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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 5 - REPORT on APPLES – Fruit pathway and Alert List

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An Excel file containing supporting information is available at https://upload.eppo.int/download/107o25ccc1b2c

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DROPSA DELIVERABLE
REPORT on **Apples – Fruit pathway and Alert List**

1. Introduction

The aim of this report is the establishment of an Alert List of pests that may be introduced with apples fruits and potentially represent a risk for plant production in Europe. Apple was selected after an Analysis of fruit production and imports in the EU to select species for pathway studies – thereafter Selection of fruit (see relevant Deliverable at https://upload.eppo.int/download/102o0eec69a8b). There is an extensive trade of apples from outside the EU, as well as a substantial cropping within the EU. In order to better target searches, a short review was made to get an overview of the pathway 'apple fruit'.

1.1 Background on apple

The cultivated apple (*Malus domestica* Borkh.) probably originates directly from *Malus sieversii* (Ledeb.) M. Roem, a species growing in altitudes between 1200 and 1800 m in the Tien Shan mountains of Central Asia (Luby 2003, Sutton et al. 2014). *M. domestica* is also known under synonymously used names such as *Malus pumila* var. *domestica* (Borkh.) C.K. Schneid., *Malus sylvestris* var. *domestica* (Borkh.) Mansf. and *Pyrus malus* L. (Qian et al. 2010, USDA 2014a). Apples are cultivated in temperate regions or at high elevations in the tropics on all continents except Antarctica. From its origin among the wild *M. sieversii* trees in Asia and from the early development of thousands of local cultivars in Europe and America, the domesticated apple has shrunk drastically in diversity. Examples for popular European cultivars are 'Cox Orange', 'Elstar', 'Gloster' and 'Topaz'. Though there exist other cultivars of local importance, current commercial production of apples is dominated by few cultivars: 'Delicious', 'Golden Delicious', 'McIntosh' and 'Jonagold' (developed in North America); 'Braeburn' and 'Gala' (New Zealand); 'Granny Smith' (Australia); and 'Fuji' (Japan) (Luby 2003).

1.2 Data on production and trade of apple fruit

Worldwide apple production showed a long-term increase after 1945 until it stagnated in the 1980s. Since the 1990s again an increase is observed, solely due to the large increase of apple production in China; for the rest of the world stagnation at 30-40 mio. t is recorded. China's share of the world's apple production increased from about 10 % in 1990 to about 35 % (c. 20 million tonnes MT) in 2000 (O'Rourke 2003).

Apples were grown on >500 000 ha in the EU in 2012. Although a decrease in production area since 2002 was observed (-11.2 %), apples play a substantial role in the EU fruit production. Poland is the major producer (195 000 ha production area in 2012), followed by Romania (55 000), Italy (52 000), France (41 000), Hungary (36 000), Germany (32 000) and Spain (31 000).

504 000 t of apples were imported to the EU from non-EU countries in 2012 (Figure 1), while 2.4 million tonnes of apples were traded within the EU. Largest imports came from Chile (132 963 t in 2012), South Africa (120 041) and New Zealand (115 470), followed by Brazil (57 803), Argentina (29 248), FYR of Macedonia (15 038), USA (10 490), Switzerland (7 665), China (3 171) and Uruguay (2 788) (Annex 1). (Source of all trade and production data for the EU: Eurostat)

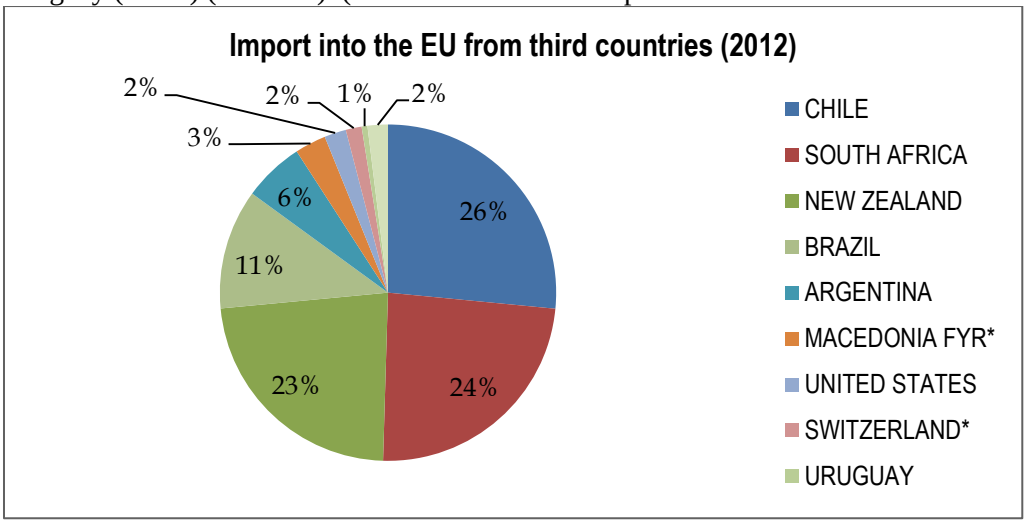

Figure 1: Proportion of imported fresh apples into the EU from non-EU countries in 2012

1.3 Pathway 'apple fruit'

1.3.1 Presence of green parts

Since stalks are normally present on harvested apples, sometimes with attached leaves, this analysis takes into account that an apple fruit on the pathway may be accompanied by green parts. While root rot diseases, wood decay fungi and a number of wood boring insects, which are very unlikely to be attached to the fruit, were not included at all or excluded after Step 1, insects not directly attacking the fruit, but feeding on the calyx, stem or leaves such as leaf miners and scale insects, were maintained until step 2 for further assessment.

1.3.2 Harvest, sorting and packaging

Harvesting and packing procedures differ between apple producers worldwide. Apples are normally harvested by hand. Harvested apples are generally checked and damaged apples sorted out before they are forwarded to the sorting facilities. After sorting the apples are directly packaged or brought to the storage facilities. Manual and automatic sorting techniques largely reduce the risk of pests and pathogens being associated with marketed fruit.

1.3.3 Duration of storage and conditions of transport

The optimal storage conditions for apples are variety-specific. For example in ULO (ultra low oxygen) stores, the temperature ranges between 1 and 4 °C. The atmosphere contains less than 1 % oxygen and has a relative humidity of around 92 %. In CA (controlled atmosphere) stores, the temperature ranges between -1 and 4 °C and the relative humidity ranges between 87 and 95 %. The atmosphere in CA stores contains 0.5 to 2 % oxygen and 0.8 to 4.5 % carbon dioxide. The storage conditions are checked regularly and corrected if necessary. Storage periods of up to ten months are possible.
Transport of apples over long distances (e.g. intercontinental) normally takes place in cooled vessels and for shipment cooled containers are used. The transport time from South Africa or from Chile to the Netherlands with container-vessels averages each three weeks (18-23 days time at sea) (SeaRates 2016). A very limited quantity is transported via airfreight within less than a day (less than 400 tonnes per year –less than 1% of imports- according to Eurostat between 2000 and 2012), or by road and train (volumes are versatiles between years).

1.3.4 Existing regulation

According to the EU Directive 2000/29, plants (which include fruit) originating in non-European countries should be free from a number of harmful organisms: *Carposina niponensis* (now considered to be *Carposina sasakii), Enarmonia (Cydia) packardi, Enarmonia (Cydia) prunivora, Grapholita (Cydia) inopinata, Tachypterellus (Anthonomus) quadrigibbus, Guignardia piricola (Botryosphaeria berengeriana f. sp. pyricola)*

2. Methods for assembling lists of pests and selection system for the Alert List

The *Methods for the preparation of alert lists of pests for individual fruit species* ('Methods' thereafter, available at https://upload.eppo.int/download/103o7b00f8216) were used, with the following adjustments:

2.1 Step 1

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

- A number of species were listed even if belonging to broad categories not to be listed at Step 1 (see Methods) (e.g. Nematoda). The Apple list was developed before these categories were fully decided in the Methods.
- A species was considered as 'present in the EU' and excluded for further consideration (NO3) if it is present outdoors and established in at least one country.

The Step 1 list of pests of *Malus* species was compiled searching for apple pests in the following sources.

1. From the **excel spreadsheet** compiled for a review on fruit pests (Steffen *et al.* 2015; sources: interceptions, notifications, pests that are present in the EU according to PQR, other publications - e.g. review on insect pest introductions) 68 pests with *Malus* as host were chosen
2. From the compendium of apple and pear diseases and pests (Sutton *et al.* 2014) apple pests were extracted (175 pests added; wood decays ignored)
3. Publication on apple pests in UDSSR (Smol'yannikov 1977) (2 pests added)
4. de Jong & van Zuijlen (2003): pest occurrence in the Netherlands (1 pest added)
5. EPPO GD: *Malus domestica* pest list (major, minor, unclassified, incidental) (26 pests added), other *Malus* spp. (1 pest added) (for 1. PQR was only checked for fruit pests present in the EU; here in 5. PQR was checked for all pests on apple in PQR)
6. CABI CPC: pest lists of *Malus domestica* and *Malus* spp. (ornamental species). Major, minor and wild hosts (weeds ignored) (67 pests added)
7. Arthropod pests in Chile: Koch & Waterhouse (2000) (37 pests added)
8. Biosecurity Australia (2010): IRA for apples from China (212 pests added)
9. Biosecurity Australia (2006): IRA for apples from New Zealand (336 pests added)
10. Australian Quarantine & Inspection Service (1998): Fuji apples from Japan (232 pests added)
11. Biosecurity Australia (2009): draft IRA for apples from the US (150 pests added)
12. Quarantine lists: Argentina 2011, Canada 2013, Chile 2010, India 2011, Korea 2013, Paraguay 2013, Peru 2013 (25 pests added)
13. Targeted searches for important exporting countries: Opatowski (2008) (3 pests added).
14. USDA (2014b): Apples from China to the US (550 pests added). Due to the large amount of additional pests found in this analysis, some groups, which are unlikely to be transported on fresh apple fruit, were not included in the list. These groups are: Cerambycidae (longhorn beetles); Scolytidae (bark beetles), Cicadellidae (leaf hoppers). Of the families Scarabaeidae (scarab beetles) and Cicadidae (cicadas) only those species that were identified in USDA (2014b) to be potentially associated with fruit (e.g. *Anomala* spp., *Brahmina* spp., *Graptopsaltria* sp.) were included.

2.2 Step 2

The *Methods* were used. 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. 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. Finally, editing and consistency adjustments were done only for the pests retained for the Alert List.
Ratings in the Step 2 List may sometimes seem inconsistent between species, but they were based on the information available. It was not always possible to judge whether there is a real difference between species or whether the relevant the information was not found. Different sources of information may lead to different ratings, so pests may have been rated differently depending on the information available to each assessor. Only for the pests retained in several Alert Lists was all information cross-checked for consistency.

2.3 Selection system for the alert list

The selection system described in the *Methods* was applied to select pests for the Alert List (see Annex 2).

The list is divided into two Parts:
Part 1 with pests with high economic importance and more likely to transfer and
Part 2 with pests with lesser economic importance and more likely to transfer, respectively high economic importance but less likely to transfer.
The combinations of criteria used to build the Apple Alert List are presented in Annex 2. It corresponds to that described in the *Methods*.

3. Results: Pests listed at steps 1 and 2 and Alert list

3.1 Step 1

At step 1, a high number of 1837 apple pests worldwide was listed, of which about three quarters (77.5 %) were insects, followed in quantity by fungi (14.5 %), Arachnida (3.4 %) and viruses, viroids and virus-like diseases (2.0 %) (Table 1). A few Gastropoda species were also listed at that stage.

