)
Estigmene acrea	I	Lepidoptera: Arctiidae	NO2 (not associated with Vaccinium fruit)
Eulecanium tiliae	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Eurhizococcus brasiliensis	I	Hemiptera: Margarodidae	NO2 (not associated with Vaccinium fruit)
Exobasidium aequatorianum	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium darwinii	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium inconspicuum	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium japonicum	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium kishianum	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium perenne	F	Basidiomycota	NO2 (not associated with Vaccinium fruit)
Exobasidium rostrupii	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Exobasidium splendidum	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Exobasidium vaccinii	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Exobasidium vaccini-uliginosi	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Fiorinia coronata	I	Hemiptera: Diaspididae	NO2 (not associated with Vaccinium fruit)
Fiorinia sp.	I	Hemiptera: Diaspididae	NO5 (other reason)
Frankliniella cestrum	I	Thysanoptera: Thripidae	NO5 (other reason)
Frankliniella occidentalis	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Frankliniella schultzei	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Frankliniella sp.	I	Thysanoptera: Thripidae	NO5 (other reason)
Frankliniella tritici	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Fusarium culmorum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Fusarium oxysporum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Fusarium proliferatum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Fusarium sp.	F	Ascomycota	NO5 (other reason)
Fusarium sporotrichioides	F	Ascomycota	NO3 (present in 3 EU countries or more)
Fusicoccum putrefaciens	F	Ascomycota	NO3 (present in 3 EU countries or more)
Galgupha albipennis	I	Hemiptera: Corimelaneidae	NO5 (other reason)

Species		Taxonomy	Conclusion
Gibberella acuminata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Gibberella avenacea	F	Ascomycota	NO3 (present in 3 EU countries or more)
Gibberella intricans	F	Ascomycota	NO3 (present in 3 EU countries or more)
Gibberella pulicaris	F	Ascomycota	NO3 (present in 3 EU countries or more)
Gloeocercospora inconspicua	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Glomerella acutata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Glomerella cingulata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Gonocerus acuteangulatus	I	Hemiptera: Coreidae	NO3 (present in 3 EU countries or more)
Grammophorus minor	I	Coleoptera: Elateridae	NO4 (not associated with Vaccinium)
Gryllus sp.	I	Orthoptera: Gryllidae	NO2 (not associated with Vaccinium fruit)
Gypsonoma aceriana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Haematonectria haematococca	F	Ascomycota	NO3 (present in 3 EU countries or more)
Halyomorpha halys	I	Hemiptera: Pentatomidae	NO3 (present in 3 EU countries or more)
Haplothrips rectipennis	I	Thysanoptera: Thripidae	NO5 (other reason)
Helicotylenchus dihystera	N	Tylenchida: Hoplolaimidae	NO2 (not associated with Vaccinium fruit)
Helicoverpa zea	I	Lepidoptera: Noctuidae	NO1 (regulated in the EU)
Heliothrips haemorrhoidalis	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Hemaris gracilis	I	Lepidoptera: Sphingidae	NO2 (not associated with Vaccinium fruit)
Hemiberlesia cyanophylli	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Hemiberlesia lataniae	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Hemiberlesia rapax	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Hendecaneura shawiana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Heterobasidion parviporum	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Homalodisca insolita	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Homalodisca vitripennis	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Homona magnanima	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Homonopsis illotana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Hoplosphyrum griseus	I	Orthoptera: Mogoplistidae	NO4 (not associated with Vaccinium)
Humicola grisea	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Hyalopterus pruni	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Hyperomyzus lactucae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Hyphantria cunea	I	Lepidoptera: Arctiidae	NO3 (present in 3 EU countries or more)
Hypothenemus sp.	I	Coleoptera: Scolytidae	NO2 (not associated with Vaccinium fruit)
Icerya purchasi	I	Hemiptera: Margarodidae	NO3 (present in 3 EU countries or more)
Illinoia lambersi	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Ilyonectria radicicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Iridopsis ephyraria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Kalmusia coniothyrium	F	Ascomycota	NO3 (present in 3 EU countries or more)
Kuschelina sp.	I	Coleoptera: Chrysomelidae	NO5 (other reason)
Lamdbina fiscellaria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Lepidosaphes ulmi	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Leptosphaeria coniothyrium	F	Ascomycota	NO3 (present in 3 EU countries or more)
Leptosphaeria nodorum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Lexiphanes sp.	I	Coleoptera: Chrysomelidae	NO5 (other reason)

Species		Taxonomy	Conclusion
Lichnanthe vulpina	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Limotettix corniculus	I	Hemiptera: Cicadellidae	NO3 (present in 3 EU countries or more)
Limotettix vaccinii	I	Hemiptera: Cicadellidae	NO2 (not associated with Vaccinium fruit)
Limothrips angulicornis	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Limothrips cerealium	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Liorhyssus hyalinus	I	Hemiptera: Rhopalidae	NO3 (present in 3 EU countries or more)
Liriomyza sp.	I	Diptera: Agromyzidae	NO5 (other reason)
Listroderes sp.	I	Coleoptera: Curculionidae	NO5 (other reason)
Lithraeus egenus	I	Coleoptera: Chrysomelidae	NO2 (not associated with Vaccinium fruit)
Lophodermium hypophyllum	F	Ascomycota	NO5 (other reason)
Lophodermium oxycocci	F	Ascomycota	NO3 (present in 3 EU countries or more)
Lycaena epixanthe	I	Lepidoptera: Lycaneidae	NO2 (not associated with Vaccinium fruit)
Lycia ursaria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Lycophotia phyllophora	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Lymantria dispar	I	Lepidoptera: Lymantriidae	NO3 (present in 3 EU countries or more)
Lymantria monacha	I	Lepidoptera: Lymantriidae	NO3 (present in 3 EU countries or more)
Macaria argillacearia	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Macaria brunneata	I	Lepidoptera: Geometridae	NO3 (present in 3 EU countries or more)
Macaria sulphurea	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Macrophomina phaseolina	F	Ascomycota	NO3 (present in 3 EU countries or more)
Macrosiphum euphorbiae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Malacosoma americanum	I	Lepidoptera: Lasiocampidae	NO2 (not associated with Vaccinium fruit)
Mallocephala deserticola	I	Lepidoptera: Arctiidae	NO2 (not associated with Vaccinium fruit)
Masonaphis azalea	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Medonia deromecoides	I	Coleoptera: Elateridae	NO2 (not associated with Vaccinium fruit)
Megalopyge amita	I	Lepidoptera: Megalopygidae	NO2 (not associated with Vaccinium fruit)
Melanoplus fasciatus	I	Orthoptera: Acrididae	NO2 (not associated with Vaccinium fruit)
Melanoplus gracilis	I	Orthoptera: Acrididae	NO2 (not associated with Vaccinium fruit)
Melanoplus spp.	I	Orthoptera: Acrididae	NO5 (other reason)
Meliola niessliana	F	Ascomycota	NO3 (present in 3 EU countries or more)
Microgryllus pallipes	I	Orthoptera: Gryllidae	NO4 (not associated with Vaccinium)
Microsphaera penicillata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Microsphaera vaccinii	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Mocis latipes	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Monilinia baccarum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia fructigena	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia ledi	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia megalospora	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia oxycocci	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia urnula	F	Ascomycota	NO3 (present in 3 EU countries or more)
Monilinia vaccinii-corymbosi	F	Ascomycota	NO3 (present in 3 EU countries or more)
Montagnula obtusa	F	Ascomycota	NO3 (present in 3 EU countries or more)
Mycosphaerella punctiformis	F	Ascomycota	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
Mythimna unipuncta	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Myxothyrium leptideum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Myzus persicae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Naohidemyces vaccinii	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Naupactus godmani	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Naupactus leucoloma	I	Coleoptera: Curculionidae	NO1 (regulated in the EU)
Nectria cinnabarina	F	Ascomycota	NO3 (present in 3 EU countries or more)
Nematocampa resistaria	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Nematus oligospilus	I	Hymenoptera: Tenthredinidae	NO3 (present in 3 EU countries or more)
Neofusicoccum australe	F	Ascomycota	NO3 (present in 3 EU countries or more)
Neofusicoccum nonquaesitum	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Neofusicoccum vitifusiforme	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Neopareophora litura	I	Hymenoptera: Tenthredinidae	NO2 (not associated with Vaccinium fruit)
Nezara viridula	I	Hemiptera: Pentatomidae	NO3 (present in 3 EU countries or more)
Niesslia exilis	F	Ascomycota	NO3 (present in 3 EU countries or more)
Nigrospora sphaerica	F	Ascomycota	NO3 (present in 3 EU countries or more)
Nocardia vaccinii	B	Actinomycetales: Nocardiaceae	NO2 (not associated with Vaccinium fruit)
Nodonota sp.	I	Coleoptera: Chrysomelidae	NO5 (other reason)
Nomophila indistinctalis or other South American spp.	I	Lepidoptera: Crambidae	NO5 (other reason)
Nomophila noctuella	I	Lepidoptera: Crambidae	NO3 (present in 3 EU countries or more)
Nomophila sp.	I	Lepidoptera: Crambidae	NO5 (other reason)
Nycterinus sp.	I	Coleoptera: Tenebrionidae	NO5 (other reason)
Nycterinus thoracicus	I	Coleoptera: Tenebrionidae	NO4 (not associated with Vaccinium)
Nysius huttoni	I	Hemiptera: Lygaeidae	NO3 (present in 3 EU countries or more)
Nysius sp.	I	Hemiptera: Lygaeidae	NO5 (other reason)
Oberea myops	I	Coleoptera: Cerambycidae	NO2 (not associated with Vaccinium fruit)
Oberea tripunctata	I	Coleoptera: Cerambycidae	NO2 (not associated with Vaccinium fruit)
Oceanaspidiotus spinosus	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Oemona hirta	I	Coleoptera: Cerambycidae	NO2 (not associated with Vaccinium fruit)
Oiketicus sp.	I	Lepidoptera: Psychidae	NO5 (other reason)
Olethreutes lacunana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Olethreutes moderata	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Oncometopia nigricans	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Oncometopia orbona	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Oncopeltus fasciatus	I	Hemiptera: Lygaeidae	NO4 (not associated with Vaccinium)
Operophtera brumata	I	Lepidoptera: Geometridae	NO3 (present in 3 EU countries or more)
Ophiodothella cuervoi	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Ophiodothella vaccinii	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Orgyia antiqua	I	Lepidoptera: Lymantriidae	NO3 (present in 3 EU countries or more)
Orgyia antiquoides	I	Lepidoptera: Lymantriidae	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
Orgyia pseudotsugata	I	Lepidoptera: Lymantriidae	NO2 (not associated with Vaccinium fruit)
Orthorhinus cylindrirostris	I	Coleoptera: Curculionidae	NO2 (not associated with Vaccinium fruit)
Orthotaenia undulana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Orthotomicus sp.	I	Coleoptera: Scolytidae	NO2 (not associated with Vaccinium fruit)
Orthotydeus californicus	A	Acarida: Tydeidae	NO3 (present in 3 EU countries or more)
Otiorhynchus ovatus	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Otiorhynchus rugosostriatus	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Otiorhynchus singularis	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Otiorhynchus sulcatus	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Pangrapta decoralis	I	Lepidoptera: Erebidae	NO2 (not associated with Vaccinium fruit)
Pantomorus cervinus	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Paraconiothyrium sporulosum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Parthenolecanium corni	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Passalora calotropidis	F	Ascomycota	NO3 (present in 3 EU countries or more)
Peach rosette mosaic virus	V	Secoviridae: nepovirus	NO1 (regulated in the EU)
Penicillium expansum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Penicillium sp.	F	Ascomycota	NO5 (other reason)
Percolapsis varia	I	Coleoptera: Chrysomelidae	NO5 (other reason)
Peridroma saucia	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Pestalotia guepinii	F	Ascomycota	NO3 (present in 3 EU countries or more)
Pestalotiopsis maculans	F	Ascomycota	NO3 (present in 3 EU countries or more)
Pestalotiopsis neglecta	F	Ascomycota	NO3 (present in 3 EU countries or more)
Pestalotiopsis photinae	F	Ascomycota	NO5 (other reason)
Pestalotiopsis sp.	F	Ascomycota	NO5 (other reason)
Phaeodothis winteri	F	Ascomycota	NO3 (present in 3 EU countries or more)
Phigalia titea	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Phoma sp.	F	Ascomycota	NO5 (other reason)
Phycopsis dennisii	F	Ascomycota	NO5 (other reason)
Phyllactinia guttata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Phyllophaga anxia	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Phyllophaga sp.	I	Coleoptera: Scarabaeidae	NO5 (other reason)
Phyllosticta ampellicida	F	Ascomycota	NO3 (present in 3 EU countries or more)
Phyllosticta elongata	F	Ascomycota	NO5 (other reason)
Phyllosticta sp.	F	Ascomycota	NO5 (other reason)
Physalospora vaccinii	F	Ascomycota	NO3 (present in 3 EU countries or more)
Phytonemus pallidus	A	Acarida: Tarsonemidae	NO3 (present in 3 EU countries or more)
Phytophthora cinnamomi	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora citricola	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora citrophthora	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora cryptogea	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora fragariae	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora kernoviae	C	Pseudofungi: Oomycetes	NO2 (not associated with Vaccinium fruit)
Phytophthora megasperma	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora pseudosyringae	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
Phytophthora ramorum	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Phytophthora sp.	C	Pseudofungi: Oomycetes	NO5 (other reason)
Phytoplasma asteris	B	Acholeplasmatales: Acholeplasmataceae	NO3 (present in 3 EU countries or more)
Phytoplasma solani	B	Acholeplasmatales: Acholeplasmataceae	NO3 (present in 3 EU countries or more)
Piezodorus guildinii	I	Hemiptera: Pentatomidae	NO4 (not associated with Vaccinium)
Pilidium lythri	F	Ascomycota	NO3 (present in 3 EU countries or more)
Plagiognathus sp.	I	Hemiptera: Miridae	NO5 (other reason)
Platynota flavedana	I	Lepidoptera: Tortricidae	NO4 (not associated with Vaccinium)
Platynota sp.	I	Lepidoptera: Tortricidae	NO5 (other reason)
Pleospora herbarum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Pleospora tarda	F	Ascomycota	NO3 (present in 3 EU countries or more)
Plusia putnami	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Podosphaera clandestina	F	Ascomycota	NO3 (present in 3 EU countries or more)
Polydrusus sericeus	I	Coleoptera: Curculionidae	NO3 (present in 3 EU countries or more)
Polydrusus sp.	I	Coleoptera: Curculionidae	NO5 (other reason)
Popillia japonica	I	Coleoptera: Scarabaeidae	NO1 (regulated in the EU)
Porotermes quadricollis	I	Isoptera: Termopsidae	NO4 (not associated with Vaccinium)
Pratylenchus brachyurus	N	Tylenchida: Pratylenchidae	NO2 (not associated with Vaccinium fruit)
Pratylenchus penetrans	N	Tylenchida: Pratylenchidae	NO2 (not associated with Vaccinium fruit)
Prietocella barbara	G	Pulmonata: Cochlicellidae	NO3 (present in 3 EU countries or more)
Prionapteryx nebulifera	I	Lepidoptera: Crambidae	NO2 (not associated with Vaccinium fruit)
Pristiphora idiota	I	Hymenoptera: Tenthredinidae	NO3 (present in 3 EU countries or more)
Pristiphora mollis	I	Hymenoptera: Tenthredinidae	NO3 (present in 3 EU countries or more)
Pristiphora sp.	I	Hymenoptera: Tenthredinidae	NO2 (not associated with Vaccinium fruit)
Proeulia sp.	I	Lepidoptera: Tortricidae	NO5 (other reason)
Prolimacodes badia	I	Lepidoptera: Limacodidae	NO2 (not associated with Vaccinium fruit)
Protopulvinaria pyriformis	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Protoventuria myrtilli	F	Ascomycota	NO3 (present in 3 EU countries or more)
Pseudaulacaspis pentagona	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Pseudexentera vaccini	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Pseudococcus calceolariae	I	Hemiptera: Pseudococcidae	NO3 (present in 3 EU countries or more)
Pseudococcus longispinus	I	Hemiptera: Pseudococcidae	NO3 (present in 3 EU countries or more)
Pseudococcus sorghiellus	I	Hemiptera: Pseudococcidae	NO2 (not associated with Vaccinium fruit)
Pseudococcus sp.	I	Hemiptera: Pseudococcidae	NO5 (other reason)
Pseudococcus viburni	I	Hemiptera: Pseudococcidae	NO3 (present in 3 EU countries or more)
Pseudomonas new disease	B	Pseudomonales:	NO3 (present in 3 EU countries or more)

Species		Taxonomy	Conclusion
		Pseudomonadaceae	
Pseudomonas syringae	B	Pseudomonales: Pseudomonadaceae	NO5 (other reason)
Pseudomonas syringae pv. syringae	B	Pseudomonales: Pseudomonadaceae	NO3 (present in 3 EU countries or more)
Pseudomonas viridiflava	B	Pseudomonales: Pseudomonadaceae	NO3 (present in 3 EU countries or more)
Pseudoparlatoria parlatorioides	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Pseudoparodia pseudopeziza	F	Ascomycota	NO5 (other reason)
Pseudothrips bekhami	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Puccinia iridis	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Pucciniastrum goeppertianum	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Pucciniastrum sp.	F	Basidiomycota	NO5 (other reason)
Pucciniastrum vaccinii	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Pythium irregulare	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Pythium splendens	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Pythium ultimum	C	Pseudofungi: Oomycetes	NO3 (present in 3 EU countries or more)
Quadraspidiotus perniciosus	I	Hemiptera: Diaspididae	NO3 (present in 3 EU countries or more)
Rachiplusia nu	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Rhagoletis mendax	I	Diptera: Tephritidae	NO1 (regulated in the EU)
Rhagoletis pomonella	I	Diptera: Tephritidae	NO1 (regulated in the EU)
Rhinoseius rafinskii	A	Acarida: Ascidae	NO2 (not associated with Vaccinium fruit)
Rhizaspidiotus dearnessi	I	Hemiptera: Diaspididae	NO2 (not associated with Vaccinium fruit)
Rhizobium radiobacter	B	Rhizobiales: Rhizobiaceae	NO3 (present in 3 EU countries or more)
Rhizobium rhizogenes	B	Rhizobiales: Rhizobiaceae	NO3 (present in 3 EU countries or more)
Rhizobium rubi	B	Rhizobiales: Rhizobiaceae	NO3 (present in 3 EU countries or more)
Rhizopus sp.	F	Zygomycota	NO5 (other reason)
Rhizopus stolonifer	F	Zygomycota	NO3 (present in 3 EU countries or more)
Rhopalosiphoninus staphyleae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Rhopobota myrtillana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Rhopobota naevana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Rhopobota unipunctana	I	Lepidoptera: Tortricidae	NO5 (other reason)
Rhopobota ustomaculana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Saissetia oleae	I	Hemiptera: Coccidae	NO3 (present in 3 EU countries or more)
Saturnia pavonia	I	Lepidoptera: Saturniidae	NO3 (present in 3 EU countries or more)
Scaphytopius vaccinium	I	Hemiptera: Cicadellidae	NO5 (other reason)
Schinia vaccinia	I	Lepidoptera: Noctuidae	NO4 (not associated with Vaccinium)
Schizophyllum commune	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Schizothyrium pomi	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Schizura concinna	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Schizura iponomoeae	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Schizura unicornis	I	Lepidoptera: Notodontidae	NO2 (not associated with Vaccinium fruit)
Scirtothrips citri	I	Thysanoptera: Thripidae	NO1 (regulated in the EU)

Species		Taxonomy	Conclusion
Scirtothrips mangiferae	I	Thysanoptera: Thripidae	NO2 (not associated with Vaccinium fruit)
Scitala sericans	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Sclerotinia minor	F	Ascomycota	NO3 (present in 3 EU countries or more)
Sclerotinia sclerotiorum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Seimatosporium vaccinii	F	Ascomycota	NO3 (present in 3 EU countries or more)
Selenomphalus euryae	I	Hemiptera: Diaspididae	NO5 (other reason)
Septoria albopunctata	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Septoria lagerheimii	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Septoria sp.	F	Ascomycota	NO5 (other reason)
Sericoides sp.	I	Coleoptera: Scarabaeidae	NO5 (other reason)
Sibinia albovittata	I	Coleoptera: Curculionidae	NO4 (not associated with Vaccinium)
Sibinia sp.	I	Coleoptera: Curculionidae	NO5 (other reason)
Silver leaf	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Sitona sp.	I	Coleoptera: Curculionidae	NO5 (other reason)
Smynthurodes betae	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Sonesimia grossa	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Sordaria fimicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Sparganothis directana	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Sphaeria vacciniicola	F	Ascomycota	NO5 (other reason)
Sphaerodothis circumscripta	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Sphinx canadensis	I	Lepidoptera: Sphingidae	NO5 (other reason)
Sphinx gordius	I	Lepidoptera: Sphingidae	NO5 (other reason)
Spilonota ocellana	I	Lepidoptera: Tortricidae	NO3 (present in 3 EU countries or more)
Spodoptera eridania	I	Lepidoptera: Noctuidae	NO1 (regulated in the EU)
Spodoptera frugiperda	I	Lepidoptera: Noctuidae	NO1 (regulated in the EU)
Stathmopoda sp.	I	Lepidoptera: Stathmopodidae	NO5 (other reason)
Stemphylium sp.	F	Ascomycota	NO5 (other reason)
Stenoptilodes littoralis	I	Lepidoptera: Pterophoridae	NO2 (not associated with Vaccinium fruit)
Stenoptilodes sp.	I	Lepidoptera: Pterophoridae	NO5 (other reason)
Stephanitis pyri	I	Hemiptera: Tingidae	NO3 (present in 3 EU countries or more)
Stephanitis takeyai	I	Hemiptera: Tingidae	NO3 (present in 3 EU countries or more)
Stereum rugosum	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Stomiopeltis myrciae	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Strasseria geniculata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Strawberry latent ringspot virus	V	Secoviridae: possibly nepovirus	NO3 (present in 3 EU countries or more)
Strepsicrates smithiana	I	Lepidoptera: Tortricidae	NO4 (not associated with Vaccinium)
Synelys enucleata	I	Lepidoptera: Geometridae	NO5 (other reason)
Syngrapha epigaea	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Syngrapha microgamma	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Tana paulseni	I	Diptera: Stratiomyiidae	NO2 (not associated with Vaccinium fruit)
Tapajosa rubromarginata	I	Hemiptera: Cicadellidae	NO1 (regulated in the EU)
Tarsonemus confusus	A	Acarida: Tarsonemidae	NO3 (present in 3 EU countries or more)
Tarsonemus sp.	A	Acarida: Tarsonemidae	NO5 (other reason)

Species		Taxonomy	Conclusion
Tetralopha sp.	I	Lepidoptera: Pyralidae	NO5 (other reason)
Tetranychus urticae	A	Acarida: Tarsonemidae	NO3 (present in 3 EU countries or more)
Thanatephorus cucumeris	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Thelephora terrestris	F	Basidiomycota	NO3 (present in 3 EU countries or more)
Thielaviopsis basicola	F	Ascomycota	NO3 (present in 3 EU countries or more)
Thrips australis	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Thrips sp.	I	Thysanoptera: Thripidae	NO5 (other reason)
Thrips tabaci	I	Thysanoptera: Thripidae	NO3 (present in 3 EU countries or more)
Thyridopteryx ephemeraeformis	I	Lepidoptera: Psychidae	NO2 (not associated with Vaccinium fruit)
Tobacco ringspot virus	V	Secoviridae: nepovirus	NO1 (regulated in the EU)
Tobacco streak virus	V	Bromoviridae: ilarvirus	NO3 (present in 3 EU countries or more)
Tomarus villosus	I	Coleoptera: Scarabaeidae	NO2 (not associated with Vaccinium fruit)
Tomato ringspot virus	V	Secoviridae: nepovirus	NO3 (present in 3 EU countries or more)
Topospora myrtilli	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trialeurodes vaporarium	I	Hemiptera: Aleyrodidae	NO3 (present in 3 EU countries or more)
Trichoderma hamatum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trichoderma harzianum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trichoderma koningii	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trichodorus	N	Dorylaimida: Trichodoridae	NO2 (not associated with Vaccinium fruit)
Trichothecium roseum	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trichothyrium orbiculare	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Trichothyrium reptans	F	Ascomycota	NO2 (not associated with Vaccinium fruit)
Trigona spinipes	I	Hymenoptera: Apidae	NO4 (not associated with Vaccinium)
Truncatella angustata	F	Ascomycota	NO3 (present in 3 EU countries or more)
Trupanea signata	I	Diptera: Tephritidae	NO2 (not associated with Vaccinium fruit)
Tulsa finitella	I	Lepidoptera: Geometridae	NO2 (not associated with Vaccinium fruit)
Tydeus sp.	A	Acarida: Tydeidae	NO5 (other reason)
Tylenchorhynchus claytoni	N	Tylenchida: Dolichodoridae	NO2 (not associated with Vaccinium fruit)
Ukamenia sapporensis	I	Lepidoptera: Tortricidae	NO2 (not associated with Vaccinium fruit)
Ulocladium sp.	F	Ascomycota	NO5 (other reason)
Uraecha angusta	I	Coleoptera: Cerambycidae	NO2 (not associated with Vaccinium fruit)
Valdensinia heterodoxa	F	Ascomycota	NO3 (present in 3 EU countries or more)
Valsa ceratosperma	F	Ascomycota	NO3 (present in 3 EU countries or more)
Valsa sordida	F	Ascomycota	NO3 (present in 3 EU countries or more)
Verticillium dahliae	F	Ascomycota	NO3 (present in 3 EU countries or more)
Wahlgreniella vaccinii	I	Hemiptera: Aphididae	NO3 (present in 3 EU countries or more)
Xerophloea sp.	I	Hemiptera: Cicadellidae	NO5 (other reason)
Xestia c-nigrum	I	Lepidoptera: Noctuidae	NO3 (present in 3 EU countries or more)
Xestia dilucida	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Xestia normaniana	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Xestia youngii	I	Lepidoptera: Noctuidae	NO5 (other reason)
Xiphinema americanum	N	Dorylaimida: Longidoridae	NO1 (regulated in the EU)
Xiphinema rivesi	N	Dorylaimida: Longidoridae	NO2 (not associated with Vaccinium fruit)
Xylella fastidiosa	B	Xanthomonadales: Xanthomonadaceae	NO1 (regulated in the EU)
Xylena cineritia	I	Lepidoptera: Noctuidae	NO2 (not associated with Vaccinium fruit)
Zeuzera coffeae	I	Lepidoptera: Cossidae	NO2 (not associated with Vaccinium fruit)

ANNEX 5. *Vaccinium* Alert List

This Alert List is divided into three parts. Please refer to section 2.3 and to Annex 2 of this report for details of the categories retained in each Part.

It was not possible to further rank the pests within the three parts by their level of risk. Pests are listed by type (pathogen, acari, insect) and then in alphabetical order.

The Alert List was finalized at December 2015, and does not contain new information that may have become available after that date.

CONTENTS

PART 1 – PESTS WITH HIGH ECONOMIC IMPORTANCE AND MORE LIKELY TO TRANSFER

Pathogens

Thekopsora minima (Basidiomycota)

Fruit pathway: Pustules are produced on fruit. *T. minima* is airborne and is also transmissible by contact (e.g. sticking to clothes) (BiosecurityTasmania, 2014a).

Other pathways: Plants for planting; pustules are also produced on leaves (Biosecurity Tasmania, 2014a).

Hosts: Several *Vaccinium* spp., incl. *V. corymbosum* (Schilder and Miles, 2011; Rebollar-Alviter et al., 2011, Yepes and Buritica Cespedes, 2012; McTaggart et al., 2013), *V. angustifolium* var. *laevifolium*, *V. erythrocarpon* (Mostert et al., 2010), *V. angustifolium* (Farr and Rossman, 2015), also others such as *Azalea*, *Rhododendron*, *Gaylussacia*, *Lyonia* (Farr and Rossman, 2015). The fungus has an alternate host, *Tsuga* (Mostert et al., 2010).

Distribution: Africa: South Africa (2006; Mostert et al., 2010); Asia: Japan (Farr and Rossman, 2015); North America: Canada, USA (Farr and Rossman, 2015), Mexico (Rebollar-Alviter et al., 2011; first finding in 2007); South America: Colombia (Yepes and Buritica Cespedes, 2012); Oceania: Australia (New South Wales, Queensland, Victoria; and entered but did not establish in Tasmania; McTaggart et al., 2013; Biosecurity Tasmania, 2014a, b, c). *T. minima* was found recently on several new continents.
Uncertain records: Biosecurity Tasmania (2014a) mentions Argentina and Europe, but no record was found. There was one incursion (in one nursery) in 2015 in Germany, and eradication is required (German express PRA; JKI, 2015). In addition, JKI (2015) makes the hypothesis that records of Pucciniastrum vaccini in Spain (in 1997; Barrau et al., 2002), Argentina and Hawaii may have been misidentifications of *T. minima*. However, this is not confirmed. No record was found for *T. minima* in Spain.

Damage: *T. minima* causes a severe disease, with extensive defoliation (BiosecurityTasmania, 2014a). Since the first finding in Mexico in 2007, it has become one of the most significant diseases of blueberry in Jalisco and Michoacan (Rebollar-Alviter et al., 2011). There were serious outbreaks in Michigan in 2010 on *V. corymbosum*, but the economic importance of the fungus remained to be studied (Schilder and Miles, 2011).

Recorded impact: High	**Intercepted:** Yes	**Spreading/invasive:** Yes

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Salazar Yepes M, Buriticá Céspedes P. 2012. Nuevos Registros de Royas (Pucciniales) en Plantas de Interés Agronómico y Ornamental en Colombia. Rev.Fac.Nal.Agr.Medellín 65(2):6691-6696

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Insects

Acrobasis vaccinii (Lepidoptera: Pyralidae)

Fruit pathway: eggs are laid at the blossom/calyx end of berries, more rarely elsewhere on the fruit surface; larvae feed inside the fruit (Averill and Sylvia, 1998).

Other pathways: soil; larvae fall to the ground to pupate, plants for planting may be a pathway if they carry fruit, but also possibly because larvae move between fruit during their lifetime, as they feed on several berries (see Damage).
Uncertain pathway: plants for planting.

Hosts: Only 2 genera, *Vaccinium* and *Gaylussacia* (Averill and Sylvia, 1998), incl. *V. macrocarpon* (IPMCenters, 1998; NYS, 2014; AgricultureCanada, 2007; AgriReseauQuebec, 2015; Dixon and Hillier, 2003), *V. oxycoccus*, *V. angustifolium*, *V. vitis-idaea* (Dixon and Hillier, 2003), *V. australe*, *V. stamineum*, *V.*

corymbosum (BugGuide, 2015). Roubos (2009) mentions a record for *Malus* (as 'apple'), but this was not found in other publications.

Distribution: North America: Canada, USA. In Eastern North America, it occurs from Quebec, Nova Scotia and Newfounland southwards to Florida, and westwards into parts of Wisconsin and Texas; the finding in Newfoundland is recent (Finn, 2003; AgriReseauQuebec, 2015, Dixon and Hillier, 2003). In the West, it occurs at least in Washington and British Columbia. It was recently rediscovered after 40 years absence (IPMCenters, 2000); previously small populations were recorded after accidental introduction in the 1920s (Finn, 2003).