Table 1: Proportion of different pest groups of all entries on the step 1 list

Pest group	No. of single entries	Proportion of all entries (%)
Insecta	1423	77.5
Fungi (incl. Chromista)	267	14.5
Arachnida	62	3.4
Viruses, viroids and virus-like diseases	37	2.0
Nematoda	26	1.4
Bacteria (incl. Phytoplasma)	18	1
Gastropoda	4	0.2
Total	**1837**	**100.0**

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

50 already quarantine pests for the EU (category NO1)
991 no possibility of association with the fruit pathway (category NO2)
424 present in the EU (category NO3)
42 not pests of *Malus* (category NO4)
97 other reasons (e.g. natural enemy, not a pest of any crop, or pests mentioned at genus level in interceptions, or cases impossible to analyze) (category NO5)

➡ Consequently, 233 pests remained for consideration at Step 2.

A list of species excluded at step 1 is provided in Annex 3. This includes all NO categories and

3.2 Step 2

The step 2 list contained 233 pests of *Malus* spp. neither being established or regulated in the EU nor falling in any other of the exclusion (NO) categories. For these pests the transmission via the apple fruit is regarded theoretically possible, though the likelihood ranges from very likely to rather unlikely. The majority of species are Insecta (almost 80%), followed by Fungi (about 18%), Arachnida and Viruses, viroids and virus-like diseases played a minor role (Table 2). The list of all rated species is provided in Annex 4.

Table 2: Proportion of different pest groups on the step 2 list

Pest group	No. of single entries	Proportion of all entries (%)
Insecta	185	79.4
Fungi	42	18.0
Arachnida	4	1.7
Viruses, viroids and virus-like diseases	2	0.9
Total	**233**	**100**

3.3 Alert List

The application of the selection system (Annex 2) resulted in 34 Alert list pests (Annex 5).

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

6 Part 1 - Pests with high economic importance and more likely to transfer

28 Part 2 - Pests with lesser economic importance and more likely to transfer, or high economic importance but less likely to transfer

3.4 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 all economic relevant *Malus* pests 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 area were 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 complicated the analysis). Some groups of pests are not reflected on the alert list, because no indication of invasive behaviour or potential to cause damage of economic relevance has been recorded. Also pests that are not very mobile (no active mobility such as crawling, running or flying) and therefore regarded to be less probable to transfer did not end up on the Alert list.

The world coverage of this study seems sufficient regarding the main importing countries into the EU. About 670 organisms which occur in South America (main import into the EU) were identified. 117 organisms from Africa and 331 from New Zealand were examined.

3.5 Other findings of interest during the preparation of the Alert List

A very high number (<550) of species could be possibly transferred plants for planting or with fruits, when green parts are attached. These species are mainly insects (526 species), but also 9 fungi, 15 Acarida and the nematode *Aphelenchoides limberi*. These organisms were excluded from further consideration (NO2), but their introduction cannot be excluded as long as there is no regulation that apple fruit imported into the EU should be free from leaves.

Some species have a very limited distribution in Europe. They were rated as NO3 and excluded, but could be harmful for countries where they not occur yet. An example is the Australian lightbrown apple moth *Epiphyas postvittana*, which is native in Australia and was introduced to New Zealand where it is now the most common leafroller species in apple crops. It accounts for more than 90% of all leafrollers associated with packed apples in USDA pre-clearance inspections (year 2000-2004). *E. postvittana* has spread to North America and is now present in Ireland and the UK. Additionally there were uncertain records from Sweden, Jersey, Guernsey and the Netherlands. *E. postvittana* is highly polyphagous and a threat many crops incl. *Malus domestica*, *Citrus*, *Diospyros kaki*, *Fragaria* x *ananassa*, *Myrtus communis*, *Prunus*, *Pyrus communis*, *Rosmarinus officinalis*, *Rubus idaeus* and *Vitis vinifera*.

19 Fruit-piercing Noctuidae for which only adults are associated with apples were identified in this study, which are not already present or regulated in the EU. For this species, eggs and larvae are on the leaves of their host plants, which do not include Malus. There is no evidence that eggs may contaminate fruits of non-hosts. Adults feed on apples (and other fruit species), but are highly mobile. In addition adults of most species are nocturnal and are large. Evidence of international movement, other than by natural spread, is scarce and not linked to fruit. Unless it is very unlikely, that this species can be introduced with fruit, 13 of this species have been checked further for their economic importance in step 2. *Agrotis tokinionidis*, *Anomis commoda*, *Calyptra gruesa* and *Lagopeptera juno* have a moderate impact on apple. The remaining species (*Adris tyrannus*, *Anomis mesogona*, *Eudocima salaminia*, *Spirama retorta*, *Anomis fulvida*, *Ophiusa coronate*, *Oraesia emarginata*, *Chrysorithrum amata*, *Simplicia niphona*) have either minor economic importance, moderate economic importance on another crop or an unknown impact, respectively. Finally, none of the species met the criteria for the alert list.

Within pests than can contaminate apple shipments, *Macchiademus diplopterus* is recorded to sometimes enter apples and pears at the calyx end and sheltering deeper inside the fruit. Numerous

interceptions are recorded on apple, citrus, nectarine, peach, pear and plum fruits. This pest originates in South Africa and is a serious pest of cereals (wheat, oats, barley.

4 Conclusions/Recommendations

As reflected in the Alert list, a high number of apple pests may be associated with the fruit pathway. Therefore it is recommended that for fruit in general the issuance of a phytosanitary certificate on the basis of a phytosanitary inspection should be requested prior to import of fruit into the EU.
Several pests are already regulated in relation to apple fruit, but it is mainly pests from North America and Asia, and none from South America and South Africa where most of the trade now comes from. Several Tephritidae were identified. They are currently regulated in the EU under general categories. It could be envisaged whether additional major species should be listed by name in the Directive. Finally, as more than 550 species are associated with fruit if green parts are attached, a requirement that apples imported to the EU should be free from leaves would be reasonable.

It should be highlighted that, the likelihood of transfer from apple fruit consignments to 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. 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.

The Alert List may 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.

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ANNEX 1. Detailed data on imports of apples to the EU

A. Quantities (in 100 kg) of apples traded within the EU, imported from EPPO non-EU countries and from non-EPPO countries respectively between 2002 and 2012

	2002	2004	2006	2008	2009	2010	2011	2012
EU28_INTRA	22,201,318	22,646,892	24,205,430	23,921,556	21,848,896	22,622,164	23,560,191	24,239,973
EPPO nonEU	1361	0	0	7560	7348	7092	8402	14394
non-EPPO	7492476	9184058	7349403	7035970	6578972	5022482	5283850	4790812

B. Quantities (in 100 kg) of apples imported to the EU by regions and countries between 2002 and 2012

	2002	2004	2006	2008	2009	2010	2011	2012
North America	**351,475**	**424,659**	**350,597**	**298,480**	**275,828**	**216,175**	**114,176**	**113,193**
CANADA	62,089	52,224	44,597	25,322	11,559	15,580	11,826	8,292
MEXICO	:	:	:	4	:	:	:	:
UNITED STATES	289,386	372,435	306,000	273,154	264,269	200,595	102,350	104,901
South America	**2,976,295**	**3,996,523**	**3,797,174**	**3,934,389**	**3,266,282**	**2,973,591**	**2,653,639**	**2,228,636**
ARGENTINA	763,085	919,316	976,695	798,253	577,145	471,079	497,579	292,475
BRAZIL	578,899	1,229,642	534,562	974,654	801,989	706,918	398,402	578,033
CHILE	1,601,281	1,794,149	2,249,828	2,114,798	1,865,220	1,777,322	1,702,135	1,329,625
COLOMBIA	:	:	127	9	:	:	1,455	622
ECUADOR	:	:	:	:	:	:	:	0
PERU	0	0	5	:	:	:	:	:
SURINAME	:	:	:	:	:	12	1	:
URUGUAY	33,030	53,416	35,957	46,675	21,928	18,260	54,067	27,881
Central America	**6,708**	**224**	**7,573**	**0**	**0**	**168**	**0**	**0**
ANTIGUA AND BARBUDA	26	10	7,533	:	:	:	:	:
BELIZE	6,519	:	:	:	:	:	:	:
COSTA RICA	:	2	21	:	:	168	:	:
DOMINICAN REP.	6	:	2	:	:	0	:	:
GUATEMALA	157	:	:	:	:	:	:	:
NICARAGUA	:	:	17	:	:	:	:	:
PANAMA	:	212	:	:	:	:	:	:
Africa	**1,484,620**	**1,803,038**	**1,519,025**	**1,713,066**	**1,448,963**	**1,130,537**	**1,111,960**	**1,201,131**
ALGERIA*	:	:	10	426	:	2,057	1,203	:
CENTRAL AFRICAN REP.	:	:	30	:	:	:	:	:
CHAD	:	:	:	:	:	:	:	163
CONGO	:	11	:	:	:	:	:	:
COTE D'IVOIRE	15	:	421	125	:	:	:	:
EGYPT	0	:	180	:	:	:	734	177
ERITREA	71	:	:	:	:	:	:	:
LIBYA	:	:	:	:	:	:	4,903	:
MADAGASCAR	75	:	:	:	:	:	:	:
MOROCCO*	166	49	:	346	:	:	:	:
MOZAMBIQUE	:	:	:	:	:	:	:	385
NIGER	234	:	:	:	:	:	:	:
NIGERIA	77	:	:	:	:	:	:	:
SAO TOME AND PRINCIPE	138	:	:	:	:	:	:	:
SOUTH AFRICA	1,483,711	1,802,973	1,518,384	1,711,768	1,448,963	1,128,480	1,105,120	1,200,406
SWAZILAND	133	:	:	:	:	:	:	:

	2002	2004	2006	2008	2009	2010	2011	2012
TUNISIA*	:	:	:	401	:	:	:	:
ZAMBIA	:	5	:	:	:	:	:	:
Asia	**151,617**	**627,631**	**336,552**	**382,239**	**184,560**	**109,816**	**56,443**	**31,710**
AFGHANISTAN	:	:	:	180	:	:	:	:
BANGLADESH	:	:	:	:	0	:	:	:
CHINA	149,339	627,286	336,485	382,047	184,479	109,790	56,443	31,710
HONG KONG	200	:	:	:	:	:	:	:
INDIA	:	:	49	:	2	:	:	0
JAPAN	128	30	18	12	:	:	:	:
KOREA REP.	859	132	:	:	79	26	:	:
SINGAPORE	1,084	180	:	:	:	:	:	:
TAIWAN	6	:	:	:	:	:	:	:
THAILAND	1	3	0	0	0	0	:	0
VIETNAM	:	:	:	0	:	:	:	0
Near East	**20,664**	**3,206**	**3,515**	**8,035**	**1,556**	**1,050**	**542**	**2,879**
IRAN	19,901	2,618	3,224	2,641	552	479	158	2,062
ISRAEL*	107	411	205	5,364	:	377	384	817
JORDAN*	:	0	:	:	:	194	:	:
LEBANON	11	:	0	30	194	0	:	:
SAUDI ARABIA	610	172	:	:	810	:	:	:
SYRIA	35	5	86	:	:	:	:	:
Oceania	**2,085,983**	**2,158,042**	**1,811,823**	**1,414,645**	**1,654,407**	**1,269,754**	**1,472,980**	**1,159,686**
AUSTRALIA	23,220	20,099	29,403	6,029	2,839	3,699	2,746	4,795
COOK ISLANDS	8	18	:	:	:	:	:	187
NEW ZEALAND	2,062,755	2,137,713	1,782,420	1,408,616	1,651,568	1,266,055	1,470,234	1,154,704
PAPUA NEW GUINEA	:	212	:	:	:	:	:	:
Europe (non-EU)	**126,596**	**207,449**	**490,562**	**356,780**	**170,638**	**451,685**	**549,341**	**304,543**
ALBANIA*	:	:	:	187	:	1,393	11,686	8,329
BELARUS*	167	:	:	:	:	:	190	151
BOSNIA AND HERZEGOVINA*	7,173	4,893	1,986	1,965	5,462	22,349	36,873	10,921
CAPE VERDE	:	:	:	:	:	:	:	382
MACEDONIA FYR*	96,962	62,438	299,393	304,696	108,614	240,306	87,053	150,380
ICELAND	:	:	30	:	:	:	:	:
MOLDOVA REP.*	5,248	126,782	158,116	2,097	19,720	51,409	29,680	17,583
NORWAY*	282	53	80	77	254	231	644	587
RUSSIA*	2,767	59	100	784	654	820	1,515	2,238
SERBIA*	:	:	15,053	11,305	21,003	120,501	322,459	21,655
SWITZERLAND*	8,764	2,388	9,707	14,960	6,547	7,064	49,570	76,651
TURKEY*	3,872	10,836	6,097	13,149	1,036	520	1,269	1,272
UKRAINE*	1,361	:	:	7,560	7,348	7,092	8,402	14,394

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)
Subratings are covered in the ratings below (e.g. E1 covers E1u, E1h, E1d) except if explicitely 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 but more likely to transfer or with high economic importance but less likely to transfer	• A1/A2 or A1ut/A2ut + E1 + any other • A1t/A2t + E1u or E1h + any other • A1t/A2t + E2+ (F1 or G1) • A1t + E2 + any other • A1t/A2t + E3v or EUv + (F1 or G1) • A1t/A2t + EU+ (F1 or G1)	• pests less able to transfer (or with an uncertainty on transfer), with a high economic impact currently • pests able to transfer, with a high economic impact (but either with an uncertainty, or in the past) • pests able to transfer, with a moderate economic impact currently, but intercepted, spreading/invasive. • non-mobile life stage associated with the fruit, pest able to transfer, with a moderate recorded impact currently • pests able to transfer, known vector, with a low or unknown recorded impact currently, and intercepted, spreading/invasive • pests able to transfer, with an unknown recorded impact currently, but intercepted, spreading/invasive

Not retained on the Alert List

- Ac (contaminant)
- NO categories
- Combinations of ratings not fulfilling any of the combinations above

ANNEX 3. Organisms excluded from further consideration at Step 1

Type of pests: A = Arachnida, B = Bacteria, I = Insecta, F = Fungi, G = Gastropoda, N = Nematoda, V = Viruses and Virus-like organisms,

Species		Taxonomy	Reason
Abraxas grossulariata	I	Lepidoptera: Geometridae	NO3
Acanthococcus coccineus	I	Hemiptera: Eriococcidae	NO3
Acanthoecia larminati	I	Lepidoptera: Psychidae	NO2
Acanthopsyche bipars	I	Lepidoptera: Psychidae	NO2
Acanthopsyche nigriplaga	I	Lepidoptera: Psychidae	NO2
Acanthopsyche subteralbata	I	Lepidoptera: Psychidae	NO2
Acanthopulvinaria orientalis	I	Hemiptera: Coccidae	NO2
Acanthosoma denticauda	I	Hemiptera: Acanthosomatidae	NO2
Acetobacter aceti	B	Alphaproteobacteria: Acetobacteraceae	NO3
Acetobacter pasteurianus	B	Alphaproteobacteria: Acetobacteraceae	NO3
Aclees cribratus	I	Coleoptera: Curculionidae	NO2
Acleris boscana ulmicola	I	Lepidoptera: Tortricidae	NO2
Acleris comariana	I	Lepidoptera: Tortricidae	NO2
Acleris cristana	I	Lepidoptera: Tortricidae	NO2
Acleris extensana	I	Lepidoptera: Tortricidae	NO2
Acleris fimbriana	I	Lepidoptera: Tortricidae	NO2
Acleris minuta	I	Lepidoptera: Tortricidae	NO2
Acleris rhombana	I	Lepidoptera	NO3
Acria ceramitis	I	Lepidoptera: Oecophoridae	NO2
Acrocercops astaurota	I	Lepidoptera: Gracilariidae	NO2
Acronicta alni	I	Lepidoptera: Noctuidae	NO2
Acronicta hercules	I	Lepidoptera: Noctuidae	NO2
Acronicta increta	I	Lepidoptera: Noctuidae	NO2
Acronicta intermedia	I	Lepidoptera: Noctuidae	NO2
Acronicta leucocuspis	I	Lepidoptera: Noctuidae	NO2
Acronicta major	I	Lepidoptera: Noctuidae	NO2
Acronicta psi	I	Lepidoptera: Noctuidae	NO2
Acronicta rumicis	I	Lepidoptera: Noctuidae	NO3
Acronicta strigosa	I	Lepidoptera: Noctuidae	NO2
Acronicta tridens	I	Lepidoptera: Noctuidae	NO2
Actias artemis	I	Lepidoptera: Saturniidae	NO2
Actias dubernardi	I	Lepidoptera: Saturniidae	NO2
Actias selene	I	Lepidoptera: Saturniidae	NO2
Actinotia intermediata	I	Lepidoptera: Noctuidae	NO2
Aculus schlechtendali	A	Acarida: Eriophyidae	NO3
Acyrthosiphon pisum	I	Hemiptera: Aphididae	NO3
Acytolepis puspa	I	Lepidoptera: Lycaenidae	NO2
Adelius sp.	I	Hymenoptera: Braconidae	NO5
Adelphocoris fasciaticollis	I	Hemiptera: Miridae	NO2
Adelphocoris lineolatus	I	Hemiptera: Miridae	NO3
Adoretus puberulus	I	Coleoptera: Scarabaeidae	NO2
Adoretus tenuimaculatus	I	Coleoptera: Scarabaeidae	NO2
Adoretus versutus	I	Coleoptera	NO2
Adoxophyes orana	I	Lepidoptera: Tortricidae	NO3
Adoxophyes privatana	I	Lepidoptera: Tortricidae	NO2
Aelia acuminata	I	Hemiptera: Pentatomidae	NO2
Aenaria lewisi	I	Hemiptera: Pentatomidae	NO2
Aenetus virescens	I	Lepidoptera: Hepialidae	NO2
Aeolesthes sarta	I	Coleoptera: Cerambycidae	NO2
Aeolothrips fasciatus	I	Thysanoptera: Aeolothripidae	NO3
Agalope hyalina	I	Lepidoptera: Zygaenidae	NO2
Agelastica coerulea	I	Coleoptera: Chrysomelidae	NO2

Species		Taxonomy	Reason
Agistemus longisetus	A	Acarida: Stigmaeidae	NO2
Agonopterix alstroemeriana	I	Lepidoptera: Oecophoridae	NO2
Agonum spp.	I	Coleoptera: Carabidae	NO2
Agrilus auriventris	I	Coleoptera: Buprestidae	NO2
Agrilus mali	I	Coleoptera: Buprestidae	NO2
Agriotes fuscicollis	I	Coleoptera: Elateridae	NO2
Agrobacterium rhizogenes	B	Rhizobiaceae	NO3
Agrobacterium tumefaciens	B	Rhizobiaceae: Rhizobiales	NO3
Agrotis ipsilon	I	Lepidoptera: Noctuidae	NO3
Agrotis segetum	I	Lepidoptera: Noctuidae	NO3
Agrypnus variabilis	I	Coleoptera: Elateridae	NO2
Ahasverus advena	I	Coleoptera: Silvanidae	NO2
Aleurocanthus spiniferus	I	Hemiptera: Aleyrodidae	NO1, NO3
Allograpta ropalus	I	Diptera: Syrphidae	NO5
Alphaea phasma	I	Lepidoptera: Arctiidae	NO2
Alsophila japonensis	I	Lepidoptera: Geometridae	NO2
Alsophila tenuis	I	Lepidoptera: Geometridae	NO2
Alternaria alternata	F	Ascomycota	NO1
Alternaria mali	F	Ascomycota	NO1
Alternaria tenuissima	F	Ascomycota	NO3
Alticinae	I	Coleoptera: Chrysomelidae	NO2
Amata fortunei	I	Lepidoptera: Arctiidae	NO2
Amatissa snelleni	I	Lepidoptera: Psychidae	NO2
Amblyseius harrowi	A	Acarida: Phytoseiidae	NO2
Ametastegia	I	Hymenoptera: Tenthredinidae	NO3
Ampelophaga rubiginosa	I	Lepidoptera: Sphingidae	NO2
Amphipsalta cingulata	I	Hemiptera: Cicadidae	NO2
Amphipsalta zelandica	I	Hemiptera: Cicadidae	NO2
Amphipyra erebina	I	Lepidoptera: Noctuidae	NO2
Amphipyra monolitha	I	Lepidoptera: Noctuidae	NO2
Amphipyra pyramidea	I	Lepidoptera: Noctuidae	NO3
Amphipyra pyramidoides	I	Lepidoptera: Noctuidae	NO2
Anametis granulata	I	Coleoptera: Curculionidae	NO2
Anarsia lineatella	I	Lepidoptera: Gelechiidae	NO3
Anastrepha fraterculus	I	Diptera: Tephritidae	NO1
Anastrepha ludens	I	Diptera: Tephritidae	NO1
Anastrepha serpentina	I	Diptera: Tephritidae	NO1
Anastrepha suspensa	I		NO1
Anchomenus spp.	I	Coleoptera: Carabidae	NO2
Ancylis selenana	I	Lepidoptera: Tortricidae	NO2
Andaspis hawaiiensis	I	Hemiptera: Diaspididae	NO2
Andes marmoratus	I	Hemiptera: Cixiidae	NO2
Andes melanobasis	I	Hemiptera: Cixiidae	NO2
Angaracris barabensis	I	Orthoptera: Acrididae	NO2
Anobium punctatum	I	Coleoptera: Anobiidae	NO2
Anomala albopilosa	I	Coleoptera: Scarabaeidae	NO2
Anomala corpulenta	I	Coleoptera: Scarabaeidae	NO2
Anomala cuprea	I	Coleoptera: Scarabaeidae	NO2
Anomala daimiana	I	Coleoptera: Scarabaeidae	NO2
Anomala ebenina	I	Coleoptera: Scarabaeidae	NO2
Anomala exoleta	I	Coleoptera: Scarabaeidae	NO4
Anomala geniculata	I	Coleoptera: Scarabaeidae	NO2