Damage: Damage is caused by larvae. Feeding on flowers buds decreases yield and feeding on fruit causes direct losses. Each larva may eat 3-8 berries (Agriculture Canada, 2007; IPMCenters, 1998). Infested berries may ripen earlier (Agriculture Canada, 2007), they become reddish, and later dry and shrivel (IPMCenters, 1998). Larvae close/hide the opening in the berry with silk, and silk also webs berries together; berries may thus be harvested and packaged without the pest being detected, resulting in consumers finding larvae in packaged berries (Prodorutti et al., 2007; LSUAgCenter, 2010). *A. vaccinii* is a primary pest of cranberries and a serious pest of highbush blueberries (Fitzpratick, 2009 cited in NVWA, 2012). It also feeds on wild *Vaccinium*, from which it may move into commercial fields (Prodorutti et al, 2007). Losses of 50-80% are mentioned (LSUAgCenter, 2010; Finn, 2003: Prodorutti et al., 2007). It is the only pest of cranberry in Eastern Canada that requires regular application of control measures (insecticides) (Le Duc et al., 2004).

Recorded impact: High	**Intercepted:** Not known	**Spreading/invasive:** Yes

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Roubos CR. 2009. Monitoring and managing blueberry gall midge (Diptera: Cecidomyiidae) in rabbiteye blueberries. Thesis (PhD), University of Florida.

Aegorhinus superciliosus (Coleoptera: Curculionidae)

Fruit pathway: adults feed on fruit (Parra et al., 2009).

Other pathways: plants for planting, soil; adults also feed on shoots, buds and leaves, larvae feed on plant collars and roots, and pupate in plant collars, eggs are laid at the plant collar or in the soil (Parra et al., 2009; Biosecurity Australia, 2011).

Hosts: Polyphagous on a wide range of hosts, incl. *Vaccinium corymbosum, Rubus idaeus, Fragaria x ananassa, Ribes uva-crispa, Rubus, Ribes, Malus domestica, Corylus avellana, Nothofagus* (Koch and Waterhouse, 2000), *Cydonia oblonga, Salix viminalis, Prunus salicina* (Parra et al., 2009).

Distribution: South America: Argentina, Chile (Koch and Waterhouse, 2000; Ellena et al., 2014; Parra et al., 2009).

Damage: The primary cause of damage to crops is through larvae feeding on roots, which can result in plant death; adults cause damage to shoots, buds, leaves and fruit (in severe cases, plants are defoliated, sometimes leading to plant death) (Parra et al., 2009; Biosecurity Australia, 2011). *A. superciliosus* is mentioned as the most important pest of raspberry and blueberry in the South of Chile (Mutis et al., 2010). It is also a pest on currant, strawberry (Aguilera, no date; Parra et al., 2009), hazelnut (Ellena et al., 2014), fruit crops, berries, gooseberries (Biosecurity Australia, 2011, citing others), occasionally on apple (Parra et al., 2009). It has passed from its native hosts to exotic crops (Parra et al., 2009).

Other information: The pest is listed in EU Decision 9 April 2003 (1184) 'Derogation for import of strawberry plants from Chile' (EUR-Lex, 2015). It is regulated in Australia for dormant rooted cuttings of hazelnut (Biosecurity Australia, 2011).

Recorded impact: High	**Intercepted:** Not known	**Spreading/invasive:** Not known

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Argyrotaenia sphaleropa (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed externally on fruit (Rocca and Brown, 2013; Meneguim and Hohmann, 2007; Botton et al., 2003, SATA, 2012).

Other pathways: plants for planting, soil (on its own or associated with plants or tubers); larvae are also on flowers, buds, leaves of their host plants (see 'damage'), no information was found on the location of pupae, but the pupae of the related species *A. velutina* and *A. citrina* are in leaves or debris on the ground. Uncertain pathways: cut flowers and branches, herbs.

Hosts: Polyphagous, on a wide range of hosts, incl. *Vaccinium corymbosum* (new host; Rocca and Brown, 2013), *Prunus persica, Diospyros kaki, Pyrus, Citrus, Citrus sinensis* (Meneguim and Hohmann, 2007), *Zea mays, Acacia, Medicago sativa, Chrysanthemum, Pelargonium, Malus sylvestris, Prunus, Vitis vinifera, Rosa, Mentha piperita, Capsicum annuum, Solanum lycopersicum, S. tuberosum* (Trematerra and Brown, 2004).

Distribution: South America: Argentina (Rocca and Brown, 2013), Bolivia (Trematerra and Brown, 2004 citing others), Brazil, Uruguay (Meneguim and Hohmann, 2007). Uncertain records: South America: Peru; Central America: Panama (collection specimens; Trematerra and Brown, 2004).

Damage: On blueberry, larvae feed primarily on flowers, buds and fruit (for 4 Tortricidae species newly reported on *V. corymbosum* - Rocca and Brown, 2013). On Citrus, the pest causes damage on foliage and fruit (newly formed or ripening) (Meneguim and Hohmann, 2007). External feeding damage on leaves and fruits is also recorded for other hosts, such as pear, pear, persimmon (Botton et al., 2003); apple, grapevine (SATA, 2012). Feeding on fruit decreases its value and favours fungal infections (Botton et al., 2003). *A. sphaeleropa* is a major pest in apple orchards and vineyards in Southern Uruguay, and also on *Diospyros kaki* in Brazil (limiting or impairing fruit production; Bentancourt et al., 2003) and pear (Botton et al., 2003). Damage was observed in 85% of sampled persimmon orchards in one region of Brazil (Bavaresco et al., 2005).

Recorded impact: High (on another crop)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

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Frankliniella bispinosa (Thysanoptera: Thripidae)

Fruit pathway: nymphs and adults feed on fruit (Finn, 2003; Liburd et al, 2013).

Other pathways: plants for planting; eggs are inside plant tissues (especially flowers), and other life stages feed on various plant parts, including buds, leaves, flowers. The last two nymphal instars hide in the ground or flowers, and do not feed (Finn, 2003; Liburd et al, 2013).
Uncertain pathway: soil.

Hosts: Polyphagous, incl. *Vaccinium corymbosum, V. darrowii, V. ashei* (Finn, 2003; Liburd et al., 2013), *Capsicum, Fragaria, Nicotiana, Citrus, Rosa, Secale cereale, Triticum* (CABI CPC), *Hibiscus, Chrysanthemum, Solanum melongena, Zea mays, Cucumis sativus, Arachis hypogea, Citrullus lanatus, Juniperus, Persea americana, Solanum lycopersicon, Passiflora* (Childers & Nakara, 2006), *Phaseolus* (as 'beans') (EFSA, 2012).

Distribution: North America: USA (Florida - Childers & Nakara, 2006; Georgia [unconfirmed] - CABI CPC; 'South-East USA' - Hoddle et al., 2012); Caribbean: Puerto Rico [unconfirmed] (CABI CPC), Bermuda, Bahama Islands (Hoddle et al., 2012).

Damage: On blueberry, *F. bispinosa* causes reduction in quality and quantity of fruits produced (through damage on other plant parts), and direct damage on fruit through feeding and scars from egg laying (Liburd et al., 2013). *F. spinosa, F. tritici* and *F. occidentalis* are also mentioned collectively to feed on mature fruits (Finn, 2003). *F. bispinosa* may cause major yield losses; It is the dominant thrips on blueberry in Florida (Liburd et al., 2007). Finally, *F. bispinosa* is a known vector of *Tomato spotted wilt virus* (EFSA, 2012). Possible damage on other hosts was not considered here.

Recorded impact: High, also vector	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

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Phlyctinus callosus (Coleoptera: Curculionidae)

Fruit pathway: adults feed on fruit (see Damage). P. callosus has been intercepted frequently in the USA, including on table grapes (CABI CPC).

Other pathways: Plants for planting, soil; adults also feed on leaves and green stems, eggs, larvae and pupae are in the soil, and larvae feed on roots (CABI CPC).
Uncertain pathways: cut flowers, vegetables, root vegetables.

Hosts: Polyphagous, hosts incl. *Vaccinium corymbosum* (Bredenhand et al., 2010), *Daucus carota* subsp. *sativus, Malus domestica, Vitis vinifera*, vegetables (PQR). CABI CPC lists additional hosts such as *Fragaria ananassa, Juglans regia, Pastinaca sativa, Pelargonium, Prunus persica, Prunus domestica, Prunus salicina, Pyrus communis*.

Distribution: Africa: South Africa (Bredenhand et al., 2010); Oceania: Australia, New Zealand (PQR). P. callosus has spread from South Africa to New Zealand and Australia (CABI CPC).

Damage: Adults of *P. callosus* cause damage to fruit on apple, nectarine, pear, plum and peach, and on grapevine mostly to leaf and stems (incl. those of bunches or berries); lesions on fruit make it unmarketable. Larvae cause damage to roots, which is not important on established trees, but important on root vegetables. In South Africa, most damage is caused by adults; *P. callosus* causes 40% of all damage to apple in Elgin area (Western Cape province); damage was estimated to reach US$ 500,000 in 1987). Main crop losses in untreated apple orchards ranged from 5 to 29% between seasons. In Tasmania, economic damage is caused by larvae on vegetable root crops. In Australia, it is a polyphagous pest of economically important crops where it has established, also in nurseries (CABI CPC).

Recorded impact: High (on another crop)	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:
Bredenhand E, Hoorn A, van May F, Ferreira T, Johnson S. 2010. Evaluation of techniques for monitoring banded fruit weevil, Phlyctinus callosus (Schoenherr) (Coleoptera:Curculionidae), infestation in blueberry orchards. African Entomology; 2010. 18(1):205-209. 24 ref.
CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc
PQR. Plant Quarantine data Retrieval system: EPPO Database on Quarantine Pests. www.eppo.int (accessed August 2015)

Proeulia auraria (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed externally on fruit (CABI CPC). The pest was intercepted on blueberries in the USA (34 interceptions) and Japan (2 interceptions) (BlueberriesChile, 2011-2012).

Other pathways: plants for planting; eggs are on leaves, larvae feed on leaves (which they roll and fold), also on flowers, growing points (CABI CPC); the pest overwinters as larvae on plants (twigs, bark, momified fruit) (Arysta 2003).
Uncertain pathway: cut flowers and branches.

Hosts: *Vaccinium* (Blueberries Chile, 2011-2012), *Actinidia deliciosa, Citrus sinensis, Malus domestica, Platanus orientalis, Prunus armeniaca, Prunus avium, Prunus domestica, Prunus persica, Pyrus communis, Robinia pseudoacacia, Vitis vinifera* (CABI CPC), *Juglans regia*, also new hosts records, incl.: *Cotoneaster, Cercis siliquastrum, Rosa, Nothofagus obliqua, Pittosporum tobira, Punica granatum, Buddleja davidii* (Cepeda and Cubillos, 2011)

Distribution: South America: Chile (CABI CPC).

Damage: Damage is caused by larvae feeding on buds, flowers, leaves and fruit. They are very voracious, and able to destroy large numbers of buds, cut flowers, and bore open galleries on fruits (at the surface, but varying in depth) (ArystaLifeScience, 2003). *P. auraria* has moved to plants that are exotic to its native range, such as apple, stone fruits, grapevine (CABI CPC). *P. auraria* was initially considered a citrus pest, but has grown in importance as a pest of Vitis; it is the most common *Proeulia* species in Chile (Biosecurity Australia, 2005). On grapevine, it destroys buds and berries (superficial damage or complete destruction;

Botrytis rots also develop inside infested bunches) and vegetative material (Biosecurity Australia, 2005). Increasing severity of infestations is reported (Reyes-Garcia et al., 2014).

Other information: In relation to transport in trade, mature larvae cannot withstand low cold storage temperatures for over 2-3 weeks; first-instar overwintering larva are hidden on plant parts and may withstand cold conditions (6-8°C) for over a month (CABI CPC). *P. auraria* has quarantine significance for at least China, Korea Republic, Taiwan and the USA.

Recorded impact: High (on another crop)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

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Reyes-Garcia L, Cuevas Y, Ballesteros C, Curkovic T, Löfstedt C, Bergmann J. 2014. A 4-component sex pheromone of the Chilean fruit leaf roller *Proeulia auraria* (Lepidoptera: Tortricidae). Cien. Inv. Agr. 41(2):187-196. 2014

Sparganothis sulfureana (Lepidoptera: Tortricidae)

Fruit pathway: on *Vaccinium*, larvae of second generation feed on berries, emptying the fruit; larger larvae attack the surface of berries (Le Duc et al., 2014; AgricultureCanada, 2007).

Other pathways: plants for planting; on *Vaccinium*, larvae of 2nd generation also feed on leaves, larvae of 1st generation feed on flower buds, the pest overwinters as young larvae in the leaf litter, adults lay eggs on leaves or weeds (AgricultureCanada, 2007).
Uncertain pathway: soil.

Hosts: Polyphagous (nearly 20 families), incl. *Vaccinium macrocarpon*, *V. corymbosum*, *Vaccinium* (AgricultureCanada, 2007; Averill and Sylvia, 1998; Brown et al., 2008; Gilligan and Epstein, 2014), also *Apium graveolens*, *Aster*, *Helianthus*, *Thuja occidentalis*, *Medicago sativa*, *Trifolium*, *Mentha*, *Lilium*, *Abies balsamea*, *Larix*, *Picea glauca*, *Pinus*, *Zea mays*, *Fragaria*, *Malus*, *Citrus*, *Salix*, *Ulmus americana*, *Vitis* (Gilligan and Epstein, 2014).

Distribution: North America: Canada (AgricultureCanada, 2007), USA (Deutsch et al., 2014).

Damage: On cranberry, each larva consumes 3-5 berries during its development (IPMCenters, 1998). Feeding by 1st-generation larvae decreases yield; second generation larvae cause direct damage to fruit (AgricultureCanada, 2007). *S. sulfureana* is a secondary pest according to AgriReseauQuebec (2015a), but a severe pest of cranberry in the Midwest and North-Eastern USA (Deutsch et al., 2014; IPMCenters, 1998; Averill and Sylvia, 1998). Infestations are more severe in the USA than in Eastern Canada, where no specific treatments are made but the pest is controlled through treatments applied against *Acrobasis vaccini* (Le Duc et al., 2014). In the past, resistance to organophosphates was suspected when its importance increased (Averill and Sylvia, 1998). Possible damage on other hosts was not considered here.

Recorded impact: High	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

AgricultureCanada. 2007. Crop profile for cranberry in Canada. http://www.agr.gc.ca/pmc-cropprofiles

AgriReseauQuebec. 2015a. Publication on cranberry, annexe 5: Identification des insectes ravageurs de la canneberge présents au Québec (Source: Insectes ravageurs de la canneberge au Québec. Guide d'identification. CETAQ 2000).

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Deutsch AE, Rodriguez Saona CR, Kyryczenko Roth V, Sojka J, Zalapa JE, Steffan SA. 2014. Degree-Day Benchmarks for Sparganothis sulfureana (Lepidoptera: Tortricidae) Development in Cranberries. Journal of Economic Entomology, 107(6): 2130-2136.

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Le Duc I, Turcotte C, Allard F. 2004. Manuel de lutte intégrée de la canneberge de l'est canadien. Agriculture Canada. 148 pp.

PART 2 – PESTS WITH LESSER ECONOMIC IMPORTANCE AND MORE LIKELY TO TRANSFER, OR HIGH ECONOMIC IMPORTANCE BUT LESS LIKELY TO TRANSFER

Pathogens

Exobasidium maculosum (Basidiomycota)

Fruit pathway: The fungus occurs on fruit (Talbot Brewer et al., 2014). No information was found on the transmission modes of this fungus (and whether these would facilitate transfer from infected fruit to host plants).

Other pathways: plants for planting; the fungus also occurs on leaves (Talbot-Brewer et al., 2014).

Hosts: *Vaccinium virgatum*, *V. corymbosum*, hybrids (Talbot Brewer et al., 2014).

Distribution: North America: USA (South-East; Talbot Brewer et al., 2014; Farr and Rossman, 2015; Smith, 2014). In South-East USA, the fungus was originally thought to be *E. vaccinii*, which also occurs in Europe (and other parts of the world – Farr and Rossman, 2015). There is no information on whether some previous records of *E. vaccinii* in Europe (or elsewhere in the world) relate to *E. maculosum*.