Species		Taxonomy	Reason
Anomalomyia guttata	I	Diptera: Mycetophilidae	NO2
Anomoneura mori	I	Hemiptera: Psyllidae	NO2
Anoplocnemis phasiana	I	Hemiptera: Coreidae	NO2
Anoplophora chinensis	I	Coleoptera: Cerambycidae	NO1, NO3
Anoplophora glabripennis	I	Coleoptera: Cerambycidae	NO1, NO3
Anthaxia concinna	I	Coleoptera: Buprestidae	NO2
Antheraea pernyi	I	Lepidoptera: Saturniidae	NO2
Antheraea yamamai	I	Lepidoptera: Saturniidae	NO2
Anthicus floralis	I	Coleoptera: Anthicidae	NO2
Anthonomus pomorum	I	Coleoptera: Curculionidae	NO3
Anthonomus quadrigibbus	I	Coleoptera: Curculionidae	NO1
Anthonomus signatus	I	Coleoptera: Curculionidae	NO1
Antipodiphora tonnoiri	I	Diptera: Phoridae	NO2
Antivaleria viridimacula	I	Lepidoptera: Noctuidae	NO2
Antrodia serialis	F	Basidiomycota	NO2
Anystis baccarum	A	Acarida: Anystidae	NO3
Anzora unicolor	I	Hemiptera: Flatidae	NO2
Aonidiella aurantii	I	Hemiptera: Diaspididae	NO3
Apanteles tasmanicus	I	Hymenoptera: Braconidae	NO5
Apate monachus	I	Coleoptera	NO3
Aphelenchoides limberi	N	Aphelenchoididae	NO2
Aphelinus abdominalis	I	Hymenoptera: Aphelinidae	NO5
Aphelinus mali	I	Hymenoptera: Aphelinidae	NO5
Aphidounguis mali	I	Hemiptera: Pemphigidae	NO2
Aphidounguis pomiradicola	I	Hemiptera: Aphididae	NO2
Aphis craccivora	I	Hemiptera: Aphididae	NO3
Aphis gossypii	I	Hemiptera: Aphididae	NO3
Aphis pomi	I	Hemiptera: Aphididae	NO3
Aphis spiraecola	I	Hemiptera: Aphididae	NO3
Aphrophora bifasciata	I	Hemiptera: Cercopidae	NO2
Aphrophora flavomaculata	I	Hemiptera: Cercopidae	NO2
Aphrophora intermedia	I	Hemiptera: Cercopidae	NO2
Aphrophora maritima	I	Hemiptera: Cercopidae	NO2
Aphrophora obliqua	I	Hemiptera: Cercopidae	NO2
Aphytis chilensis	I	Hymenoptera: Aphelinidae	NO3
Aphytis chrysomphali	I	Hymenoptera: Aphelinidae	NO3
Aphytis diaspidis	I	Hymenoptera: Aphelinidae	NO3
Aphytis mytilaspidis	I	Hymenoptera: Aphelinidae	NO5
Apocheima cinerarium	I	Lepidoptera: Geometridae	NO2
Apocheima juglansiaria	I	Lepidoptera: Geometridae	NO2
Aporia crataegi	I	Lepidoptera: Pieridae	NO3
Apple chlorotic leaf spot virus (ACLSV)	V	Betaflexiviridae: Trichovirus	NO3
Apple dimple fruit viroid	V	Pospoviroidae	NO3
Apple flat limb agent	V	unknown	NO3
Apple freckle scurf	V		NO4
Apple fruit chat agent	V		NO3
Apple fruit crinkle viroid (AFCVd)	V	Pospoviroidae: Apscaviroid	NO4
Apple green crincle agent	V		NO3
Apple leaf pucker agent	V	Virus-like deseases	NO3
Apple McIntosh depression agent	B	unknown agent	NO2
Apple mosaic virus	V	Bromoviridae: Ilarvirus	NO1, NO3
Apple necrosis virus	V		NO5
Apple platycarpa scaly bark agent	V	Virus-like deseases	NO2
Apple pustule canker	V	unknown virus	NO2
Apple ringspot agent	V		NO3
Apple rosette agent	V	unknown	NO3
Apple rough skin agent	V		NO3
Apple rubbery wood agent	V	Virus-like deseases	NO3
Apple russet ring and associated disorders	V	Virus	NO3
Apple scar skin viroid (ASSVd)	V	Pospoviroidae: Apscaviroid	NO3
Apple star crack agent	V		NO3
Apple stem grooving virus (ASGV)	V	Betaflexiviridae: Capillovirus	NO3
Apple stem pitting virus (ASPV)	V	Betaflexiviridae: Foveavirus	NO3
Apriona cinerea	I	Coleoptera: Cerambycidae	NO2
Apriona germari	I	Coleoptera: Cerambycidae	NO2
Apriona japonica	I	Coleoptera: Cerambycidae	NO2
Apterygothrips collyerae	I	Thysanoptera: Phlaeothripidae	NO2
Araecerus palmaris	I	Coleoptera: Anthribidae	NO2
Arboridia apicalis	I	Hemiptera: Cicadellidae	NO2
Arboridia suzukii	I	Hemiptera: Cicadellidae	NO2
Arcesis threnodes	I	Lepidoptera: Tortricidae	NO2
Archips betulana	I	Lepidoptera: Tortricidae	NO2
Archips crataegana	I	Lepidoptera: Tortricidae	NO2
Archips oporana	I	Lepidoptera: Tortricidae	NO2
Archips podana	I	Lepidoptera: Tortricidae	NO3
Archips rosanus	I	Lepidoptera: Tortricidae	NO3
Archips subrufana	I	Lepidoptera: Tortricidae	NO2
Archips xylosteanus	I	Lepidoptera: Tortricidae	NO3
Arge mali	I	Hymenoptera: Argidae	NO2
Argyresthia conjugella	I	Lepidoptera: Yponomeutidae	NO3
Argyrotaenia ljungiana	I	Lepidoptera: Tortricidae	NO3
Argyrotaenia loxonephes	I	Lepidoptera: Tortricidae	NO2
Arhopalus ferus	I	Coleoptera: Cerambycidae	NO2
Aridius bifasciatus	I	Coleoptera: Corticariidae	NO2
Aridius nodifer	I	Coleoptera:Corticariidae	NO2
Armillaria luteobubalina	F	Basidiomycota	NO2
Armillaria mellea	F	Basidiomycota	NO2
Armillaria obscura	F	Basidiomycota	NO2
Armillaria tabescens	F	Basidiomycota	NO3
Artena dotata	I	Lepidoptera: Noctuidae	NO2
Arthrocnodax sp.	I	Diptera: Cecidomyiidae	NO5
Ascochyta piricola	F	Ascomycota	NO2
Ascogaster quadridentatus	I	Hymenoptera: Braconidae	NO5
Ascotis selenaria	I	Lepidoptera: Geometridae	NO2
Asias halodendri	I	Coleoptera: Cerambycidae	NO2
Aspergillus flavus	F	Ascomycota	NO3
Aspergillus glaucus	F	Ascomycota	NO3
Aspergillus niger	F	Ascomycota	NO3
Aspergillus ochraceus	F	Ascomycota	NO3
Aspergillus sclerotiorum	F	Ascomycota	NO3
Aspergillus tamarii	F	Ascomycota	NO3
Aspergillus tamarii	F	Ascomycota	NO3
Aspicolpus hudsoni	I	Hymenoptera: Braconidae	NO2
Aspidiotus nerii	I	Hemiptera: Diaspididae	NO3
aster yellows phytoplasma group	B	Phytoplasma	NO3
Asteromella mali	F	Ascomycota	NO2

Species		Taxonomy	Reason
Asura strigipennis	I	Lepidoptera: Arctiidae	NO2
Athelia rolfsii	F	Basidiomycota	NO3
Athrypsiastis salva	I	Lepidoptera: Xyloryctidae	NO2
Atrachya menetriesi	I	Coleoptera: Chrysomelidae	NO2
Atrachya menetriesis	I	Coleoptera: Chrysomelidae	NO2
Atractomorpha lata	I	Orthoptera: Acrididae	NO2
Atractomorpha sinensis	I	Orthoptera: Acrididae	NO2
Atractotomus mali	I	Hemiptera: Miridae	NO3
Attacus atlas	I	Lepidoptera: Saturniidae	NO2
Aulacophora femoralis	I	Coleoptera: Chrysomelidae	NO2
Aulacophora lewisi	I	Coleoptera: Chrysomelidae	NO2
Aulacorthum solani	I	Hemiptera: Aphididae	NO3
Aureobasidium pullulans	F	Ascomycota	NO3
Auriculariopsis ampla	F	Basidiomycota	NO3
Austrapoda dentata	I	Lepidoptera: Limacodidae	NO2
Autographa gamma	I	Lepidoptera: Noctuidae	NO2
Autographa nigrisigna	I	Lepidoptera: Noctuidae	NO2
Bacchisa fortunei	I	Coleoptera: Cerambycidae	NO2
Bactrocera aquilonis	I	Diptera: Tortricidae	NO1
Bactrocera dorsalis	I	Diptera: Tephritidae	NO1
Bactrocera occipitalis	I	Diptera: Tephritidae	NO1
Bactrocera pedestris	I	Diptera: Tephritidae	NO1
Bactrocera tryoni	I	Diptera: Tephritidae	NO1
Baenothrips moundi	I	Thysanoptera: Phlaeothripidae	NO4
Balsa malana	I	Lepidoptera: Noctuidae	NO2
Bambalina sp.	I		NO2
Barathra configurata	I	Lepidoptera: Noctuidae	NO2
Basilepta fulvipes	I	Coleoptera: Chrysomelidae	NO2
Basiprionota bisignata	I	Coleoptera: Chrysomelidae	NO2
Bdellodes oraria	A	Acarida: Bdellidae	NO5
Belippa horrida	I	Lepidoptera: Limacodidae	NO2
Bhima idiota	I	Lepidoptera: Lasiocampidae	NO2
Biscogniauxia marginata	F	Ascomycota	NO3
Biston marginatus	I	Lepidoptera: Geometridae	NO2
Biston robustus	I	Lepidoptera: Geometridae	NO2
Biston thibetaria	I	Lepidoptera: Geometridae	NO2
Blattella germanica	I	Blattodea: Blattellidae	NO3
Blister Bark		unknown	NO2
Blosyrus herthus	I	Coleoptera: Curculionidae	NO2
Boarmia consonaria	I	Lepidoptera: Geometridae	NO2
Boarmia irrorataria	I	Lepidoptera: Geometridae	NO2
Bothynoderes punctiventris	I	Coleoptera: Curculionidae	NO2
Botryosphaeria berengeriana f. sp. *pyricola*	F	Ascomycota	NO1
Botryosphaeria dothidea	F	Ascomycota	NO3
Botryosphaeria lutea	F	Ascomycota	NO3
Botryosphaeria obtusa	F	Ascomycota	NO3
Botryosphaeria parva	F	Ascomycota	NO3
Botryosphaeria rhodina	F	Ascomycota	NO3
Botryosphaeria ribis	F	Ascomycota	NO3
Botryosphaeria stevensii	F	Ascomycota	NO3
Botryotinia fuckeliana	F	Ascomycota	NO3
Botrytis mali	F	Ascomycota	NO2
Brachytarsus niveovariegatus	I	Coleoptera: Anthribidae	NO2
Bradysia sp.	I	Diptera: Sciaridae	NO5
Brentiscerus putoni	I	Hemiptera: Lygaeidae	NO2

Species		Taxonomy	Reason
Brevicornu maculatum	I	Diptera: Mycetophilidae	NO2
Brevipalpus obovatus	A	Acari: Tenuipalpidae	NO3
Brevipalpus phoenicis	A	Acarida: Tenuipalpidae	NO3
Brevipecten consanguis	I	Lepidoptera: Noctuidae	NO2
Bryobia graminum	A	Acari: Tetranychidae	NO2
Bryobia praetiosa	A	Acari: Tetranychidae	NO3
Bryobia rubrioculus	A	Acarida: Tetranychidae	NO3
Bryobia vasiljevi	A	Acari: Tetranychidae	NO2
Bucculatrix pyrivorella	I	Lepidoptera: Bucculatrigidae	NO2
Butlerelfia eustacei	F	Basidiomycota	NO3
Buzura superans	I	Lepidoptera: Geometridae	NO2
Byctiscus betulae	I	Coleoptera: Curculionidae	NO2
Byctiscus coelulans	I	Coleoptera: Curculionidae	NO2
Byctiscus congener	I	Coleoptera: Curculionidae	NO2
Byctiscus congenor	I	Coleoptera: Curculionidae	NO2
Byctiscus omissus	I	Coleoptera: Curculionidae	NO2
Byctiscus princeps	I	Coleoptera: Curculionidae	NO2
Byctiscus rugosus	I	Coleoptera: Curculionidae	NO2
Byctiscus venustus	I	Coleoptera: Curculionidae	NO2
Byturus tomentosus	I	Coleoptera: Byturidae	NO3
Cacoecimorpha pronubana	I	Lepidoptera: Tortricidae	NO3
Cacopsylla chinensis	I	Hemiptera: Psyllidae	NO2
Cacopsylla malicola	I	Hemiptera: Psyllidae	NO2
Cacopsylla melanoneura	I	Hemiptera: Psyllidae	NO3
Cacopsylla pyri	I	Hemiptera: Psyllidae	NO3
Cacopsylla pyricola	I	Hemiptera: Psyllidae	NO3
Cacopsylla pyrisuga	I	Hemiptera: Psyllidae	NO3
Cadophora malorum	F	Ascomycota	NO3
Calepitrimerus baileyi	A	Acari: Eriophyidae	NO2
Caliroa cerasi	I	Hymenoptera: Tenthredinidae	NO3
Callideriphus laetus	I	Coleoptera: Cerambycidae	NO2
Calliphora stygia	I	Diptera: Calliphoridae	NO4
Callisphyris macropus	I	Coleoptera: Cerambycidae	NO2
Callisphyris vespa	I	Coleoptera: Cerambycidae	NO2
Calliteara pseudabietis	I	Lepidoptera: Lymantriidae	NO2
Calliteara pudibunda	I		NO2
Calocoris norvegicus	I	Hemiptera: Miridae	NO2
Calomycterus obconicus	I	Coleoptera: Curculionidae	NO2
Calonectria kyotensis	F	Ascomycota	NO2
Caloptilia theivora	I	Lepidoptera: Gracillariidae	NO2
Caloptilia zachrysa	I	Lepidoptera: Gracillariidae	NO2
Calosphaeria sp.	F	Ascomycota	NO2
Calyptotrypus hibinonis	I	Orthoptera: Gryllidae	NO2
Calyptra lata	I	Lepidoptera: Noctuidae	NO2
Calyptra minuticornis	I	Lepidoptera: Noctuidae	NO2
Calyptra thalictri	I	Lepidoptera: Noctuidae	NO2
Campoplex sp.	I	Hymenoptera: Ichneumonidae	NO2
Campylomma liebknechti	I	Hemiptera: Miridae	NO5
Campylomma verbasci	I	Hemiptera: Miridae	NO3
Candidula intersecta	G		NO2
Canephora asiatica	I	Lepidoptera: Psychidae	NO2
Canephora unicolor	I	Lepidoptera: Psychidae	NO2
Capnodis tenebrionis	I	Coleoptera	NO3
Cardiastethus consors	I	Hemiptera: Anthocoridae	NO2
Cardiastethus poweri	I	Hemiptera: Anthocoridae	NO2
Carnation ringspot dianthovirus	V	Tombusviridae: Dianthovirus	NO3
Carpocoris pudicus	I	Hemiptera: Pentatomidae	NO2

Species		Taxonomy	Reason
Carpophilus humeralis	I	Coleoptera: Nitidulidae	NO3
Carposina sasakii	I	Lepidoptera: Carposinidae	NO1
Cartodere sp.	I	Coleoptera: Corticariidae	NO2
Cassida discalis	I	Coleoptera: Chrysomelidae	NO2
Cassida nucula	I	Coleoptera: Chrysomelidae	NO2
Cassida versicolor	I	Coleoptera: Chrysomelidae	NO2
Catharsius molossus	I	Coleoptera: Scarabaeidae	NO2
Catocala abamita	I	Lepidoptera: Noctuidae	NO2
Catocala agitatrix	I	Lepidoptera: Noctuidae	NO2
Catocala columbina	I	Lepidoptera: Noctuidae	NO2
Catocala dissimilis	I	Lepidoptera: Noctuidae	NO2
Catocala dula	I	Lepidoptera: Noctuidae	NO2
Catocala electa	I	Lepidoptera: Noctuidae	NO2
Catocala fulminea	I		NO2
Catocala nivea	I	Lepidoptera: Noctuidae	NO2
Catocala patala	I	Lepidoptera: Noctuidae	NO2
Catocala remissa	I	Lepidoptera: Noctuidae	NO2
Catopta mongolicus	I	Lepidoptera: Cossidae	NO2
Catoptes coronatus	I	Coleoptera: Curculionidae	NO2
Cavariella aegopodii	I	Hemiptera: Aphididae	NO3
Celastrina argiolus	I	Lepidoptera: Lycaenidae	NO2
Cenopalpus pulcher	A	Acarida: Tenuipalpidae	NO3
Cenopalpus ruber	A	Acarida: Tenuipalpidae	NO2
Ceratitis capitata	I	Diptera: Tephritidae	NO3
Ceratitis rosa	I	Diptera: Tephritidae	NO1
Cercopedius artemisiae	I	Coleoptera: Curculionidae	NO2
Ceresa alta	I	Hemiptera: Membracidae	NO3
Ceresa basalis	I	Hemiptera: Membracidae	NO2
Cermada punctimargo	I	Hemiptera: Cixiidae	NO2
Cermatulus nasalis	I	Hemiptera: Pentatomidae	NO5
Cerococcus muratae	I	Hemiptera: Cerococcidae	NO2
Cerodontha australs	I	Diptera: Agromyzidae	NO2
Ceroplastes centroroseus	I	Hemiptera: Coccidae	NO2
Ceroplastes ceriferus	I	Hemiptera: Coccidae	NO3
Ceroplastes floridensis	I	Hemiptera: Coccidae	NO3
Ceroplastes japonicus	I	Hemiptera: Coccidae	NO3
Ceroplastes pseudoceriferus	I	Hemiptera: Coccidae	NO2
Ceroplastes sinensis	I	Hemiptera: Coccidae	NO3
Cerura menciana	I	Lepidoptera: Notodontidae	NO2
Cerura vinula	I	Lepidoptera: Notodontidae	NO2
Chaetocnema confinis	I	Coleoptera: Chrysomelidae	NO2
Chaetomella sp.	F	Ascomycota	NO2
Chalioides kondonis	I	Lepidoptera: Psychidae	NO2
Cheimatobia bruceata	I	Lepidoptera: Geometridae	NO3
Chelidonium quadricolle	I	Coleoptera: Cerambycidae	NO2
Cheromettia apicata	I	Lepidoptera: Limacodidae	NO2
Cherry leaf roll virus (CLRV)	V	Secoviridae: Nepovirus	NO3
Cherry rasp leaf virus (CRLV)	V	Secoviridae: Cheravirus	NO1
Chihuo sunzao	I	Lepidoptera: Geometridae	NO2
Chihuo zao	I	Lepidoptera: Geometridae	NO2
Chilecomadia moorei	I	Lepidoptera: Cossidae	NO2
Chilecomadia valdiviana	I	Lepidoptera: Cossidae	NO2
Chilocorus rubidus	I	Coleoptera: Coccinellidae	NO5
Chionaema phaedra	I	Lepidoptera: Arctiidae	NO2
Chlamisus velutinomaculat	I	Coleoptera: Chrysomelidae	NO2
Chlorophanus grandis	I	Coleoptera: Curculionidae	NO2

Species		Taxonomy	Reason
Chlorophanus lineolus	I	Coleoptera: Curculionidae	NO2
Chlorophorus annularis	I	Coleoptera: Cerambycidae	NO2
Chlorophorus diadema	I	Coleoptera: Cerambycidae	NO2
Chondrostereum purpureum	F	Basidiomycota	NO3
Choreutis pariana	I	Lepidoptera: Choreutidae	NO3
Choreutis vinosa	I	Lepidoptera: Choreutidae	NO2
Choristoneura diversana	I	Lepidoptera: Tortricidae	NO2
Choristoneura lafauryana	I	Lepidoptera: Tortricidae	NO2
Choristoneura luticostana	I	Lepidoptera: Tortricidae	NO2
Choristoneura parallela	I	Lepidoptera: Tortricidae	NO2
Choristoneura rosaceana	I	Lepidoptera: Tortricidae	NO1
Chorthippus brunneus	I	Orthoptera: Acrididae	NO2
Chrysobothris affinis	I	Coleoptera: Buprestidae	NO2
Chrysobothris femorata	I	Coleoptera: Buprestidae	NO2
Chrysobothris mali	I	Coleoptera: Buprestidae	NO2
Chrysobothris succedanea	I	Coleoptera: Buprestidae	NO2
Chrysodeixis eriosoma	I	Lepidoptera: Noctuidae	NO4
Chrysomela aeneicollis	I	Coleoptera: Chrysomelidae	NO2
Chrysomphalus aonidum	I	Hemiptera: Diaspididae	NO3
Chrysomphalus dictyospermi	I	Hemiptera: Diaspididae	NO3
Chymomyza amoena	I	Diptera: Drosophilidae	NO3
Cicadella viridis	I	Hemiptera: Cicadellidae	NO2
Cifuna eurydice	I	Lepidoptera: Lymantriidae	NO2
Cifuna jankowskii	I	Lepidoptera: Lymantriidae	NO2
Cifuna locuples	I	Lepidoptera: Lymantriidae	NO2
Cilix glaucata	I	Lepidoptera	NO3
Cladosporium cladosporioides	F	Ascomycota	NO3
Clavipalpula aurariae	I	Lepidoptera: Noctuidae	NO2
Cleonidius poricollis	I	Coleoptera: Curculionidae	NO2
Cleonidius quadrilineatus	I	Coleoptera: Curculionidae	NO2
Cleonis coloradensis	I	Coleoptera: Curculionidae	NO2
Cleoporus variabilis	I	Coleoptera: Chrysomelidae	NO2
Cleora insolita	I	Lepidoptera: Geometridae	NO2
Cleora scriptaria	I	Lepidoptera: Geometridae	NO2
Cleorina aeneomicans	I	Coleoptera: Chrysomelidae	NO2
Clepsis imitator	I	Lepidoptera: Tortricidae	NO2
Clepsis mellissa	I	Lepidoptera: Tortricidae	NO2
Clepsis pallidana	I	Lepidoptera: Tortricidae	NO2
Clostera anastomosis	I	Hemiptera: Coreidae	NO3
Clostera anatomosis	I		NO2
Clover yellow mosaic potexvirus	V	Alphaflexiviridae: Potexvirus	NO2
Clytrasoma palliatum	I	Coleoptera: Chrysomelidae	NO2
Cnephasia stephensiana	I	Lepidoptera: Tortricidae	NO2
Cnethodonta japonica	I	Lepidoptera: Notodontidae	NO2
Coccinella undecimpunctata	I	Coleoptera: Coccinellidae	NO3
Coccophagus gurneyi	I	Hymenoptera: Aphelinidae	NO3
Coccophagus ochraceus	I	Hymenoptera: Aphelinidae	NO5
Coccophagus scutellaris	I	Hymenoptera: Aphelinidae	NO3
Coccura suwakoensis	I	Hemiptera: Pseudococcidae	NO4
Coccus discrepans	I	Hemiptera: Coccidae	NO2
Coccus hesperidum	I	Hemiptera: Coccidae	NO3
Coccus viridis	I	Hemiptera: Coccidae	NO2
Cochlicopa lubrica	G	Gastropoda: Cochlicopidae	NO2
Colaspis brunnea	I	Coleoptera: Chrysomelidae	NO2
Colasposoma dauricum	I	Coleoptera: Chrysomelidae	NO2

Species		Taxonomy	Reason
Coleophora cerasivorella	I		NO2
Coleophora coracipennella	I	Lepidoptera: Coleophoridae	NO3
Coleophora ringoniella	I	Lepidoptera: Coleophoridae	NO2
Colletogloeum sp.	F	Ascomycota	NO5
Colletotrichum dematium	F	Ascomycota	NO3
Colletotrichum nymphaeae	F	Ascomycota	NO3
Colocasia coryli	I	Lepidoptera: Noctuidae	NO2
Colotois pennaria	I		NO2
Coniothecium sp.	F	Ascomycota	NO5
Coniothyrium convolutum	F	Ascomycota	NO3
Coniothyrium olivacea	F	Ascomycota	NO3
Conistra vaccinii	I	Lepidoptera: Noctuidae	NO2
Conocephalus gladiatus	I	Orthoptera: Tettigoniidae	NO2
Conoderus exsul	I	Coleoptera: Elateridae	NO2
Conotrachelus anaglypticus	I	Coleoptera: Curculionidae	NO2
Conotrachelus nenuphar	I	Coleoptera: Curculionidae	NO1
Contarinia mali	I	Diptera: Cecidomyiidae	NO4
Copitarsia turbata	I	Lepidoptera: Noctuidae	NO2
Corticaria pubescens	I	Coleoptera: Corticariidae	NO3
Corticaria serrata	I	Coleoptera: Corticariidae	NO3
Corticium koleroga	F	Basidiomycota	NO2
Corticium utriculicum	F	Basidiomycota	NO2
Cortinicara hirtalis	I	Coleoptera: Corticariidae	NO2
Cosmia exigua	I	Lepidoptera: Noctuidae	NO2
Cosmia pyralina	I	Lepidoptera: Noctuidae	NO2
Cosmia trapezina	I		NO3
Cosmotriche albomaculata	I	Lepidoptera: Lasiocampidae	NO2
Cossus cossus	I	Lepidoptera: Cossidae	NO3
Cossus jezoensis	I	Lepidoptera: Cossidae	NO2
Cossus mongolicus	I	Lepidoptera: Cossidae	NO2
Costelytra zealandica	I	Coleoptera: Scarabaeidae	NO2
Cotesia ruficrus	I	Hymenoptera: Braconidae	NO3
Creatonotus transiens	I	Lepidoptera: Arctiidae	NO2
Cresococcus candidus	I	Hemiptera: Lecanodiaspididae	NO2
Cricula trifenestrata	I	Lepidoptera: Saturniidae	NO2
Croesia holmiana	I	Lepidoptera: Tortricidae	NO3
Cryphonectria parasitica	F	Ascomycota	NO3
Cryptoblabes gnidiella	I	Lepidoptera: Pyralidae	NO3
Cryptocephalus approximatus	I	Coleoptera: Chrysomelidae	NO2
Cryptocephalus fortunatus	I	Coleoptera: Chrysomelidae	NO2
Cryptocephalus sexpunctatus	I	Coleoptera: Chrysomelidae	NO2
Cryptochetum iceryae	I	Diptera: Cryptochetidae	NO5
Cryptolaemus montrouzieri	I	Coleoptera: Coccinellidae	NO3
Cryptolestes spp.	I	Coleoptera: Laemophloeidae	NO2
Cryptomphalus aspersus	G	Gastropoda: Helicidae	NO3
Cryptophagus spp.	I	Coleoptera: Cryptophagidae	NO2
Cryptoscenea australiensis	I	Neuroptera: Coniopterygidae	NO5
Cryptothelea variegata	I	Lepidoptera: Psychidae	NO2
Cryptotympana atrata	I	Hemiptera: Cicadellidae	NO2
Cucullia asteris	I	Lepidoptera: Noctuidae	NO2
Culex pervigilans	I	Diptera: Culicidae	NO2
Culpinia diffusa	I	Lepidoptera: Geometridae	NO2