Damage: E. maculosum causes fruit spot and leaf spot (Talbot Brewer et al., 2014). It cause an emerging disease and its prevalence has been increasing throughout Southeastern USA (Talbot Brewer et al., 2014). In Mississippi, it was previously considered to be occasional and of minor importance, but is currently reported more often and is responsible for significant fruit loss. Up to 60-70% losses have been reported at some sites (Smith, 2014).

Other information: There is an uncertainty on whether this fungus only occurs in the USA, because it was described very recently and was originally confused with *E. vaccinii*, which has a wider distribution (Talbot Brewer et al., 2014). However, E. maculosum causes an emerging disease of *Vaccinium* and was retained here.

Recorded impact: High	**Intercepted:** Not known	**Spreading/invasive:** Yes

References:
Farr DF, Rossman AY. 2015. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA. http://nt.ars-grin.gov/fungaldatabases (accessed August 2015)
Smith B. 2014. Exobasidium Leaf and Fruit Spot: Disease Management. Mississippi Vaccinium Journal. Volume 3, Issue 3 July-September 2014. Pages 2-5.
Talbot Brewer M, Turner AN, Brannen PM, Cline WO, Richardson EA. 2014. Exobasidium maculosum, a new species causing leaf and fruit spots on blueberry in the southeastern USA and its relationship with other Exobasidium spp. parasitic to blueberry and cranberry. Mycologia May/June 2014 vol. 106 no. 3 415-423.

Acari

Acalitus vaccinii (Acarida: Eriophyidae)

Fruit pathway: Although the pest seems to mostly attack buds, some sources mention feeding on fruit (NCSU, 1997; possibly CAES, 2007 – see 'Damage'). However, there is an uncertainty on association with fruit.

Other pathways: plants for planting. *A. vaccinii* lives and feeds inside buds (including leaf and flower) (NCSU, 1997; Roubos, 2009; CAES, 2007; Prodorutti et al., 2007).

Hosts: *Vaccinium*, *Gaylussacia baccata* (Keifer, 1941). Among *Vaccinium*, 'highbush blueberries', 'lowbush blueberries' (Roubos, 2009); 'rabbiteye blueberries' (Weibelzahl and Liburd, 2013), 'huckleberries' (NCSU, 1997).

Distribution: North America: Canada, USA (NVWA, 2012).

Damage: The pest may cause severe yield losses through damage to flower buds (from a reduction in number of fruits per cluster, to total desiccation of developing flower buds) (Weibelzahl and Liburd, 2009).

It may also cause malformed berries (Cromroy and Kuitert, 2014; Roubos, 2009) and lead to growth retardation, small flowers and fruits (NVWA, 2012). It is reported to also feed on developing fruits (NCSU, 1997). CAES (2007) mention that 'feeding may cause the skin of berries to be rough'. A. vaccinii is gaining importance as a pest of southern highbush blueberries (Weibelzahl & Liburd, 2009).

Other information: *A. vaccini* is present throughout the season. It is too tiny to be seen by the naked eye (CAES, 2007).

Recorded impact: High	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

CAES. 2007. Blueberry (Vaccinium). The Connecticut Agricultural Experiment Station.

Cromroy HL, Kuitert LC. 2014. Blueberry Bud Mite, Acalitus vaccinii (Keifer) (Arachnida: Acari: Eriophyidae).. (original from 1973) EENY-186. University of Florida

Keifer HH. 1941. Eriophyid Studies XI. Bulletin of California Department of Agriculture 30: 192-204.

NCSU. 1997. Blueberry bud mite. North Carolina State University. Available at http://ipm.ncsu.edu/small_fruit/mite.html (accessed August 2015)

NVWA. 2012. Pest Risk Analysis for Blueberry scorch virus - Including an inventory of highbush blueberry pests and diseases present in North America and absent in the Netherlands. Dirk Jan van der Gaag, Arjen Werkman & Gerard van Leeuwen. Netherlands Food and Consumer Product Safety Authority Ministry of Economic Affairs, Agriculture & Innovation

PQR. Plant Quarantine data Retrieval system: EPPO Database on Quarantine Pests. www.eppo.int (accessed August 2015)

Prodorutti D, Pertot I, Giongo L, Gessler C. 2007. Highbush Blueberry: Cultivation, Protection, Breeding and Biotechnology. The European Journal of Plant Science and Biotechnology. 1(1), 44-56

Roubos CR. 2009. Monitoring and managing blueberry gall midge (Diptera: Cecidomyiidae) in rabbiteye blueberries. Thesis (PhD), University of Florida.

Weibelzahl E, Liburd OE. 2009. Epizootic of Acalitus vaccinii (Acari: Eriophyidea) Caused byHirsutella thompsonii on Southern Highbush Blueberry in North-Central Florida. Florida Entomologist 92(4):601-607.

Weibelzahl E, Liburd OE. 2013. Blueberry Bud Mite, Acalitus vaccinii (Keifer) on Southern Highbush Blueberry in Florida. ENY-858. University of Florida. https://edis.ifas.ufl.edu/pdffiles/IN/IN84400.pdf (accessed August 2015).

Insects

Acleris minuta (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed superficially on berries (Averill and Sylvia, 1998, for cranberry).

Other pathways: plants for planting, cut branches; larvae feed on leaves, web leaves together or fold single leaves; eggs on bark or leaves (Gilligan and Epstein, 2014; Averill and Sylvia, 1998; OSU, no date).

Hosts: Polyphagous, incl. *Vaccinium macrocarpon*, *Malus domestica* (CABI CPC), *Calluna, Kalmia angustifolia, Kalmia, Vaccinium, Myrica gale, Malus pumila, Malus, Prunus* (as peach, plum), *Pyrus, Salix* (Brown et al., 2008).

Distribution: North America: USA, Canada (Brown, 2008; OSU, no date). Brown et al. (2008) also mentions Europe, based on Benander (1934), which probably relates to Sweden. No record was found for Sweden or any European countries; in particular, the pest is not in de Jong et al. (2014 – Fauna Europaea).

Damage: Total defoliation is mentioned in Brown (2008). Several publications tend to point to damage only in the past (on apple, plum, cranberry in Gilligan and Epstein, 2014; on huckleberry, blueberry in Averill and Sylvia, 1998).

Recorded impact: Moderate (in the past)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Averill AL, Sylvia MM. 1998. Cranberry Insects of the Northeast: A Guide to Identification, Biology, and Management. UMass Extension. 112 pp.

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.

CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc

de Jong Y et al. 2014. Fauna Europaea - all European animal species on the web.Biodiversity Data Journal 2: e4034. doi: 10.3897/BDJ.2.e4034.

Gilligan TM, Epstein M. 2014. Tortricids of Agricultural Importance. Interactive Keys developed in Lucid 3.5. Last updated August 2014. http://idtools.org/id/leps/tortai/index.html

OSU. No date. Codling Moth Information Support System (CMISS). Natural Enemies of Codling Moth and Leafrollers of Pome and Stone Fruits. Integrated Plant Protection Center, Oregon State University. http://www.ipmnet.org/codlingmoth/biocontrol/natural/ (accessed August 2015).

***Argyrotaenia citrana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae of later generations feed at the surface of berries (CABI CPC; OregonBlueberry, no date; De Francesco and Murray, 2011; Retamales and Hancock, 2012). Larvae may also contaminate mechanically harvested *Vaccinium* fruit/'fall' in fruit at harvest (DeFrancesco and Bell, 2014; BerriesNW, 2014). On grapes, larvae make a nest between berries and include leaves, stems and berries (UC IPM, 2014). Eggs may be on fruit (Gilligan and Epstein, 2009).

Other pathways: plants for planting; larvae also feed on buds and leaves (De Francesco and Murray, 2011; UC IPM, 2014). Eggs may also be on leaves and twigs (Gilligan and Epstein, 2009). Larvae overwinter on the ground or in plants; pupae are on webbed leaves or in debris on the ground (OregonBlueberry, no date). Uncertain pathway: soil.

Hosts: Over 80 hosts incl. *Vaccinium* (incl. *V. corymbosum*, *V. ovatum* - DeFrancesco and Bell, 2014; De Francesco and Murray, 2011; Brown et al., 2008), *Citrus*, *Malus domestica*, *Pinus radiata*, *Prunus armeniaca* (CABI CPC); *Prunus persica* (USPest, 2014); *Vitis vinifera* (UC IPM, 2014), *Rubus* (as raspberry, blackberry, boysenberry, loganberry), *Persea americana* (OregonBlueberry, no date).

Distribution: North America: Canada, USA (West) (OregonBlueberries, no date; USPest, 2014; UC IPM, 2014), Mexico (AQIS, 1999. Lopez, 2007, listing pests in 3 municipalities following a 3-year study).

Damage: Feeding on leaves causes relatively minor damage; on growing points on young plants, it can promote stunting and undesirable branching; on blossoms, it can spread *Botrytis*. On blueberry, *A. citrana* causes loss of fruit quality by binding leaves to developing fruit, and if the larvae contaminate fruit in mechanically harvested fields (DeFranscesco and Bell, 2014; BerriesNW, 2014). It is minor problem on blueberry in Oregon (De Francesco and Murray, 2011). *A. citrana* can cause economic damage to citrus, apple, and grapes (Gilligan and Epstein, 2009). It is an important pest on apple and other important fruit crops in Western USA; it can cause significant damage even at relatively low populations (Walker and Welter 2009, Zalom and Pickel 1988). On grape, it is an occasional pest in California (UC IPM, 2014); damage levels of 25% are mentioned in AQIS (1999). It is mentioned as an 'occasional and less well-known' pest of apple (for Mexico, Lopez, 2007).

Other information: *A. citrina* was intercepted in Japan (no indication of the commodity; Amano and Higo, 2015). The synonym *A. franciscana* is used in Brown et al. (2008), Amano and Higo (2015) and BerriesNW (2014).

Recorded impact: Moderate	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Amano T, Higo Y. 2015 (published online). A convenient diagnostic polymerase chain reaction method for identifying codling moth Cydia pomonella (Lepidoptera: Tortricidae) among tortricid pests in cherries imported from western North America. Applied Entomology and Zoology, Published online 30 July 2015. http://link.springer.com/article/10.1007%2Fs13355-015-0360-9#/page-1

AQIS. 1999. Draft import risk analysis For the importation of Fresh table grapes [Vitis vinifera l.] From California (USA). March 1999. Australian Quarantine & Inspection Service, Canberra, Australia.

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Gilligan TM, Epstein ME. 2009. LBAM ID - Tools for diagnosing light brown apple moth and related western US leafrollers (Tortricidae: Archipini). Colorado State Univeristy, California Department of Food and Agriculture, and Center for Plant Health Science and Technology, USDA, APHIS, PPQ. Web database. URL: http://itp.lucidcentral.org/id/lep/lbam/Argyrotaenia_franciscana.htm

Lopez EQ. 2007. Diversidad de plagas y enemigos naturales en el manzano. http://www.unifrut.com.mx/archivos/simposiums/congreso/2007/v1.pdf
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USPest. 2014. Orange tortrix Lepidoptera: Tortricidae Argyrotaenia. Data sheet pdf. US PEST.ORG, web server at the Integrated Plant Protection Center of Oregon State University. http://uspest.org/pdf/reb77.pdf (accessed October 2014)
Walker KR, Welter SC. 2004. Biological control potential of *Apanteles aristoteliae* (Hymenoptera: Braconidae) on populations of *Argyrotaenia citrana* (Lepidoptera: Tortricidae) in California apple orchards. Environmental Entomology 33(5): 1327-1334.
Zalom F, Pickel C. 1988. Spatial and seasonal distribution of damage to apples by *Argyrotaenia citrana* (Fernald) and *Pandemis pyrusana* Kearfott. Journal of Agricultural Entomology 5(1): 11-15.

Aroga trialbamaculella (Lepidoptera: Gelechiidae)

Fruit pathway: larvae contaminate fruit at harvest (IPM Centers, 1999; Averill and Sylvia, 1998).

Other pathways: plants for planting; larvae feed on leaves tied together (CAES, 2007; IPMCenters, 1999); eggs are on plants; the pest overwinters as mature larvae in the leaf litter, and pupae are in the leaf litter (IPMCenters, 1999).
Uncertain pathway: soil.

Hosts: *Vaccinium angustifolium* (Drummond et al., 2009; Averill and Sylvia, 1989), *Vaccinium* (as blueberry) (CAES, 2007), 'wild blueberries' (*V. angustifolium*?, *V. myrtillioides*?) (IPMCenters, 1999), *Vaccinium stamineum* (Busck, 1903). *V. corymbosum* (as highbush blueberries), various other *Vaccinium* and *Arbutus* (Averill and Sylvia, 1998).

Distribution: North America: Canada (Blatt et al, 1989); USA (CAES, 2007).

Damage: The pest causes feeding damage on leaves . 50% of stems may also be webbed together. It creates webs around the fruit, which may affect their growth and makes harvest difficult (Blatt et al, 1989). The importance of the pest had been increasing (IPMCenters, 1999). It was considered as a pest of lowbush blueberry in Maine (through contamination of harvested fruit), and minor elsewhere in Eastern USA (Averill and Sylvia, 1998).

Other information: In Maine, it is also found on managed wild plants (Drummond et al., 2009). Note: CAES (2007) uses the synonym *Gelechia trialbamaculella*.

Recorded impact: Moderate (in the past)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:
Averill AL, Sylvia MM. 1998. Cranberry Insects of the Northeast: A Guide to Identification, Biology, and Management. UMass Extension. 112 pp.
Blatt CR. 1989. La production du bleuet nain. Publication 1477/F. Agriculture Canada
BugGuide. 2015. Internet Database. Identification, Images, & Information For Insects, Spiders & Their Kin For the United States & Canada. Iowa State University, 2003-2015.
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IPMCenters. 1999. Crop Profile for Blueberries (Wild) in Maine. http://www.ipmcenters.org/

Choristoneura parallela (Lepidoptera: Tortricidae)

Fruit pathway: larvae of second generation feed on cranberry fruit (Rutgers, no date). Occasionally, eggs are laid on cranberry fruit (Stuart and Polavarapu 1998).

Other pathways: plants for planting; on cranberry, larvae feed mainly on foliage, eggs are typically laid on leaves of weeds, occassionally also on cranberry leaves (Stuart and Polavarapu 1998). On North American pawpaw (*Asimina triloba*), the pest may damage flowers and leaves (Pomper and Layne, 2004).

Hosts: Herbaceous and woody plants, incl. *Vaccinium* (at least *V. macrocarpon* - Stuart and Polavarapu 1998), *Citrus, Rosa* (Brown et al., 2008), *Asimina triloba* (Pomper and Layne, 2004), ferns, *Malus, Salix, Fragaria, Aster, Rosa* (Averill and Sylvia, 1998).

Distribution: North America: Canada, USA (Averill and Sylvia, 1998).

Damage: on cranberries, *C. parallela* causes shoot browning and direct damage to fruit(Rutgers, nd). It was the most important cranberry pest in New Jersey, and sometimes a rose pest in greenhouses (Averill and Sylvia, 1998).

Other information: The common name 'spotted fireworm' is used in Rutgers (no date).

Recorded impact: Moderate (in the past)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Averill AL, Sylvia MM. 1998. Cranberry Insects of the Northeast: A Guide to Identification, Biology, and Management. UMass Extension. 112 pp.

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.

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Rutgers. No date. Spotted Fireworm. Philip E. Marucci Center for Blueberry and Cranberry Research and Extension, New Jersey Agricultural Experiment Station, Rutgers University, New Jersey. http://pemaruccicenter.rutgers.edu/ (accessed August 2015).

Stuart RJ, Polavarapu S. 1998. Oviposition preferences of the polyphagous moth *Choristoneura parallela* (Lepidoptera: Tortricidae): effects of plant species, leaf size, and experimental design. Environmental Entomology 27(1): 102-109.

Cingilia catenaria (Lepidoptera: Geometridae)

Fruit pathway: larvae feed on fruit (IPM Centers, 1999; Blatt et al, 1989).

Other pathways: plants for planting; larvae also feed on leaves, eggs are on leaves and overwinter on dead leaves (IPM Centers, 1999; Blatt et al, 1989).
Uncertain pathways: cut branches.

Hosts: Hosts incl. *Ericaceae*, such as *Vaccinium angustifolium*, *V. myrtillioides* (IPMCenters, 1999), *Vaccinium* (as blueberry, cranberry, huckleberry) (Averill and Sylvia, 1998), *Gaylussacia, Myrica* (Wagner et al., 2003), as well as various shrubs and trees, such as: *Alnus, Betula, Abies, Acer, Quercus, Pinus, Populus, Salix* (BugGuide, 2015), *Fraxinus, Rubus* (as raspberry, blackberry), *Corylus, Juniperus, Malus, Pyrus* (Averill and Sylvia, 1998).

Distribution: North America: Canada, USA (University of Alberta, 2015).

Damage: *C. catenaria* is currently an occasional pest in Eastern North America (University of Alberta, 2015; IPM Centers, 1999). In the past, it caused severe outbreaks on cranberry and was reported as important on blueberries (1920s/30s) (Averill and Sylvia, 1998). It could reappear as a problem if pest management practices changed drastically (IPMCenters, 1999).

Recorded impact: High (in the past)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Averill AL, Sylvia MM. 1998. Cranberry Insects of the Northeast: A Guide to Identification, Biology, and Management. UMass Extension. 112 pp.

Blatt CR. 1989. La production du bleuet nain. Publication 1477/F. Agriculture Canada

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Wagner DL, Nelson MW, Schweitzer DF. 2003. Shrubland Lepidoptera of southern New England and southeastern New York: ecology, conservation, and management. Forest Ecology and Management 185 (2003) 95–112

Ctenopseustis obliquana (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed at the fruit surface (for avocado in Stevens et al., 1995, generally in Gilligan and Epstein, 2014). On apple, larvae feed on the fruit surface, young larvae may also enter the interior of the fruit through the calyx (Biosecurity Australia 2006). No specific information was found for *Vaccinium*, but the pest was intercepted on blueberry (2 interceptions in and on fruit; USDA, 2008).

Other pathways: plants for planting, cut branches; larvae also feed on leaves and buds (Stevens et al., 1995; Gilligan and Epstein, 2014); eggs on leaves (Biosecurity Australia 2006).

Hosts: Highly polyphagous, in more than 20 families (Gilligan and Epstein, 2014), including deciduous and coniferous trees (NZFFA, 2009). Hosts include *Vaccinium corymbosum* (Tomkins and Koller, 1985), *Vitis, Prunus, Malus, Vaccinium* (CABI CPC), *Actinidia, Rubus, Persea americana, Pinus, Eucalyptus, Populus, Salix* (Green and Dugdale, 1982), *Diospyros kaki, Ribes, Syzygium smithii, Cyclamen, Rosa, Citrus, Veronica, Camellia japonica* (Gilligan and Epstein, 2014).

Distribution: Oceania: New Zealand (NZFFA, 2009).

Damage: The pest causes feeding damage on leaves, buds and fruit, and by webbing leaves to fruits (Gilligan and Epstein, 2014). *C. obliquana* is a cause of *Vaccinium* fruit rejection at export from NZ (Tomkins and Koller, 1985). On avocado, it caused rejection of up to 30% of the fruit because of larval damage (unsprayed orchards) (Stevens et al., 1995). It is an economically important pest of apple in New Zealand (Shaw et al. 1994), and causes occasional damage in *Pinus radiata* (Brockerhoff et al. 2002).

Recorded impact: Moderate (on another crop)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Biosecurity Australia. 2006. Final import risk analysis report for apples from New Zealand, Part C. Biosecurity Australia, Canberra, 197 p.

Brockerhoff, E. G., Jactel, H., Leckie, A. C., and Suckling, D. M. (2002). Species composition and abundance of leafrollers in a Canterbury pine plantation. New Zealand Plant Protection, 85-89.

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Green CJ, Dugdale JS. 1982. Review of the genus Ctenopseustis Meyrick (Lepidoptera: Tortricidae), with reinstatement of two species, New Zealand Journal of Zoology, 9:4, 427-435, DOI: 10.1080/03014223.1982.10423874.

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Shaw PW, Cruickshank VM, Suckling DM. 1994. Geographic changes in leafroller species composition in Nelson orchards. New Zealand journal of Zoology 21(3): 289-294.

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Epiglaea apiata (Lepidoptera: Noctuidae)

Fruit pathway: Martinson and Kummer (no date) mention that larvae feed on small developing fruit. (note: this was the only reference found on association with fruit, therefore considered uncertain).

Other pathways: Plants for planting, soil; larvae mostly feed on leaves, bore in buds and severe flowers. The pest overwinter as eggs in leaf litter, and pupae are in the soil (AgricultureCanada, 2007).

Hosts: *Vaccinium macrocarpon* (AgricultureCanada, 2007; Sandler and Mason, 1997; Zhang and Polavarapu, 2003; AgriReseauQuebec, 2015), *Vaccinium angustifolium*, *V. myrtilloides*, possibly *Vaccinium crassifolium* and others (Wagner et al., 2015 - draft).

Distribution: North America: Canada (AgricultureCanada, 2007), USA (Averill and Sylvia, 1998).

Damage: *E. apiata* damages leaves, buds and affects fruit production. It is a major pest of cranberry in New Jersey (Zhang and Polavarapu, 2003) and Quebec (AgriReseauQuebec, 2015). Averill and Sylvia (1998) mention that damage was more important in the past.

Recorded impact: Moderate (in the past)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

AgricultureCanada. 2007. Crop profile for cranberry in Canada. http://www.agr.gc.ca/pmc-cropprofiles

AgriReseauQuebec. 2015. Publication on cranberry, annexe 5: Identification des insectes ravageurs de la canneberge présents au Québec (Source: Insectes ravageurs de la canneberge au Québec. Guide d'identification. CETAQ 2000).

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Grapholita libertina (Lepidoptera: Tortricidae)

Fruit pathway: eggs are on berries and larvae bore into berries (for *Vaccinium vitis-idaea*, Hillier, 2002).

Other pathways: possibly soil; the pest overwinters in pre-pupa stage on the ground (Hillier, 2002).

Hosts: *Vaccinium vitis-idaea*, *V. macrocarpon* (Dixon and Hillier, 2003, Hillier et al., 2004). Possibly others (California, where *G. libertina* was recorded, is not part of the geographical range of *V. vitis-idaea*).

Distribution: North America: Canada (Newfoundland; Dixon and Hillier, 2003). Hillier (2002) mentions that the pest was also reported in Canada from British Columbia and Nova Scotia, and in the USA from California, New Jersey and Maine, and is therefore probably more widely distributed than only these records.

Damage: The pest causes direct damage to fruit. Each larva damages approximately 10 berries (Hillier, 2002). *G. libertina* is a pest of lingonberry in Newfoundland, affecting domestic and export markets (Morris et al., 1988; Penhallegon, 2006).

Recorded impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

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Ochropleura implecta (Lepidoptera: Noctuidae)

Fruit pathway: Larvae feed on unripe and ripe berries (Maurice, 2000).

Other pathways: Plants for planting; no specific data was found on other plant parts attacked, but many cutworms also feed on leaves.

Hosts: Polyphagous, incl. *Vaccinium macrocarpon* (Maurice et al., 2000), Beta (as beet), *Trifolium* (as clover), *Salix* (BugGuide, 2015).

Distribution: North America: Canada, USA (BugGuide, 2015).

Damage: The first damage in cranberry was observed in 1997 in British Columbia, leading to economic impact (Fitzpatrick et al., 2000). It is still mentioned in a recent guide on cranberry insects pests in British Columbia (Fitzpatrick et al., 2014). No information was found on the pest status on other hosts.

Recorded impact: Moderate (in the past, uncertain)	Intercepted: Not known	Spreading/invasive: Not known

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Orthosia hibisci (Lepidoptera: Noctuidae)

Fruit pathway: larvae feed on fruit (Martison and Kummer, no date, for cranberry; Howell, 2015; Alston et al., 2010; WSU, no date, for various fruit trees).

Other pathways: plants for planting, soil; larvae also feed on buds, flowers and leaves; eggs are on leaves; pupae are in the soil (Howell, 2015).

Hosts: Polyphagous on many trees and shrubs including: *Vaccinium macrocarpon* (AgricultureCanada, 2007), *Malus domestica* (CABI CPC), *Prunus* (as cherries, plums) (Alston et el., 2010*), Salix, Betula, Populus, Acer* (Alston et al., 2010; BugGuide, 2015).

Distribution: North America: Canada, USA (AgricultureCanada, 2007; CABI CPC).
Uncertain record: Mexico (Lopez, 2007, indicating pests in 3 municipalities following a 3-year study; this record is considered uncertain only because of the nature of the publication – powerpoint).

Damage: On cranberry, the pest is reported to cause severe damage to leaves, buds and flowers (AgricultureCanada, 2007). It causes feeding damage to fruit trees, and high densities can cause localized defoliation; it is generally not a problem where insecticides are applied against other fruit insect pests (Alston et al., 2010). It is mentioned as a secondary pest of apple in Lopez (2007, for Mexico). In Canada, it is a pest of cranberry and an important pest of apple (Le Duc et al., 2004).

Recorded impact: Moderate	Intercepted: Not known	Spreading/invasive: Not known

References:

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Howell JF. 2015. Fruitworms, armyworms and climbing cutworms. Tree Fruit Research & Extension Center. Orchard Pest Management Online. Washington State University.

Le Duc I, Turcotte C, Allard F. 2004. Manuel de lutte intégrée de la canneberge de l'est canadien. Agriculture Canada. 148 pp.

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WSU. No date. Speckled green fruitworm, green fruitworm, pyramidal fruitworm, *Orthosia hibisci* (Guenée) Lithophane antennata (Walker), Amphipyra pyramidoides (Guenée) (Lepidoptera: Noctuidae). Tree Fruit Entomology, Washington State University. http://entomology.tfrec.wsu.edu/jfbhome/miscellaneous/noctuid/speckledtext.html (accessed August 2015)

Systena frontalis (Coleoptera: Chrysomelidae)

Fruit pathway: adults feed on berries (Mahr et al., 2005; Averill and Sylvia, 1998; AgriReseauQuebec, 2015).

Other pathways: plants for planting, soil; adults also feed on leaves (Averill and Sylvia, 1998), larvae are in the soil and feed on roots, eggs are in the soil (Mahr, 2005).
Uncertain pathway: cut flowers.

Hosts: Over 40 host plants, including crops, native plants, weeds; crops include *Vaccinium macrocarpon*, *Vaccinium corymbosum, Medicago sativa* (Mahr, 2005; AgricultureCanada, 2013, AgriReseauQuebec, 2015; Averill and Sylvia, 1998), *Ipomoea batatas, Phaseolus vulgaris* (CABI CPC), ornemental plants, such as *Weigelia, Ilex, Rosa, Chrysanthemum, Salvia, Zinnia* (Hiskes, 2013).

Distribution: North America: Canada (AgricultureCanada, 2007); USA (CABI CPC). Native range is East of the Rockies; also present (not native) in the Pacific Northwest (Hiskes, 2013).

Damage: On cranberry, the pest causes root damage (larvae), as well as leaf browning and feeding damage to fruits (adults) (Mahr, 2005). Feeding by adults can impact bud development (Averill and Sylvia, 1998) and cause shoot death; feeding by larvae may lead to plant death (Mahr et al., 2005). On ornamentals, it causes damage to foliage (adults) and roots (larvae) (Hiskes, 2013). Populations large enough to cause damage are uncommon, but severe infestations may result in mortality (Mahr, 2005). *S. frontalis* became a pest in cultivated cranberry bogs of Massachussets in the 1990s (Averill and Sylvia, 1998). In Eastern USA, it affects ornamental nurseries, as well as cranberry and blueberry; it emerged in 2013 as a pest of many ornamental species in nurseries in Connecticut (Hiskes, 2013). In Wisconsin, it rarely causes significant damage on cranberry (Mahr, 2005), while it is considered a secondary pest in Quebec (AgriReseauQuebec, 2015).

Recorded impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Yes

References:

AgricultureCanada. 2007. Crop profile for cranberry in Canada. http://www.agr.gc.ca/pmc-cropprofiles

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Teia anartoides **(Lepidoptera: Lymantriidae)**

Fruit pathway: it was considered here that larvae (and pupae) may become associated to packaging material containing *Vaccinium* fruit (with an uncertainty). There is no indication of the presence of a life stage on fruit. However, *T. anartoides* is a pest of *Vaccinium* and eggs and pupae may be associated with a wide range of commodities and items (see Other pathways).

Other pathways: plants for planting, inanimate objects (including possibly packaging, containers); eggs are laid at the pupation site, larvae feed on leaves and disperse by crawling or ballooning. Pupae form on or near hosts plants, on other plants and on inanimate objects (MAF, no date; CABI CPC). The pest was intercepted twice in New Zealand on a container, and a container packaging (MPI, 2014). Other possible pathways are indicated as vehicles, live plant material, passengers' items, other commodities (MAF, no date).

Hosts: Highly polyphagous. During an incursion in New Zealand, it was found on 92 species in 38 families, including new hosts and native plants (Zespri, no date). Hosts include *Vaccinium* (Ireland and Wilk, 2006), *Acacia, Eucalyptus, Malus, Pyrus, Prunus* (as cherry, apricot), *Cupressus, Pinus radiata, Passiflora, Rosa, Dahlia, Salix, Musa, Primula, Gladiolus* (Zespri, no date).

Distribution: Oceania: Australia (native - Ireland and Wilk, 2006, CABI CPC). Absent, eradicated: New Zealand (Suckling et al., 2007).

Damage: The pest is qualified as being a 'voracious and indiscriminate feeder', causing defoliation. Contact with caterpillars may cause skin irritation and allergic reactions (MPI, 2014). It can feed on pine trees up to 8 years old, affecting their growth. *Acacia, Rosa and Malus* are amongst preferred hosts (Zespri, no date). In Australia, *T. anartoides* is one of the main pests of blueberries in New South Wales (Ireland and Wilk, 2006); it is also a common pest on urban garden plants, and a sporadic pest of horticultural and forestry trees (CABI CPC). In New Zealand, it was identified as a major risk with potential high economic and ecological impact (30-213 million USD over 20 years) and, during an incursion, heavy defoliation of native trees was observed in a localised area (Zespri, no date; MAF, no date; Suckling et al, 2007). Eradication costed ca. 40 million USD (Zespri, no date).

Other information: Females are flightless, ballooning larvae are the main means of dispersal (Suckling et al., 2007). Note: the name 'painted apple moth' is used in Ireland and Wilk (2006).

Recorded impact: Moderate	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:

CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc

Ireland G, Wilk P. 2006. Blueberry production in northern NSW (factsheet). PRIMEFACT 195. New South Wales Department of Primary Industries.

MAF. No date. Painted Apple Moth – Auckland New Zealand May 1999. Outline for case-studies on alien species. http://www.biosecurity.govt.nz/files/pests/painted-apple-moth/ias-nz-moth-2007-en.pdf (accessed August 2015)

MPI. 2014. Painted Apple Moth, *Teia anartoides* (online data sheet). Ministry for Primary Industries, New Zealand. Available at http://www.biosecurity.govt.nz/pests/painted-apple-moth.

Suckling DM, Barrington AM, Chhagan A, Stephens AEA, Burnip GM, Charles JG, Wee SL. 2007. Eradication of the Australian Painted Apple Moth *Teia anartoides* in New Zealand: Trapping, Inherited Sterility, and Male Competitiveness. Chapter 7, pp 603-615. In Area-Wide Control of Insect Pests, eds Vreysen MJB, Robinson AS, Hendrichs J. Published by Springer Netherlands.