Species		Taxonomy	Reason
Cusiara stipitaria	I	Lepidoptera: Geometridae	NO2
Cyclophragma undans	I	Lepidoptera: Lasiocampidae	NO2
Cydia funebrana	I	Lepidoptera: Tortricidae	NO3
Cydia inopinata	I	Lepidoptera: Tortricidae	NO1
Cydia packardi	I	Lepidoptera: Tortricidae	NO1
Cydia pomonella	I	Lepidoptera: Tortricidae	NO3
Cydia prunivora	I	Lepidoptera: Tortricidae	NO1
Cylindrocarpon angustum	F	Ascomycota	NO2
Cylindrocarpon didymum	F	Ascomycota	NO2
Cystidia couaggaria	I	Lepidoptera: Geometridae	NO2
Cystidia stratonice	I	Lepidoptera: Geometridae	NO2
Cytospora personata	F	Ascomycota	NO2
Cytospora sp.	F	Ascomycota	NO2
Dactylispa angulosa	I	Coleoptera: Chrysomelidae	NO2
Dactylispa chatutanga	I	Coleoptera: Chrysomelidae	NO2
Dactylispa excisa	I	Coleoptera: Chrysomelidae	NO2
Dactylispa subquadrata	I	Coleoptera: Chrysomelidae	NO2
Dappula tertia	I	Lepidoptera: Psychidae	NO2
Dasineura mali	I	Diptera: Cecidomyiidae	NO3
Dasychira complicata	I	Lepidoptera: Lymantriidae	NO2
Dasychira fascellina	I	Lepidoptera: Lymantriidae	NO2
Dasychira grotei	I	Lepidoptera: Lymantriidae	NO2
Dasychira horsfieldii	I	Lepidoptera: Lymantriidae	NO2
Dasychira mendosa	I	Lepidoptera: Lymantriidae	NO2
Datana ministra	I	Lepidoptera: Notodontidae	NO2
Davidiella tassiana	F	Ascomycota	NO3
Dead spur of apple	V		NO5
Delottococcus aberiae	I	Hemiptera : Coccidae	NO3
Dendrophoma sp.	F	Ascomycota	NO2
Depressaria isshikii	I	Lepidoptera: Oecophoridae	NO2
Deracantha onos	I	Orthoptera: Bradyporidae	NO2
Dermestes maculatus	I	Coleoptera: Demestidae	NO3
Diadegma sp.	I	Hymenoptera: Ichneumonidae	NO5
Diadiplosis koebelei	I	Diptera: Cecidomyiidae	NO5
Diaporthe actinidiae	F	Ascomycota	NO2
Diaporthe eres	F	Ascomycota	NO3
Diaporthe tanakae	F	Ascomycota	NO2
Diasemia grammalis	I	Lepidoptera: Pyralidae	NO2
Diaspidiotus ostreaeformis	I	Hemiptera: Diaspididae	NO3
Dichomeris ustalella	I	Lepidoptera: Gelechiidae	NO2
Dictyophara nakanonis	I	Hemiptera: Dictyopharidae	NO2
Dictyophara patruelis	I	Hemiptera: Dictyopharidae	NO2
Dictyophara sinica	I	Hemiptera: Dictyopharidae	NO2
Dictyoploca japonica	I	Lepidoptera: Saturniidae	NO2
Dictyoploca simla	I	Lepidoptera: Saturniidae	NO2
Didesmococcus koreanus	I	Hemiptera: Coccidae	NO2
Didesmococcus unifasciatus	I	Hemiptera: Coccidae	NO2
Dieuches notatus	I	Hemiptera: Lygaeidae	NO2
Diplazon laetatorius	I	Hymenoptera: Ichneumonidae	NO3
Diplocarpon maculatum	F	Ascomycota	NO3
Diplocarpon mali	F	Ascomycota	NO3
Diplodia seriata	F	Ascomycota	NO3
Diptacus gigantorhynchus	A	Acari: Diptilomiopidae	NO2
Discostroma corticola	F	Ascomycota	NO3
Dociostaurus maroccanus	I	Orthoptera: Acrididae	NO3
Dolichogenidea sicaria	I	Hymenoptera: Braconidae	NO5

Species		Taxonomy	Reason
Dolycoris baccarum	I	Hemiptera: Pentatomidae	NO2
Dolycoris indicus	I	Hemiptera: Pentatomidae	NO2
Doryidomorpha nigripennis	I	Coleoptera: Chrysomelidae	NO2
Dothichiza sp.	F	Ascomycota	NO2
Drepanacra binocula	I	Neuroptera: Hemerobiidae	NO5
Drosicha contrahens	I	Hemiptera: Margarodidae	NO2
Drosicha corpulenta	I	Hemiptera: Margarodidae	NO2
Drosicha maskelli	I	Hemiptera: Margarodidae	NO2
Drosophila suzukii	I	Diptera: Drosophilidae	NO3
Dysaphis anthrisci	I	Hemiptera: Aphididae	NO2
Dysaphis devecta	I	Hemiptera: Aphididae	NO2
Dysaphis plantaginea	I	Hemiptera: Aphididae	NO3
Dyscerus shikokuensis	I	Coleoptera: Curculionidae	NO2
Dysgonia arctotaenia	I	Lepidoptera: Noctuidae	NO2
Dysgonia arcuata	I	Lepidoptera: Noctuidae	NO2
Dysgonia stuposa	I	Lepidoptera: Noctuidae	NO2
Dysmicoccus brevipes	I	Hemiptera: Pseudococcidae	NO3
Dysmicoccus wistariae	I	Hemiptera: Pseudococcidae	NO2
Echthromorpha intricatoria	I	Hymenoptera: Ichneumonidae	NO5
Ectopsocus spp.	I	Psocoptera: Ectopsocidae	NO5
Ectropis excellens	I	Lepidoptera: Geometridae	NO2
Ectropis obliqua	I	Lepidoptera: Geometridae	NO2
Edwardsiana crataegi	I	Hemiptera: Cicadellidae	NO2
Edwardsiana flavescens	I	Hemiptera: Cicadellidae	NO2
Edwardsiana ishidai	I	Hemiptera: Cicadellidae	NO2
Elachista sp.	I	Lepidoptera: Elashistidae	NO2
Elcysma westwoodii	I	Lepidoptera: Zygaenidae	NO2
Elsinoë pyri	F	Ascomycota	NO3
Empoasca fabae	I	Hemiptera: Cicadellidae	NO2
Empoasca maligna	I	Hemiptera: Cicadellidae	NO2
Empoasca vitis	I	Hemiptera: Cicadellidae	NO2
Enaptorrhinus sinensis	I	Coleoptera: Curculionidae	NO2
Enarmonia formosana	I	Lepidoptera: Tortricidae	NO2
Encarsia citrina	I	Hymenoptera: Aphelinidae	NO3
Encarsia perniciosa	I	Hymenoptera: Aphelinidae	NO3
Endoclyta excrescens	I	Lepidoptera : Hepialidae	NO2
Endrosis sarcitrella	I	Lepidoptera: Oecophoridae	NO3
Ennomos autumnaria	I	Lepidoptera: Geometridae	NO2
Eoscarta assimilis	I	Hemiptera: Cercopidae	NO2
Eotetranychus carpini borealis	A	Acari: Tetranychidae	NO2
Eotetranychus pruni	A	Acarida: Tetranychidae	NO3
Eotetranychus sexmaculatus	A	Acarida: Tetranychidae	NO2
Eotetranychus uncatus	A	Acari: Tetranychidae	NO2
Ephestia elutella	I	Lepidoptera: Pyralidae	NO3
Epicaerus imbricatus	I	Coleoptera: Curculionidae	NO2
Epicnaptera ilicifolia	I	Lepidoptera: Lasiocampidae	NO2
Epicoccum granulatum	F	Ascomycota	NO2
Epicoccum purpurascens	F	Ascomycota	NO3
Epidiaspis leperii	I	Hemiptera: Diaspididae	NO3
Epilachna vigintioctomaculata	I	Coleoptera: Coccinellidae	NO2
Epiphyas postvittana	I	Lepidoptera: Tortricidae	NO3
Epirrita autumnata	I	Lepidoptera: Geometridae	NO2
Episomus kwanhsiensis	I	Coleoptera: Curculionidae	NO2
Epitetracnemus intersectus	I	Hymenoptera: Encyrtidae	NO5
Epyaxa rosearia	I	Lepidoptera: Geometridae	NO2