Zespri. No date. Data sheet. High Priority Organism: *Teia anartoides* (Painted Apple Moth). 2 pages. Available from the website http://mpi.govt.nz/ (accessed August 2015)

Thrips obscuratus (Thysanoptera: Thripidae)

Fruit pathway: Adults feed on fruit (Teulon, 1988, also reports feeding on *Vaccinium* fruit; Schmidt et al., 2006, mentioning ripe fruits, e.g. nectarine, peach). In the USA, there was one interception on *Vaccinium* fruit (USDA, 2007, 2008). Nymphs are normally not on fruit, but Teulon et al. (1988) recorded few specimens on fruit of *Prunus persica* and *P. armeniaca*.

Other pathways: plants for planting, cut flowers, herbs; adults also feed on leaves, flowers, soft plant tissues, pollen grains, nectar (Teulon, 1988; Schmidt et al., 2006); they are usually observed on flowers, but common on leaves and fruit. Larvae are mostly on flowers (Teulon, 1988).

Hosts: Adults feed on at least 223 species (177 genera in 77 families, incl. *Vaccinium* (Teulon, 1988). In New Zealand, 51 larval hosts were recorded (incl. 36 non-native) (Teulon and Penman, 1990). Hosts incl. vegetables (e.g. *Brassica*), ornamentals (e.g. *Dahlia, Rosa*), herbs (e.g. *Rosmarinus*), ornamental trees/shrubs (e.g. *Viburnum, Hebe*), fruit trees (e.g. *Malus, Prunus, Pyrus, Vitis vinifera*), pasture plants (e.g. *Trifolium, Medicago*), weeds.

Distribution: Oceania: New Zealand (CABI CPC; Teulon, 1988).

Damage: The pest causes fruit distortion, infestation at harvest (leading to contamination of export commodities, incl. cut flowers and fruit). It was suspected to transfer *Monilinia fructicola* to stonefruit flowers and fruit. It was reported as an important pest of stonefruit during flowering and at harvest; its increased pest status coincided with expansion of the horticultural industry in 1970s-80s (Teulon, 1988; Teulon and Penman, 1995). No information was found on current pest status.

Other information: It was also intercepted in Japan (no indication of commodity; Parker et al., 1995).

Recorded impact: Moderate (in the past)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc

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Teulon DAJ, Penman DR. 1990. Host Records for the New Zealand flower thrips (*Thrips obscuratus* (Crawford) Thysanoptera: Thripidae). New Zealand Entomologist, 1990, Vol. 13

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Teulon DAJ. 1988. Pest Management of the New Zealand Flower Thrips *Thrips obscuratus* (Crawford) (Thysanoptera: Thripidae) on Stonefruit in Canterbury, New Zealand. PhD Thesis. University of Canterbury, New Zealand.

USDA. 2007. Importation of fresh highbush and rabbit-eye blueberry (*Vaccinium corymbosum* L & V. virgatum Aiton) fruit into the Continental United States from Uruguay. A Pathway-Initiated Risk Assessment April 2007. USDA-APHIS.

USDA. 2008. Pathway-Initiated Risk Analysis of the Importation of Vaccinium spp. fruit from Countries in Central and South America into the Continental United States. February 5, 2008. Revision 003. USDA-APHIS.

Tortrix excessana (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed at the fruit surface (Gilligan and Epstein, 2014. The calyx of various fruits, especially pip fruits, may be invaded by young larvae but show no external damage (on apple, Biosecurity Australia, 2006). No specific information was found for *Vaccinium*, but the pest was intercepted in the USA on blueberry fruit (2 interceptions - USDA, 2008).

Other pathways: plants for planting; larvae also feed on leaves, buds and soft stems, eggs are on leaves (NZFFA, 2009; Biosecurity Australia, 2006). Larvae web leaves or leaves to fruit; pupae are in the larval shelter (Gilligan and Epstein, 2014).
Uncertain pathway: cut branches.

Hosts: Polyphagous, incl. *Vaccinium corymbosum* (Tomkins and Koller, 1985), *Actinidia chinensis, Diospyros, Malus domestica, Prunus armeniaca, Vaccinium* (CABI CPC), many native and introduced forest, orchard, and garden shrubs and trees, deciduous or conifers, incl. *Eucalyptus, Sequoia sempervirens, Pinus, Pseudotsuga menziesii* (NZFFA, 2009).

Distribution: Oceania: New Zealand (NZFFA, 2009). North America: Hawaii (USA, introduced) (Gilligan and Epstein, 2014).

Damage: *T. excessana* may cause economic damage by feeding directly on the surface of fruit. It is a pest of strawberry, walnut, stonefruit, apple in New Zealand (Gilligan and Epstein, 2014; Biosecurity Australia, 2006). It may cause damage to forest trees (NZFFA, 2009). The pest is also a cause of rejection of *Vaccinium* fruit at export (Tomkins and Koller, 1985).

Other information: *T. excessana* is occasionally intercepted on *Fragaria, Malus* or *Prunus* (no indication of commodities; Gilligan and Epstein, 2014). It is regulated in South Africa on fruits of kiwi and *Vaccinium* from New Zealand (MPI, 2013), and in Australia for apple. Note: most publications use the name *Planotortrix excessana*.

Recorded impact: Moderate (on another crop, uncertain)	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:

Biosecurity Australia. 2006. Final import risk analysis report for apples from New Zealand, Part C. Biosecurity Australia, Canberra.

CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc.

Gilligan TM, Epstein M. 2014. Tortricids of Agricultural Importance. Interactive Keys developed in Lucid 3.5. Last updated August 2014. http://idtools.org/id/leps/tortai/index.html

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USDA. 2008. Pathway-Initiated Risk Analysis of the Importation of Vaccinium spp. Fruit from Countries in Central and South America into the Continental United States. February 5, 2008. Revision 003. USDA-APHIS.

Xylena nupera (Lepidoptera: Noctuidae)

Fruit pathway: larvae feed on berries (Martinson and Kummer, no date).

Other pathways: plants for planting, soil; larvae also feed on buds, leaves, flowers and new growth; eggs are on leaves; pupae are in the soil (AgricultureCanada, 2007; Averill and Sylvia, 1998; Martinson and Krummer, nd; AgriReseauQuebec, 2015).

Hosts: Polyphagous, incl. *Vaccinium macrocarpon* (AgricultureCanada, 2007; AgriReseauQuebec, 2015; Averill and Sylvia, 1998), Rosaceae and many deciduous plants, herbaceous plants and grasses (PNW Moths, 2015).

Distribution: North America: Canada, USA (PNW Moths, 2015, AgriReseauQuebec, 2015; Dixon and Hillier, 2003).

Damage: On cranberry, the most important damage is to buds (Averill and Sylvia, 1998). *X. nupera* is a main pest of cranberry in Québec (AgriReseauQuebec, 2015), and not considered a pest in the Pacific Northwest (PNW Moths, 2015). Possible damage on other hosts was not considered here.

Recorded impact: Moderate (uncertain)	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:
AgricultureCanada. 2007. Crop profile for cranberry in Canada. http://www.agr.gc.ca/pmc-cropprofiles
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Averill AL, Sylvia MM. 1998. Cranberry Insects of the Northeast: A Guide to Identification, Biology, and Management. UMass Extension. 112 pp.
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Martinson N, Kummer L. no date. Wisconsin cranberry insect pests identification pocket guide. Ocean Spray Cranberries Inc., Wisconsin. Available at https://uwmadison.box.com/shared/static/f219xqml15ubn9gup634.pdf (accessed August 2015).
PNW Moths. 2015. Internet database on moths of the Pacific Northwest http://pnwmoths.biol.wwu.edu (accessed August 2015)

PART 3 – NEW PESTS OF VACCINIUM, POSSIBLY EMERGING

Pathogens

Diaporthe australafricana (Ascomycota)

Fruit pathway: *D. australafricana* was found virulent in blueberry fruit (in experiments, Elfar et al., 2013). It is also intercepted in blueberry fruits (FreshFruitPortal, 2014).

Other pathways: plants for planting; the fungus causes lesions on stems and shoots (Latorre et al., 2012).

Hosts: *Vaccinium corymbosum* (CABI CPC; new host in Elfar et al., 2013 & Latorre et al., 2012); Corylus avellana (new host, Guerrero and Perez, 2013); Vitis vinifera (Latorre et al., 2012). Udayanga et al. (2014) mention *D. australafricana* was recently found on Persea americana in the USA (without reference).

Distribution: South America: Chile (Elfar et al., 2013; Guerrero and Perez 2013; Latorre et al., 2012), Oceania: Australia; Africa: South Africa (Latorre et al., 2012); North America: USA (California; Lawrence et al., 2014). *D. australafricana* was first reported from Australia and South Africa (on Vitis vinifera; Latorre et al., 2012).

Damage: The pest causes stem canker and dieback, lesions on stems and necrosis of shoots (Latorre et al., 2012). It was observed on as much as 15% of plants in plantations in central and southern Chile since 2006; in experiments, It was shown to be highly virulent in shoots, stems and fruit of blueberry (Elfar et al., 2013).

Other information: *D. australafricana* has been detected in several new crops (incl. Vaccinium) and places in recent years, and may present a risk. No information was found on transmission modes (and whether they would facilitate its transfer from fruit consignment to hosts). Udayanga et al. (2014) note the need to investigate population structure and species boundaries with additional isolates of D. australafrica and D. rudi.

Recorded impact: Moderate	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:
CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc
Elfar, K., Torres, R., Díaz, G. A., and Latorre, B. A. 2013. Characterization of *Diaporthe australafricana* and Diaporthe spp. associated with stem canker of blueberry in Chile. Plant Dis. 97:1042-1050.
FreshFruitPortal. 2014. China intercepts fungus in Chilean blueberry shipment. December 12th, 2014. New Items at http://www.freshfruitportal.com/news/2014/12/12/china-intercepts-fungus-in-chilean-blueberry-shipment/?country=chile
Guerrero J. 2013. First Report of *Diaporthe australafricana*-Caused Stem Canker and Dieback in European Hazelnut (Corylus avellana L.) in Chile. Plant Disease, Volume 97, Number 12, Page 1657
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Udayanga D, Castlebury LA, Rossman AY, Hyde KD. 2014. Species limits in Diaporthe: molecular re-assessment of D. citri, D. cytosporella, D. foeniculina and D. rudis. Persoonia 32, 2014: 83–101

Gliocephalotrichum bulbilium (Ascomycota)

Fruit pathway: *G. bulbilium* occurs on fruit.

Other pathways: uncertain: plants for planting, others; information was not found on the presence of *G. bulbilium* on other parts of plants.

Hosts: *Vaccinium macrocarpon* (new host), Nephelium lappaceum, Psidium guava, Durio (Constantelos et al., 2011).

Distribution: Africa: Central African Republic (Lombard et al., 2014); North America: Mexico, USA (Hawaii, Louisiana, Massachusetts, North Carolina, New Jersey, Wisconsin, West Virginia); Caribbean: Puerto Rico, 'West Indies'; South America: Brazil, French Guiana (Lombard et al., 2014), Guyana (Farr and Rossman, 2015); Asia: Brunei Darussalam, Indonesia, Thailand, India (Farr and Rossman, 2015) Sri Lanka (Serrato-Diaz et al., 2011). *G. bulbilium* occurs mostly in tropical or sub-tropical countries, but was recently found in more temperate areas of the USA.

Damage: *G. bulbilium* causes fruit rot, pre- and post-harvest. It was first recorded on cranberry during field surveys on fruit rot, and found on 5% of the fruit collected on 3 farms. It was pathogenic, developed faster than Colletotrichum acutatum and C. gloeosporioides, and all fruit rotted within 2 days in experiments. *G. bulbilium* causes important post-harvest fruit rot on Nephelium lappaceum in Thailand, Nephelium lappaceum and Psidium guajava in Hawaii, Durio spp. in Brunei Darussalam (Constantelos et al., 2011).

Other information: No information was found on transmission modes (and whether they would facilitate its transfer from fruit consignment to hosts). This pest was detected recently on Vaccinium and may present a risk.

Recorded impact: Moderate (on another crop)	**Intercepted:** Not known	**Spreading/invasive:** Yes (uncertain)

References:

Constantelos C, Doyle VP, Litt A, Oudemans PV. 2011. First Report of *Gliocephalotrichum bulbilium* Causing Cranberry Fruit Rot in New Jersey and Massachusetts. Plant Disease, May 2011, Volume 95, Number 5, Page 618

Farr DF, Rossman AY. 2015. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA. http://nt.ars-grin.gov/fungaldatabases (accessed August 2015)

Lombard L, Serrato-Diaz LM, Cheewangkoon R, French-Monar RD, Decock C, Crous PW. 2014. Phylogeny and taxonomy of the genus Gliocephalotrichum. Persoonia 32, 2014: 127–140

Serrato-Diaz LM, Latoni Brailowsky EI, Rivera Vargas LI. Goenaga R, French Monar RD. First Report of *Gliocephalotrichum bulbilium* and G. simplex Causing Fruit Rot of Rambutan in Puerto Rico. Plant Disease, August 2012, Volume 96, Number 8, Page 1225

Insects

Accuminulia buscki (Lepidoptera: Tortricidae)

Fruit pathway: larvae bore into the fruit (unlike most Tortricidae) (Brown, 1999). No specific information was found for Vaccinium. The pest is intercepted on fruit, incl. blueberry (12 interceptions in the USA on blueberries - BlueberriesChile, 2011-2012; also intercepted on grapes - Brown, 1999).

Other pathways: uncertain: plants for planting.

Hosts: Prunus armeniaca, Prunus domestica, *Prunus persica*, Vitis (Brown et al., 2008), Vitis vinifera (Cepeda, 2014). No host record was found for Vaccinium, but the pest is intercepted on Vaccinium. *A. buscki* is known to have expanded its host range to plants that are exotic to Chile (Prunus, Vitis) (Brown, 1999).

Distribution: South America: Chile.

Damage: Little information on damage was found. *A. buscki* is considered as a 'potential future pest problem' for Chile (Biosecurity Australia, 2005, citing an article from 2000). Cepeda (2014) mentions that it has occasional economic importance and quarantine significance, and it is mentioned as a cause of rejection of consignments in BlueberriesChile (2011-2012).

Other information: Information is lacking on the host status of Vaccinium and damage. However, larvae bore into the fruit, which would present a higher risk of introduction with fruit. In addition, the pest was intercepted on blueberries. It is not clear if this reflects its growing importance on this crop, but it may be an emerging pest.

Recorded impact: Unknown	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Biosecurity Australia, 2005. Revised Draft Import Risk Analysis Report for Table Grapes from Chile. Part B. Commonwealth of Australia.

BlueberriesChile, 2011-2012. Estadisticas De Inspecciones De Arandanos. Temporada 2011/2012. Programa De Pre-Embarque. Sag/Usda-Aphis/Asoex. Powerpoint presentation.

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.

Brown JW. 1999. A new genus of tortricid moths (Tortricidae: Euliini) injurious to grapes and stone fruits in Chile. Journal of the Lepidopterists' Society, 53 (2), 60-64.

Cepeda DE. 2014. Descripción del Último Estado Larvario de *Accuminulia buscki*, Especie de Tortricidae (Lepidoptera: Euliini) de Importancia Económica en Chile. Rev. Chilena Ent. 2014, 39: 23-27.

Clarkeulia bourquini (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed externally on fruit (for Vaccinium) (Rocca and Brown, 2013). There is an uncertainty as this is indicated for four species of Tortricidae together (newly recorded on *V. corymbosum*).

Other pathways: plants for planting; larvae also feed on buds and flowers (Rocca and Brown, 2013, for four species of Tortricidae).
Uncertain pathway: herbs.

Hosts: *Vaccinium corymbosum* (new host; Rocca and Brown, 2013); Medicago sativa, Trifolium repens, Mentha sauveolens, Ligustrum sinense, Malus domestica, Prunus domestica, Citrus sinensis, Verbenaceae (Brown et al., 2008).

Distribution: South America: Argentina (Rocca and Brown, 2013); Brazil (Gilligan et al., 2014).