Species		Taxonomy	Reason
Erannis defoliaria	I		NO3
Erannis dira	I	Lepidoptera: Geometridae	NO2
Erannis golda	I	Lepidoptera: Geometridae	NO2
Ercheia umbrosa	I	Lepidoptera: Noctuidae	NO2
Eriococcus lagerstroemiae	I	Hemiptera: Eriococcidae	NO2
Eriococcus tokaedae	I	Hemiptera: Eriococcidae	NO2
Eriogyna pyretorum	I	Lepidoptera: Saturniidae	NO2
Eriophyes mali	A	Acarida: Eriophyidae	NO3
Eriophyes pseudoinsidiosus	A	Acarida: Eriophyidae	NO3
Eriophyes pyri	A	Acarida: Eriophyidae	NO3
Eriosoma lanigerum	I	Hemiptera: Aphididae	NO3
Ernobius mollis	I	Coleoptera: Anobiidae	NO2
Erthesina fullo	I	Hemiptera: Pentatomidae	NO2
Erwinia amylovora	B	Enterobacteriales: Enterobacteriaceae	NO1, NO3
Eryngiopus nelsonensis	A	Acari: Stigmaeidae	NO5
Erythroneura bigemina	I	Hemiptera: Cicadellidae	NO2
Eucetonia pilifera	I	Coleoptera: Scarabaeidae	NO4
Eucolaspis brunnea	I	Coleoptera: Chrysomelidae	NO2
Eudemis porphyrana	I	Lepidoptera: Tortricidae	NO2
Eudocima fullonia	I	Lepidoptera: Noctuidae	NO2
Eudonia lepatalea	I	Lepidoptera: Pyralidae	NO4
Eudonia paltomacha	I	Lepidoptera: Pyralidae	NO2
Eudonia psammitis	I	Lepidoptera: Pyralidae	NO2
Eulecanium alnicola	I	Hemiptera: Coccidae	NO2
Eulecanium cerasorum	I	Hemiptera: Coccidae	NO2
Eulecanium excrescens	I	Hemiptera: Coccidae	NO2
Eulecanium kunoense	I	Hemiptera: Coccidae	NO2
Eulecanium rugulosum	I	Hemiptera: Coccidae	NO2
Eulecanium tiliae	I	Hemiptera: Coccidae	NO3
Eupithecia insigniata	I	Lepidoptera: Geometridae	NO2
Euproctis atereta	I	Lepidoptera: Lymantriidae	NO2
Euproctis bimaculata	I	Lepidoptera: Lymantriidae	NO2
Euproctis chrysorrhoea	I	Lepidoptera: Lymantriidae	NO3
Euproctis flava	I	Lepidoptera: Lymantriidae	NO2
Euproctis flavinata	I	Lepidoptera: Lymantriidae	NO2
Euproctis flavotriangulata	I	Lepidoptera: Lymantriidae	NO2
Euproctis fraterna	I	Lepidoptera: Lymantriidae	NO2
Euproctis karghalica	I	Lepidoptera: Lymantriidae	NO2
Euproctis kurosawai	I	Lepidoptera: Lymantriidae	NO2
Euproctis piperita	I		NO2
Euproctis pulverea	I		NO2
Euproctis scintillans	I	Lepidoptera: Lymantriidae	NO2
Eupsenella sp.	I	Hymenoptera: Bethylidae	NO5
Eupsilia transversa	I	Lepidoptera: Noctuidae	NO2
Eupteromalus sp.	I	Hymenoptera: Pteromalidae	NO5
Euricania ocellus	I	Hemiptera: Ricaniidae	NO2
Eurydema gebleri	I	Hemiptera: Pentatomidae	NO2
Eurygaster integriceps	I	Hemiptera: Scutelleridae	NO2
Euryomma peregrimum	I	Diptera: Fanniidae	NO2
Eutelia geyeri	I	Lepidoptera: Noctuidae	NO2
Eutypa lata	F	Ascomycota	NO3
Eutypella prunastri	F	Ascomycota	NO2
Euxanthellus philippiae	I	Hymenoptera: Aphelinidae	NO5
Euxoa clerica	I	Lepidoptera: Noctuidae	NO2
Euzophera batangensis	I	Lepidoptera: Pyralidae	NO2
Euzophera bigella	I	Lepidoptera: Pyralidae	NO3
Euzophera pinguis	I	Lepidoptera: Pyralidae	NO3

Species		Taxonomy	Reason
Euzophera semifuneralis	I	Lepidoptera: Pyralidae	NO4
Evippe syrictis	I	Lepidoptera: Gelechiidae	NO2
Evotus naso	I	Coleoptera: Curculionidae	NO2
Eysarcoris ventralis	I	Hemiptera: Pentatomidae	NO2
Favonius yuasai	I	Lepidoptera: Lycaenidae	NO2
Fieberiella florii	I	Hemiptera: Cicadellidae	NO2
Fixsenia herzi	I	Lepidoptera: Lycaenidae	NO2
Fleutiauxia armata	I	Coleoptera: Chrysomelidae	NO2
Fomitopsis pinicola	F	Basidiomycota	NO3
Forficula auricularia	I	Dermaptera: Forficulidae	NO3
Frankliniella occidentalis	I	Thysanoptera: Thripidae	NO3
Frankliniella tritici	I	Thysanoptera: Thripidae	NO3
Fusarium camptoceras	F	Ascomycota	NO3
Fusarium culmorum	F	Ascomycota	NO3
Fusarium oxysporum	F	Ascomycota	NO2
Fusarium solani	F	Ascomycota	NO3
Fusarium trincinctum	F	Ascomycota	NO2
Fusicoccum pyrorum	F	Ascomycota	NO2
Galendromus occidentalis	A	Acari: Phytoseiidae	NO3, NO5
Gampsocleis buergeri	I	Orthoptera: Tettigoniidae	NO2
Gampsocleis ussuriensis	I	Orthoptera: Tettigoniidae	NO2
Gampsocoris pulchellus	I	Hemiptera: Berytidae	NO2
Gastropacha populifolia	I	Lepidoptera: Lasiocampidae	NO2
Gastropacha quercifolia	I	Lepidoptera: Lasiocapidae	NO2
Gastropacha tremulifolia	I	Lepidoptera: Lasiocampidae	NO2
Geastrumia polystigmatis	F	Ascomycota	NO3
Geisha distinctissima	I	Hemiptera: Flatidae	NO2
Gelechia rhombella	I	Lepidoptera: Gelechiidae	NO2
Geocoris proteus	I	Hemiptera: Lygaeidae	NO5
Geotomus pygmaeus	I	Hemiptera: Cydnidae	NO2
Geotrichum candidum	F	Ascomycota	NO3
Gergithus variabilis	I	Hemiptera: Issidae	NO2
Gibberella acuminata	F	Ascomycota	NO3
Gibberella avenacea	F	Ascomycota	NO3
Gibberella baccata	F	Ascomycota	NO3
Gibberella cyanea	F	Ascomycota	NO5
Gibberella fujikuroi	F	Ascomycota	NO3
Gibberella intricans	F	Ascomycota	NO3
Gibberella zeae	F	Ascomycota	NO3
Glabridorsum stokesii	I	Hymenoptera: Ichneumonidae	NO5
Gloeosporium sp.	F	Ascomycota	NO5
Glomerella acutata	F	Ascomycota	NO3
Glomerella cingulata	F	Ascomycota	NO3
Gluconobacter oxydans	B	Rhodospirillales: Acetobacteraceae	NO3
Goniozus sp.	I	Hymenoptera: Bethylidae	NO5
Gonipterus scutellatus	I	Coleoptera: Curculionidae	NO3, NO1
Gonocephalum recticolle	I	Coleoptera: Tenebrionidae	NO2
Gonocephalum reticulatum	I	Coleoptera: Tenebrionidae	NO2
Graphania lignana	I	Lepidoptera: Noctuidae	NO2
Graphania sp.	I	Lepidoptera: Noctuidae	NO2
Graphania ustistriga	I	Lepidoptera: Noctuidae	NO2
Graphiphora augur	I	Lepidoptera: Noctuidae	NO2
Grapholita molesta	I	Lepidoptera: Tortricidae	NO3
Graptopsaltria nigrofuscata	I	Hemiptera: Cicadidae	NO2
Gryllotalpa africana	I	Orthoptera: Gryllotalpidae	NO2

Species		Taxonomy	Reason
Gryllotalpa gryllotalpa	I		NO3
Gryllotalpa unispina	I	Orthoptera: Gryllotalpidae	NO2
Gryllus chinensis	I	Orthoptera: Gryllidae	NO2
Gymnetron pascuorum	I	Coleoptera: Curculionidae	NO4
Gymnobathra parca	I	Lepidoptera: Oecophoridae	NO2
Gymnosporangium asiaticum	F	Basidiomycota	NO1
Gymnosporangium clavipes	F	Basidiomycota	NO1
Gymnosporangium globosum	F	Basidiomycota	NO1
Gymnosporangium juniperi-virginianae	F	Basidiomycota	NO1
Gymnosporangium yamadae	F	Basidiomycota	NO1
Gypsonoma minutana	I	Lepidoptera: Tortricidae	NO2
Habrosyne pyritoides	I	Lepidoptera: Thyatiridae	NO2
Halmus chalybeus	I	Coleoptera: Coccinellidae	NO5
Halticus minutus	I	Hemiptera: Miridae	NO4
Halyomorpha halys	I	Hemiptera: Pentatomidae	NO3
Haplothrips chinensis	I	Thysanoptera: Phlaeothripidae	NO2
Haplothrips kurdjumovi	I	Thysanoptera: Phlaeothripidae	NO2
Haplothrips niger	I	Thysanoptera: Phlaeothripidae	NO2
Harmonia axyridis	I	Coleoptera: Coccinellidae	NO3
Harmonia conformis	I	Coleoptera: Carabidae	NO5
Hedya auricristana	I	Lepidoptera: Tortricidae	NO2
Hedya dimidioalba	I	Lepidoptera: Tortricidae	NO3
Hedya ignara	I	Lepidoptera: Tortricidae	NO2
Helastia corcularia	I	Lepidoptera: Geometridae	NO2
Helastia cryptica	I	Lepidoptera: Geometridae	NO2
Helicobasidium mompa	F	Basidiomycota	NO2
Helicotylenchus agricola	N	Hoplolaimidae	NO2
Helicotylenchus borinquensis	N	Meloidogynidae	NO2
Helicotylenchus dihystera	N	Tylenchida: Hoplolaimidae	NO3
Helicotylenchus labiatus	N	Tylenchida: Hopolaimidae	NO4
Helicoverpa armigera	I	Lepidoptera: Noctuidae	NO3
Heliothis dipsacea	I	Lepidoptera: Noctuidae	NO2
Heliothrips haemorrhoidalis	I	Thysanoptera: Thripidae	NO3
Hemerocampa leucostigma	I	Lepidoptera: Lymantriidae	NO2
Hemiberlesia lataniae	I	Hemiptera: Diaspididae	NO3
Hemiberlesia palmae	I	Hemiptera: Diaspididae	NO3
Hemiberlesia rapax	I	Hemiptera: Diaspididae	NO3
Hemisarcoptes coccophagus	A	Acari: Hemisarcoptidae	NO5
Hemithea aestivaria	I		NO2
Heptophylla picea	I	Coleoptera: Scarabaeidae	NO2
Heterocordylus flavipes	I		NO2
Heterocrasa expansalis	I	Lepidoptera: Pyralidae	NO2
Heterosporium maculatum	F	Ascomycota	NO2
Hishimonus sellatus	I	Hemiptera: Cicadellidae	NO2
Hofmannophila pseudospretella	I	Lepidoptera: Oecophoridae	NO4
Holcocerus arenicolus	I	Lepidoptera: Cossidae	NO2
Holcocerus insularis	I	Lepidoptera: Cossidae	NO4
Holcocerus vicarius	I	Lepidoptera: Cossidae	NO2
Holochlora japonica	I	Orthoptera: Tettigoniidae	NO2
Holochlora nawae	I	Orthoptera: Tettigoniidae	NO2