Damage: No details on damage was found. However, *Vaccinium corymbosum* was recently identified as a new host (Rocca and Brown, 2013).

Other information: Although no information on damage was found, and there is an uncertainty on its association with fruit, there is a risk that this pest may be harmful on this crop.

Recorded impact: Unknown	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.

Gilligan TM, Baixeras J, Brown JW, Tuck KR. 2014. T@rts, Online world catalogue of the Tortricidae. Version 3.0 (December, 2014) - Current through early 2014 http://www.tortricidae.com/catalogue.asp (accessed August 2015)

Rocca M, Brown JW. 2013. New Host Records for Four Species of Tortricid Moths (Lepidoptera: Tortricidae) on Cultivated Blueberries, *Vaccinium corymbosum* (Ericaceae), in Argentina. Proceedings of the Entomological Society of Washington 115(2):167-172.

Clarkeulia deceptiva (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed externally on Vaccinium fruit (Rocca and Brown, 2013). There is an uncertainty as this is indicated for four species of Tortricidae together (newly recorded on *V. corymbosum*).

Other pathways: plants for planting; larvae also feed on buds and flowers (Rocca and Brown, 2013, for four species of Tortricidae).

Hosts: *Vaccinium corymbosum* (new host, Rocca and Brown, 2013). No data was found on other hosts (in particular, this species is not listed in the catalogue of Brown et al., 2008).

Distribution: Argentina (Rocca and Brown, 2013); Brazil (Gilligan et al., 2014).

Damage: No details on damage was found. However, *Vaccinium corymbosum* was recently identified as a new host (Rocca and Brown, 2013).

Other information: Although no information on damage was found, and there is an uncertainty on its association with fruit, there is a risk that this pest may be harmful on this crop.

Recorded impact: Unknown	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.

Gilligan TM, Baixeras J, Brown JW, Tuck KR. 2014. T@rts, Online world catalogue of the Tortricidae. Version 3.0 (December, 2014) - Current through early 2014 http://www.tortricidae.com/catalogue.asp (accessed August 2015)

Rocca M, Brown JW. 2013. New Host Records for Four Species of Tortricid Moths (Lepidoptera: Tortricidae) on Cultivated Blueberries, *Vaccinium corymbosum* (Ericaceae), in Argentina. Proceedings of the Entomological Society of Washington 115(2):167-172.

Hylamorpha elegans (Coleoptera: Scarabaeidae)

Fruit pathway: There is an uncertainty on whether adults feed on fruit. However, there are records of interceptions (4 on Vaccinium fruit, 30 on fruit, leaves and stems of various species) and the pest may become associated with fruit at harvest and packing (USDA, 2007, 2008).

Other pathways: soil (on its own and associated with plants for planting; eggs, larvae and pupae are in soil; larvae are reported to feed on roots of gramineas or on decomposing material (UDEC, no date) and roots of blueberry (Larrain et al., 2007). Adults feed on leaves (UDEC, nd).
Uncertain pathway: plants for planting.

Hosts: Polyphagous, incl. Vaccinium (Larrain et al., 2007), cereals, grasses (larvae), Prunus (as 'cerezo' [cherry]), Nothofagus, Quercus (as 'robles' [oak]) and other trees (adults) (Gonzalez, 1989). The main hosts are native South American species (such as Nothofagus), and this pest has probably moved to Vaccinium.

Distribution: South America: Argentina, Chile (UDEC, no date; Gonzalez, 1989).

Damage: On Vaccinium, the pest may cause death of plants by feeding on roots (Larrain et al., 2007). It is a primary pest for the hosts mentioned in Gonzalez (1989) (see Hosts).

Recorded impact: Moderate	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

González R. 1989. Insectos y ácaros de importancia agrícola y cuarentenaria en Chile. Universidad de Chile, Facultad de Ciencias Agrarias y Forestales. Santiago de Chile. Ograma. 310 p.

Larraín PS, Salas CF, Graña FS. 2007. Región de Coquimbo. Plagas del arándano y generalidades de manejo. Técnico Agrícola. IniaTierraAdentro, noviembre-diciembre 2007.

UDEC. No date. *Hylamorpha elegans*. [online data sheet]. Universidad de Concepción, Chile. http://www2.udec.cl/entomologia/H-elegans.html (accessed August 2015)

USDA. 2007. Importation of fresh highbush and rabbit-eye blueberry (*Vaccinium corymbosum* L & V. virgatum Aiton) fruit into the Continental United States from Uruguay. A Pathway-Initiated Risk Assessment April 2007. USDA-APHIS.

USDA. 2008. Pathway-Initiated Risk Analysis of the Importation of Vaccinium spp. Fruit from Countries in Central and South America into the Continental United States. February 5, 2008. Revision 003. USDA-APHIS.

Hyphantus sulcifrons (Coleoptera: Curculionidae)

Fruit pathway: No information was found on the life stages associated with different parts of the blueberry plants. However, association with fruit was not excluded as this is a new pest for this crop, and that some other Curculionidae also feed on fruit.

Other pathways: soil, plants for planting with roots; larvae of weevils feed on roots, adults on leaves (Del Rio et al., 2010).

Hosts: *Vaccinium corymbosum* (new host), Citrus, Fragaria (Del Rio et al., 2010, citing others).

Distribution: South America: Argentina, Brazil, Uruguay (Del Rio et al., 2010).

Damage: No information was found on impact, nor if it is caused by larvae (on roots) or adults (on leaves or fruits). For the related species H. olivaea, damage to grapevine is done by adults on foliage (Botton et al., 2003).

Other information: Little information was found on this pest. As it is a new pest of Vaccinium, and association with fruit was not excluded, it was considered that there may be a risk.

Recorded impact: Unknown	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Botton M, Scoz PL, Arioli CJ. 2003. Hyphantus olivae Vaurie (Coleoptera: Curculionidae) Como Praga da Videira (Vitis spp.) na Região da Serra Gaúcha. Neotropical Entomology 32(3):515-516 (2003)

Del Río MG, Klasmer P, Lanteri AA. 2010. Gorgojos (Coleoptera: Curculionidae) perjudiciales para "frutos rojos" en la Argentina. Rev. Soc. Entomol. Argent. 69 (1-2): 101-110, 2010

Plagiognathus repetitus (Hemiptera: Miridae)

Fruit pathway: possibly nymphs or adults, if present in the crop at the time of harvest. This is not known. Little is known of the biology of the pest (Rodriguez-Saona, 2014).

Other pathways: plants for planting; nymphs and adults attack young leaves and flower buds (Rodriguez-Saona, 2014).

Hosts: *Vaccinium macrocarpon*, Ericaceae (incl. Kalmia angustifolia, Vaccinium) (Rodriguez-Saona, 2014), Ledum, possibly Rhododendron (Schuh, 2001).

Distribution: North America: Canada (Nova Scotia, Ontario, Quebec; Schuh 2002-2013), USA (Massachusetts, Michigan, New York, New Jersey, Pennsylvania, south to Virginia; Rodriguez-Saona, 2014; Schuh 2002-2013).

Damage: *P. repetitus* may be an emerging pest on cranberry. It was observed causing damage in New Jersey for the first time in 2014, causing serious damage and yield reduction in that year (Rodriguez-Saona, 2014). No other information on impact was found.

Other information: The biology of this pest is reviewed in Wheeler (1996) [cited in Schuh (2001) but not available to the assessor]. This pest was found on cranberry recently, and may present a risk.

Recorded impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Rodriguez-Saona C. 2014. Bug Damaging Cranberries Identified: Plagiognathus repetitus. Plant & pest advisory. October 2, 2014. Rutgers Cooperative Extension. Rudgers, the State University of New Jersey, USA. http://plantpestadvisory.rutgers.edu/bugdamagingcranberrieshasbeenidentified/

Schuh RT. 2001. Revision of New World Plagionathus Fieber, with comments on the Paleartic fauna and the description of a new genus (Heteroptera: Miridae: Phylinae). Bulletin of the American Museum of Natural History. Number 266, 267 pp., 40 figures, 1 table, Issued November 8, 2001

Schuh RT. 2002-2013. On-line Systematic Catalog of Plant Bugs (Insecta: Heteroptera: Miridae). http://research.amnh.org/pbi/catalog/

Proeulia chrysopteris (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed on fruit (CABI CPC, Cubillos Vallejos, 2011). No specific information was found for Vaccinium. However, there are many interceptions of Proeulia spp. on blueberries (630 in the USA, 6 in Japan in BlueberriesChile, 2011-2012).

Other pathways: plants for planting, cut flowers and branches; larvae also feed on buds, flowers, leaves and shoots, and overwinter on bark; eggs are laid on leaves (CABI CPC; Cubillos Vallejos, 2011).

Hosts: Polyphagous, hosts incl. *Vaccinium corymbosum*, Corylus avellana (new hosts in Cubillos Vallejos, 2011), Vitis vinifera, Actinidia deliciosa, Malus domestica, Prunus armeniaca, Prunus domestica, *Prunus persica*, Pyrus communis (CABI CPC), Citrus sinensis, Acer, Diospyros (Koch and Waterhouse, 2000), Euonymus, Cotoneaster, Lonicera japonica, Prunus cerasifera, Viburnum, Platanus orientalis, Rosa (Cubillos Vallejos, 2011), Pinus radiata, Pinus, Eriobotrya japonica, Prunus avium, Juglans regia, Acer buergerianum, Ulmus, (Cepeda and Cubillos, 2011).

Distribution: South America: Chile (Cepeda and Cubillos, 2011).

Damage: *P.chrysopteris* is native to Chile, and has moved from natural habitats into crop systems, including exotic species of berries and ornamental trees; it was recently recorded on *Vaccinium corymbosum* (Cubillos-Vallejos, 2011). Direct damage is due to larvae feeding on buds, leaves, flowers and fruit; fruits are cut and pierced with large galleries. On apple, fruits may be emptied, on kiwi, fruit pedicels are attacked; on grapevine, it is harmful to buds; on orange, it bores into the rind and may reach the pulp (Cubillos Vallejos, 2011). *P.chrysopteris* has infested kiwifruit orchards in less than a decade. It is considered as a secondary or incidental pest problem in fruit trees, but the whole genus is considered as an emergent pest problem of fruit trees and vineyards (CABI CPC). It is occasionally important, especially on apple, and is of quarantine importance on kiwi as larvae are present at the time of harvest (Cubillos Vallejos, 2011). It is a significant pest of table grapes (Biosecurity Australia, 2005).

Other information: The pest is of quarantine concern to some countries, such as the USA, China, Korea Rep, Japan, Mexico (CABI CPC). Although P. arauria is the most common species of the genus in Chile and other Proeulia spp. are considered to be of less significance (Biosecurity Australia, 2005), *P.chrysopteris* seems to have passed recently onto Vaccinium, and may present a risk for that crop.

Recorded impact: Moderate (on another crop)	**Intercepted:** Yes (as genus)	**Spreading/invasive:** Not known

References:

Biosecurity Australia, 2005. Revised Draft Import Risk Analysis Report for Table Grapes from Chile. Part B. Commonwealth of Australia.

CABI CPC. Crop Protection Compendium. CAB International, UK. http://www.cabi.org/cpc

BlueberriesChile, 2011-2012. Estadisticas De Inspecciones De Arandanos. Temporada 2011/2012. Programa De Pre-Embarque. Sag/Usda-Aphis/Asoex. Powerpoint presentation.

Cepeda DE, Cubillos GE. 2011. Descripción del último estado larvario y recopilación de registros de hospederos de siete especies de Tortrícidos de importancia económica en Chile (Lepidoptera: Tortricidae). Gayana 75(1): 39-70, 2011

Cubillos Vallejos GE. 2011. Caracterización Taxonómica Del Último Estado Larvario De Proeulia auraria (Clarke) Y *Proeulia chrysopteris* (Butler) (Lepidoptera: Tortricidae) [thesis]. Universidad de Chile, Santiago.

Koch KC, Waterhouse DF. 2000. The distribution and importance of arthropods associated with agriculture and forestry in Chile (Distribucion e importancia de los artropodos asociados a la agricultura y silvicultura en Chile). ACIAR Monograph No. 68, 234 pp.

***Proeulia triquetra* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae of Proeulia spp. feed on fruit (Gilligan and Epstein, 2014); on grapes, larvae feed on berries (Biosecurity Australia, 2005). No specific information was found for Vaccinium. However, there are many interceptions of Proeulia spp. on blueberries (630 in the USA, 6 in Japan in BlueberriesChile, 2011-2012).

Other pathways: plants for planting; larvae also feed on leaves, eggs are on leaves, flowers, buds (Gilligan and Epstein, 2014).

Hosts: Polyphagous, incl. Vaccinium (Gilligan and Epstein, 2014), Vitis vinifera (Brown et al., 2008), Malus domestica, Hebe, Rubus occidentalis. New host records on Citrus reticulata, Myoschilus oblonga, Convolvulus arvensis, Maytenus boaria, Lonicera japonica, Prunus cerasifera, Buddleja davidii, Fuchsia magellanica (Cepeda and Cubillos, 2011).

Distribution: South America: Chile (Cepeda and Cubillos, 2011).

Damage: Little information on impact was found, and none specific to Vaccinium. The pest causes direct damage to buds, flowers, leaves and fruit (Gilligan and Epstein, 2014). On grape, berries can be damaged superficially or completely destroyed (Biosecurity Australia, 2005).

Other information: Although P. arauria is the most common species of the genus in Chile and other Proeulia spp. are considered to be of less significance (Biosecurity Australia, 2005), *P. triquetra* seems to have passed recently onto Vaccinium, and may present a risk for that crop.

Recorded impact: Unknown	**Intercepted:** Yes (as genus)	**Spreading/invasive:** Not known

References:

Biosecurity Australia, 2005. Revised Draft Import Risk Analysis Report for Table Grapes from Chile. Part B. Commonwealth of Australia.

Brown JW, Robinson G, Powell JA. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricid.net/foodplants.asp.
Cepeda DE, Cubillos GE. 2011. Descripción del último estado larvario y recopilación de registros de hospederos de siete especies de Tortrícidos de importancia económica en Chile (Lepidoptera: Tortricidae). Gayana 75(1): 39-70, 2011
Gilligan TM, Epstein M. 2014. Tortricids of Agricultural Importance. Interactive Keys developed in Lucid 3.5. Last updated August 2014. http://idtools.org/id/leps/tortai/index.html

Tolype innocens (Lepidoptera: Lasiocampidae)

Fruit pathway: possibly larvae; in the publications available, there is no information regarding association with Vaccinium fruit. However, the pest is present at the time of fruiting (Muller et al., 2009), and it is a new pest of Vaccinium. Information is lacking on whether it could become associated with fruit.

Other pathways: Larvae feed on leaves (Louzada et al., 2011; Diez Rodriguez et al., 2012).

Hosts: Vaccinium ashei (Louzada et al., 2011). This was the first record of a Tolype on a crop. Other host are not mentioned, but larvae of Tolype spp. are characteristically polyphagous, feeding on leaves and sprouts of forest plants (Louzada et al., 2011).

Distribution: South America: Brazil, Argentina, Paraguay, Uruguay (Diez Rodriguez et al., 2012; Louzada et al., 2011).

Damage: Damage to fruit was not observed, but defoliation up to 10% (Louzada et al., 2011). *T. innocens* has urticating caterpillars, which was of concern as those were present in the crop at the time of harvest (Muller et al., 2009).

Other information: This pest was detected recently in Vaccinium, which is also the first record on a crop. Although damage reported so far seems minor, it is not excluded that it evolves. This pest may present a risk.

Recorded impact: Minor	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Diez-Rodríguez GI, Hübner LK, Bisognin M, Antunes LEC, Nava DE. 2012. Levantamento de Insetos em Pomares de Mirtileiro (Vaccinium ashei) na Região de Pelotas, RS. In: Congresso brasileiro de entomologia, 24., 2012, Curitiba. SEB - 40 anos de avanços da Ciência Entomológica Brasileira. Curitiba: SEB, 2012.
Louzada RS, Müller FA, Gonçalves RS, Nava DE. Occurrence and biology of *Tolype innocens* (Burmeister) on blueberry. Rev. Bras. Frutic., Jaboticabal - SP, v. 33, n. 1, p. 061-065, Março 2011
Muller FA, Louzada RS, Gonçalves RS, Nava DE. No date. Biologia e tabela de vida de fertilidade de *Tolype innocens* (Burmeister, 1878) (Lepidoptera: Lasiocampidae) em mirtileiro (Vaccinium ashei) (Ericaceae) Conference abstract. XIII CIC, XI Enpos i mostra scientífica.

ANNEX 6. Pests of interest with records in fewer than 3 EU countries

The records for the EU are from the literature and have not been checked with the NPPOs of the countries concerned.

References are given below only for EU records. References for other information as well as additional details are given in the Step 2 List.

Name (taxonomy)	Pathways	Hosts	Summary of information	Distribution
Blueberry red ringspot virus (Caulimoviridae : soymovirus)	Fruit? (if vector), plants for planting	*Vaccinium corymbosum*, *V. macrocarpon*	- An emerging virus in the USA. Graft transmissible, but also actively moving (natural spread); a mealybug may be involved. - Causes red ringspots/ blotches on stems, leaves and on some cultivars also on fruits. Occasionally reddish rings on green fruit, usually not apparent on ripe fruits. - 25% crop loss in one cultivar, others yet to be documented.	**EU**: Poland (Paduch-Cichal, 2011; Kalinowska et al., 2012). Very limited presence in Slovenia and Czech Rep (few plants, no natural spread, infected plant material suspected; Spak et al., 2014). There is possibly no vector in Europe. *Doubtful record.* Slovakia: from CABI distribution map, which refers to Paduch-Cichal et al. (2011), which in turn refers to Plesko et al. (2010), which relates to Slovenia. **Others**: Asia: Japan, Korea; North America: USA
Blueberry shoestring virus (sobemovirus)	Fruit? (if vector), plants for planting	*Vaccinium corymbosum*, *V. angustifolium*	- Transmitted by Illinoia pepperi, mechanical inoculation, grafting; not transmitted by contact, seeds, pollen. Long latent period. - Causes reddish-purple discoloration on leaves. - In severe cases, extensive losses (yield reduction, unmarketable fruit). Reported as causing several millions of losses annually in Michigan.	**EU:** Poland (Paduch-Cichal et al., 2011). **Others:** North America: Canada, USA; South America: eradicated in Chile? (Medina et al., 2006; found in one farm and infected plants eliminated).
Calonectria colhounii (Ascomycota)	Fruit?, plants for planting	Polyphagous on woody plants, incl. *Vaccinium, Annona cherimoya, Ficus, Rhododendron, Castanea vulgaris, Camellia sinensis, Eucalyptus*.	- Causes root rot on some hosts, necrotic stems and leaves; leaf spot and basal stem rot on blueberry. On atemoya and sugar apple, causes leaf and fruit spot. - Normally a common but secondary foliage disease, which may cause serious losses in periods with heavy rainfalls. First report on blueberry in the USA, mortality of 80-100% observed in some cases. Intercepted on *Vaccinium* seedlings.	**EU**: Belgium (Inghelbrecht et al., 2011). **Others**: Africa: Mauritius, South Africa; Asia: China, India, Japan, Thailand; North America: USA; Central America: Costa Rica; South America: Colombia.
Ceroplastes cirripediformis (Hemiptera: Coccidae)	Fruit?, plants for planting	Polyphagous incl. *Vaccinium, Citrus, Coffea arabica, Ipomoea batatas, Manihot esculenta, Tamarindus indica, Psidium guajava*, *Diospyros kaki*, many ornamentals, *Vitis vinifera*.	- No data found on the location of the different life stages, but the related species *C. rusci* can attack fruit. - Introduced into Egypt, where it cause serious damage on *Psidium guava*. A pest of *Citrus* and many ornamentals, occasionally serious in Mexico and Caribbean. Serious pest of avocado in Bolivia in the 1970s. - In the USA, intercepted on variety of hosts. - No data found on hosts and pest status in Italy and Greece.	**EU**: Greece, Italy (Ben-Dov et al., 2006 onwards; Longo et al., 1995; Milonas et al., 2006). **Others**: Africa: Egypt; North America: Mexico, USA; South America: Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Peru; Caribbean: Antigua and Barbuda, Cuba, Guadeloupe, Haiti, Jamaica, Martinique, Puerto Rico, Trinidad and Tobago, US Virgin Islands, Turks and Caicos, Barbados, Bermuda, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines; Asia: Indonesia, Philippines; Oceania: Marshall Islands, Wake Isl..
Colletotrichum karstii (Ascomycota)	Fruit, plants for planting, cut flowers and branches?	Polyphagous, incl. *Vaccinium, Malus domestica, Carica papaya, Mangifera indica, Citrus sinensis, Vitis vinifera, Orchidaceae, Capsicum, Solanum lyciopersicum, Olea europaea*.	- Described recently. - Causes an emerging disease of apple in Brazil. Affects fruit of mango fruit, *Citrus sinensis*, *Passiflora edulis*. - Necrotic leaf spots on blueberry seedlings in a nursery, severe defoliation in 100% of the seedlings, leading to serious losses for the nursery.	**Europe**: Italy (Aiello et al., 2014; Schena et al., 2014). Hypothesis is made that it was introduced to Italy (Ismail et al., 2015). *Uncertain record*: Germany (Damm et al., 2012, mention 3 strains from Germany: 2 from Gossypium hirsutum [collection place not accessible], the 3rd from Lupinus albus, collected in Gülzow, DE). **Others:** Africa: South Africa?, Zimbabwe?; Asia: China, India, Japan?, Taiwan?, Thailand, Vietnam?; Central America: Panama?; North America: Mexico, USA; South America: Brazil, Colombia?; Oceania: Australia, New Zealand. Madeira? (Portugal).

Name (taxonomy)	Pathways	Hosts	Summary of information	Distribution
Diaspidiotus ancylus (Hemiptera: Diaspididae)	Fruit, plants for planting	Polyphagous, incl. *Malus, Prunus, Pyrus, Vaccinium corymbosum*, *Quercus, Ribes, Juglans, Olea europaea, Tilia, Rosa*.	- Most common scale attacking blueberry (for Connecticut). Damage worst on older bushes/branches. Also occurs on forest trees. - Crawlers on bark, but also leaves and fruits. Occasionally an economic pest. - Causes reduced plant vigour, death of branches, deformed fruit, discoloration on leaves. A single scale attachment per fruit can completely distort the fruit at harvest. Honeydew covers leaves and fruits, interrupting growth. Sooty mould may develop on honeydew.	**EU**: Portugal (Franco et al., 2011). *Uncertain records*: France, Germany, Spain. Mentioned in general publications (Ben-Dov et al., 2006 onwards – Scalenet; Miller and Davidson, 2005; de Jong et al., 2014 – Fauna Europaea), but no specific record found. For Germany, only a mention in a website: http://www.beerendoktor.de/index.php?d=1&f_id=6&kr_id=396. This species is not mentioned as introduced in European countries in Pellizzari and Germain (2010). **Others**: Africa: South Africa; Asia: Japan; South America: Argentina, Brazil, Chile; North America: Canada?, Mexico, USA; Oceania: Australia.
Epiphyas postvittana (Lepidoptera: Tortricidae)	Fruit, vegetables, plants for planting, cut flowers	Polyphagous, incl *Vaccinium, Malus domestica, Citrus, Diospyros kaki, Fragaria x ananassa, Myrtus communis, Prunus, Pyrus communis, Rosmarinus officinalis, Rubus idaeus, Vitis vinifera.*	- Native from Australia, and has spread extensively. - Amongst the main pests of blueberry in New South Wales. - Eggs on leaves, larvae feed on leaves, buds, fruits, sometimes tunnel into the fruit (incl. ripening fruit); pupae on leaves. - May also cause post-harvest damage when in consignments. Intercepted.	**EU**: Ireland, UK (PQR) *Uncertain records*: Sweden, Jersey, Guernsey, Netherlands. Sweden in CABI CPC refers to Svensson (2009, [Remarkable records of Microlepidoptera in Sweden during 2008] Entomologisk Tidskrift, 130(1):61-72]. The full article was not available, but no confirming record was found, and it is also indicated as absent in Fauna Europaea). Jersey and Guernesey are mentioned in Fauna Europaea (no details) and Société Guernesiaise (2009) reports 21 findings in 2009. However it is not clear if it is established. Finally, the pest is mentioned as 'intermittently recorded from continental Europe, most recently in the Netherlands and Sweden (Gilligan and Epstein, 2012). This may refer to interceptions only. **Others**: North America: USA (established in Hawaii, 'found' in Oregon, California); Oceania: Australia, New Caledonia, New Zealand, also 'Pacific Isl.; Azores (Portugal).
Gloeosporium minus (Ascomycota)	Fruit, plants for planting	*Vaccinium*	- Causes stem canker, leaf spot, dieback, storage rot of fruit. - Common in South-East USA, and often results in defoliation and reduced yield. In Canada, 3 fungi (incl. *Gloeosporium minus*) previsouly considered as minor pests to wild blueberry production have begun to cause significant yield losses.	**EU**: Estonia (at the location ['Järvselja'] in article on seasonal dynamics in forest; Pisek et al., 2015). *Uncertain records*: Latvia, Lithuania. Lithuania is mentioned in Kacergius et al. (2004 - article on *Diaporthe vaccini*), but it is not clear if *G. minus* is present. For Latvia, it is mentioned in the abstract of Vilka et al. (2009) amongst fungi of *Vaccinium* in Latvia, but is not named in the article itself; it is also in APP (2010), but it is not clear if it is present. **Others**: North America: Canada, USA *Uncertain record*. Turkey: the distribution in Farr and Rossman (2015) is indicated as 'North America (USA: NC, WA)', but a specific record is indicated for Turkey (all others from the USA). The original source could not be found, nor any other record for Turkey.
Neopestalotiopsis clavispora (Ascomycota)	Fruit, plants for planting	Polyphagous, incl. *Vaccinium corymbosum, Persea, Quercus, Mangifera indica, Eriobotrya japonica, Carya*.	- Causes symptoms on stems and branches (canker, dieback). Conidia may be found on blueberry fruit. In experiments, shown to be pathogenic on wounded fruit of blueberry, apple and kiwifruit. - Causes a fruit rot of loquat, leaf spot of mango, stem-end rot of avocado. One human eye infection in Japan.	**EU**: Italy, Spain (Ismail et al., 2012; Palou et al., 2013). **Others**: Africa: South Africa; Asia: China, Sri Lanka; North America: USA; South America: Brazil, Chile, Uruguay; Oceania: New Zealand.

Name (taxonomy)	Pathways	Hosts	Summary of information	Distribution
Oligonychus ilicis (Acarida: Tetranychidae)	Fruit? (incidental, as nymphs or adults, mobile), plants for planting, wood?	35 species in 14 families, incl. *Vaccinium macrocarpon*, *Rhododendron, Platanus occidentalis, Buxus, Coffea arabica, Juglans regia, Eucalyptus, Psidium guajava, Juniperus, Quercus, Pyrus communis, Picea, Rosa*.	- causes discoloration, distortion and feeding damage on leaves, leading to defoliation. - Eggs on bark and leaves, mites feed primarily on the foliage of woody ornamental plants. - Important pest of broad-leaved evergreens in Southern and Eastern USA, incl. Ericaceae and Aquilafoliacae.	**EU:** Italy, Netherlands (de Jong et al., 2013, Fauna Europaea; INRA, 2006-2015). **Others**: North America: USA; South America: Brazil, Paraguay, Chile; Asia: Japan, Korea Rep., Iran. *Absent, eradicated*: Australia.
Prodiplosis vaccinii (Diptera: Cecidomyiidae)	Plants for planting	*Vaccinium*	- Larvae feed inside vegetative meristems, on buds. - Causes leaf distortion, blackening and death of young buds. - In South-East USA, bud-infesting larvae of *Dasineura oxycoccana* & *Prodiplosis vaccinii* destroy 20 to 80% of *V. ashei* crops.	**EU**: Spain (in 2001 - Calvo et al., 2006, DAISIE) *Uncertain record*: The pest is included in the EPPO certification scheme PM 4 /18(1998), and it is not clear if it is present elsewhere in Europe. **Others**: North America: Canada, USA.
Pseudococcus maritimus (Hemiptera: Pseudococcidae)	Fruit, plants for planting	Polyphagous, incl. *Vaccinium, Persea, Passiflora, Malus, Pyrus, Rubus, Citrus, Vitis, Diospyros kaki, Passiflora*	- Larvae and females feed mostly on leaves, but also on fruits and shoots. - Intercepted on Malus fruits in EPPO. - Causes feeding damage, honeydew and sooty moulds on fruit. Is a vector of grapevine leafroll-associated virus-3 (GLRaV-3).	**EU:** Poland (indoors; Goszczyński and Golan, 2011). *Doubtful records*: Netherlands, Hungary (both from datamining in CABI CPC). No specific records were found. The pest is not present in Hungary according to Kozar et al. (2013). **Others:** North America: Canada, Mexico, USA; Asia: Armenia, Indonesia; South America: Argentina, Brazil, Chile, Colombia, French Guiana; Caribbean: Guadeloupe, Puerto Rico; Central America: Guatemala; Puerto Rico *Uncertain record*: Madeira (possibly misidentification), former-USSR.
Zaprionus indianus (Diptera: Drosophilidae)	Fruit	Polyphagous, 74 species in 31 families, incl. *Citrus, Ficus carica, Psidium guajava, Punica granatum, Prunus persica, Actinidia, Vitis, Musa*. The pest has passed onto many new hosts. Adults were trapped in other crops in North America where it was recently introduced, such as *Vaccinium, Rubus* (as raspberry, blackberry), *Fragaria* (as strawberry), *Prunus* (as cherry, plums).	- Ecologically versatile. Often associated with damaged or fallen rotting fruit, but there are reports of infestation of tree-ripened fruit (e.g. figs, *Dimocarpus longan*, *Punica granatum*, *Eriobotrya japonica*). Reported to lay eggs in unripe fruits (possibly referring mostly to figs). - Caused losses of 40% of fig harvest in Brazil when introduced. Reported to infest ripened peaches in Brazil. Substantial losses reported for Citrus (oranges), peach and fig. Uncertainty on importance and type of damage on some crops, and whether it related to undamaged fruit. - Recently found in crops of several hosts in the USA. On grapevine, crop damage was reported in Virginia; in Michigan, it was still unclear *Z. indianus* will become a pest or will attack only damaged fruit. For *Vaccinium* in Mississippi, still uncertain whether it will attack blueberry in the field, but there is also a concern for fruit in packing houses. - In international trade, intercepted on fruits in the EU (incl. *Citrus*, *Diospyros kaki*, *Mangifera indica*, *Psidium guajava*).	**EU**: Spain (Carles-Tolra, 2009). *Absent, unreliable records*: Italy, Austria (PQR). **Others:** Africa: Benin, Cape Verde, Congo, Cote d'Ivoire, Egypt, Kenya, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Niger, Nigeria, Reunion, Sao Tome & Principe, Seychelles, South Africa, Tanzania, Madeira (Portugal), Islas Canarias (Spain), Cameroon, Comoros, Gabon, Guinea, Senegal, Sudan. Asia: India, Iran, Israel, Saudi Arabia, Lebanon, Jordan, Iraq, Nepal, Oman, Pakistan, United Arab Emirates, and unpublished record for Azerbaijan; South America: Argentina, Brazil, Uruguay, Ecuador?, Peru?, unpublished record for Venezuela; North America: Canada (first records; uncertainty if will establish), Mexico, USA; Central America: Panama; Caribbean: unpublished record for Cayman Isl.; intercepted from the Dominican Rep. (but no published record). **Note**: In Brazil, a single introduction in 1998, was followed by rapid spread within the country, and subsequent spread within South and North America.