Species		Taxonomy	Reason
Holotrichia diomphalia	I	Coleoptera: Scarabaeidae	NO2
Holotrichia parallela	I	Coleoptera: Scarabaeidae	NO2
Holotrichia scrobiculata	I	Coleoptera: Scarabaeidae	NO2
Homona coffearia	I	Lepidoptera: Tortricidae	NO2
Homonopsis foederatana	I	Lepidoptera: Tortricidae	NO2
Homonopsis illotana	I	Lepidoptera: Tortricidae	NO2
Hop stunt viroid	V		NO3
Hoplistodera fergussoni	I	Hemiptera: Pentatomidae	NO2
Hoplocampa pyricola	I	Hymenoptera: Tenthredinidae	NO2
Hoplocampa testudinea	I	Hymenoptera: Tenthredinidae	NO3
Hoshinoa adumbratana	I	Lepidoptera: Tortricidae	NO2
Hoshinoa longicellana	I	Lepidoptera: Tortricidae	NO2
Hyalophora cecropia	I	Lepidoptera: Saturniidae	NO2
Hyalopterus pruni	I	Hemiptera: Aphididae	NO3
Hydrellia tritici	I	Diptera: Ephydridae	NO2
Hygraula nitens	I	Lepidoptera: Pyralidae	NO4
Hylastes ater	I	Coleoptera: Scolytidae	NO2
Hylesinus spp.	I	Coleoptera: Scolytidae	NO2
Hypena similalis	I	Lepidoptera: Noctuidae	NO2
Hyphantria cunea	I	Lepidoptera: Arctiidae	NO3
Hyphoderma litschaueri	F	Basidiomycota	NO2
Hypomeces squamosus	I	Coleoptera: Curculionidae	NO2
Hypomecis punctinalis	I		NO2
Hypomecis roboraria	I		NO2
Hypopyra vespertilio	I	Lepidoptera: Noctuidae	NO2
Hypsopygia regina	I	Lepidoptera: Pyralidae	NO2
Hysteropatella sp.	F	Ascomycota	NO5
Icerya aegyptiaca	I	Hemiptera: Margarodidae	NO2
Icerya formicarum	I	Hemiptera: Margarodidae	NO3
Icerya purchasi	I	Hemiptera: Margarodidae	NO3
Idiocerus populi	I	Hemiptera: Cicadellidae	NO2
Illiberis nigra	I	Lepidoptera: Zygaenidae	NO2
Illiberis pruni	I	Lepidoptera: Zygaenidae	NO2
Illiberis sinensis	I	Lepidoptera: Zygaenidae	NO2
Ilyonectria radicicola	F	Ascomycota	NO2
Inonotus hispidus	F	Basidiomycota	NO3
Iphiclides podalirius	I	Lepidoptera: Papilionidae	NO2
Iragoides fasciata	I	Lepidoptera: Limacodidae	NO2
Iragoides thaumasta	I	Lepidoptera: Limacodidae	NO2
Irenimus compressus	I	Coleoptera: Curculionidae	NO2
Ischnaspis longirostris	I		NO3
Ischyja manlia	I	Lepidoptera: Noctuidae	NO2
Ixeuticus martius	A	Araneida: Amaurobiidae	NO5
Janus piri	I	Hymenoptera: Cephidae	NO4
Jodis lactearia	I	Lepidoptera: Geometridae	NO2
Kalmusia coniothyrium	F	Ascomycota	NO3
Khuskia oryzae (X-spot)	F	Ascomycota	NO5
Kilifia acuminata	I		NO2
Lacanobia oleracea	I	Lepidoptera: Noctuidae	NO2
Lacanobia pisi	I	Lepidoptera: Noctuidae	NO2
Lacanobia suasa	I	Lepidoptera: Noctuidae	NO2
Lacanobia thalassina	I	Lepidoptera: Noctuidae	NO2
Lacon binodulus	I	Coleoptera: Elateridae	NO2
Lamprocabera candidaria	I	Lepidoptera: Geometridae	NO2
Lamprodila limbata	I	Coleoptera: Buprestidae	NO2
Langia zenzeroides	I	Lepidoptera: Sphingidae	NO2
Laprius varicornis	I	Hemiptera: Pentatomidae	NO2
Larerannis filipjevi	I	Lepidoptera: Geometridae	NO2

Species		Taxonomy	Reason
Ledra auditura	I	Hemiptera: Cicadellidae	NO2
Leguminivora glycinivorella	I	Lepidoptera: Tortricidae	NO4
Lelia decempunctata	I	Hemiptera: Pentatomidae	NO2
Lemyra imparilis	I	Lepidoptera: Arctiidae	NO2
Lepesoma nigrescens	I	Coleoptera: Curculionidae	NO2
Lepesoma tanneri	I	Coleoptera: Curculionidae	NO2
Lepidosaphes malicola	I	Hemiptera: Diaspididae	NO2
Lepidosaphes tubulorum	I	Hemiptera: Diaspididae	NO2
Lepidosaphes ulmi	I	Hemiptera: Diaspididae	NO3
Lepidosaphes ussuriensis	I	Hemiptera: Diaspididae	NO2
Leptobelus gazella	I	Hemiptera: Membracidae	NO2
Leptodontidium elatius [+ other causal fungi of sooty blotch and flyspeck (tab. p. 25)]	F	Ascomycota	NO5
Leptomias acutus	I	Coleoptera: Curculionidae	NO2
Leptomias longicollis	I	Coleoptera: Curculionidae	NO2
Leptomias longisetosus	I	Coleoptera: Curculionidae	NO2
Leptosphaeria coniothyrium	F	Ascomycota	NO3
Leptosphaeria mandshurica	F	Ascomycota	NO2
Leptosphaeria yulan	F	Ascomycota	NO2
Leptoypha capitata	I	Hemiptera: Tingidae	NO2
Leucoma candida	I	Lepidoptera: Lymantriidae	NO2
Leucoptera malifoliella	I	Lepidoptera: Lyonetiidae	NO3
Liberibacter europaeus	B	Proteobacteria: Alphaproteobacteria	NO3
Limothrips cerealium	I	Thysanoptera: Thripidae	NO3
Linda fraterna	I	Coleoptera: Cerambycidae	NO2
Lindingaspis rossi	I	Hemiptera: Diaspididae	NO3
Linoclostis gonatias	I	Lepidoptera: Xyloryctidae	NO4
Liothula omnivora	I	Lepidoptera: Psychidae	NO2
Liotryphon caudatus	I	Hymenoptera: Ichneumonidae	NO5
Listroderes difficilis	I	Coleoptera: Curculionidae	NO2
Listronotus bonariensis	I	Coleoptera: Curculionidae	NO1
Lithocolletis ringoniella	I	Lepidoptera: Gracillariidae	NO2
Lithophane antennata	I	Lepidoptera: Noctuidae	NO2
Lithophane socia	I	Lepidoptera: Noctuidae	NO2
Lithosia quadra	I	Lepidoptera: Arctiidae	NO2
Lixus obliquivittis	I	Coleoptera: Curculionidae	NO2
Lobesia botrana	I	Lepidoptera: Tortricidae	NO3
Lobophora halterata	I	Lepidoptera: Geometridae	NO2
Lochmaea capreae	I	Coleoptera: Chrysomelidae	NO2
Locusta migratoria	I	Orthoptera: Acrididae	NO2
Longidorus elongatus	N	Dorylaimida: Longidoridae	NO3
Longistigma xizangensis	I	Hemiptera: Aphididae	NO4
Longitarsus fuliginosus	I	Coleoptera: Chrysomelidae	NO2
Lopholeucaspis japonica	I	Hemiptera: Diaspididae	NO1, NO3
Loxoblemmus doenitzi	I	Orthoptera: Gryllidae	NO2
Loxostege sticticalis	I	Lepidoptera: Pyralidae	NO2
Lucanus maculifemoratus	I	Coleoptera: Lucanidae	NO2
Luperus cavicollis	I	Coleoptera: Chrysomelidae	NO2
Lycia hirtaria	I	Lepidoptera: Geometridae	NO2
Lycorma delicatula	I	Hemiptera: Fulgoridae	NO2
Lyctocoris campestris	I	Hemiptera: Anthocoridae	NO5
Lygus kalmi	I	Hemiptera: Miridae	NO2
Lygus kalmii	I	Hemiptera: Miridae	NO3
Lygus pratensis	I	Hemiptera: Miridae	NO2

Species		Taxonomy	Reason
Lymantria bantaizana	I	Lepidoptera: Lymantriidae	NO2
Lymantria concolor	I	Lepidoptera: Lymantriidae	NO2
Lymantria dispar	I	Lepidoptera: Lymantriidae	NO3
Lymantria marginata	I	Lepidoptera: Lymantriidae	NO2
Lymantria mathura	I	Lepidoptera: Lymantriidae	NO2
Lymantria monacha	I		NO3
Lyonetia clerkella	I		NO2
Lyonetia prunifoliella	I	Lepidoptera: Lyonetiidae	NO3
Lypesthes ater	I	Coleoptera: Chrysomelidae	NO2
Lypesthes basalis	I	Coleoptera: Chrysomelidae	NO2
Machaerotypus mali	I	Hemiptera: Membracidae	NO2
Macromphalia ancilla	I	Lepidoptera: Lasiocampidae	NO2
Macrophthalmothrips argus	I	Thysanoptera: Phlaeothripidae	NO2
Macrosiphum euphorbiae	I	Hemiptera: Aphididae	NO3
Macrosiphum rosae	I	Hemiptera: Aphididae	NO3
Macrothylacia rubi	I		NO3
Magdalis aenescens	I	Coleoptera: Curculionidae	NO2
Magdalis gracilis	I	Coleoptera: Curculionidae	NO2
Mahasena aurea	I	Lepidoptera: Psychidae	NO2
Mahasena hakingi	I	Lepidoptera: Psychidae	NO2
Mahasena minuscula	I	Lepidoptera: Psychidae	NO2
Mahasena nitobei	I	Lepidoptera: Psychidae	NO2
Mahasena yuna	I	Lepidoptera: Psychidae	NO2
Maireina marginata	F	Basidiomycota	NO2
Malacosoma americanum	I	Lepidoptera: Lasiocampidae	NO2
Malacosoma dentata	I	Lepidoptera: Lasiocampidae	NO2
Malacosoma disstria	I	Lepidoptera: Lasiocampidae	NO2
Malacosoma neustria	I	Lepidoptera: Lasiocampidae	NO3
Malacosoma parallela	I	Lepidoptera: Lasiocampidae	NO2
Maladera japonica	I		NO2
Maladera orientalis	I	Coleoptera: Scarabaeidae	NO2
Malaxioides grandicornis	I	Coleoptera: Chrysomelidae	NO2
Mamestra brassicae	I		NO3
Marumba goschkewitschii	I	Lepidoptera: Sphingidae	NO2
Marumba jankowskii	I	Lepidoptera: Sphingidae	NO2
Maurya rotundidenticula	I	Hemiptera: Membracidae	NO2
Maxates illiturata	I	Lepidoptera: Geometridae	NO2
Megacopta punctatissimum	I	Hemiptera: Plataspidae	NO4
Megaplatypus mutatus	I	Coleoptera: Platypodidae	NO3
Megopis sinica	I	Coleoptera: Cerambycidae	NO2
Melanchra persicariae	I	Lepidoptera: Noctuidae	NO2
Melangyna novaezealandiae	I	Diptera: Syrphidae	NO5
Melanostoma fasciatum	I	Diptera: Syrphidae	NO5
Melanotus caudex	I	Coleoptera: Elateridae	NO2
Melanotus legatus	I	Coleoptera: Elateridae	NO2
Meloidogyne arenaria	N	Tylenchida: Meloidogynidae	NO3
Meloidogyne hapla	N	Tylenchida: Meloidogynidae	NO3
Meloidogyne incognita	N	Tylenchida: Meloidogynidae	NO3
Meloidogyne javanica	N	Tylenchida: Meloidogynidae	NO3
Meloidogyne mali	N	Tylenchida: Meloidogynidae	NO4
Melolontha hippocastani	I	Coleoptera: Scarabaeidae	NO2
Melolontha japonica	I	Coleoptera: Scarabaeidae	NO2
Melolontha melolontha	I	Coleoptera: Scarabaeidae	NO3
Menida formosa	I	Hemiptera: Pentatomidae	NO2
Menophra atrilineata	I	Lepidoptera: Geometridae	NO2
Meristata spilota	I	Coleoptera: Chrysomelidae	NO2
Meristoides oberthuri	I	Coleoptera: Chrysomelidae	NO2

Species		Taxonomy	Reason
Merothrips brunneus	I	Thysanoptera: Merothripidae	NO2
Mesosa myops	I	Coleoptera: Cerambycidae	NO2
Metabolus flavescens	I	Coleoptera: Scarabaeidae	NO2
Metaceronema japonica	I	Hemiptera: Coccidae	NO2
Metaphycus claviger	I	Hymenoptera: Encyrtidae	NO5
Metcalfa pruinosa	I	Hemiptera: Flatidae	NO3
Meteorus pulchricornis	I	Hymenoptera: Braconidae	NO3
Metriona thais	I	Coleoptera: Chrysomelidae	NO2
Micrambina rutila	I	Coleoptera: Cryptophagidae	NO2
Microdiplodia sp.	F	Ascomycota	NO5
Microleon longipalpis	I	Lepidoptera: Limacodidae	NO2
Micromus tasmaniae	I	Neuroptera: Memerobiidae	NO5
Mimastra cyanura	I	Coleoptera: Chrysomelidae	NO2
Mimastra grahami	I	Coleoptera: Chrysomelidae	NO2
Mimastra limbata	I	Coleoptera: Chrysomelidae	NO2
Mimerastria mandschuriana	I	Lepidoptera: Noctuidae	NO2
Miresa flavidorsalis	I	Lepidoptera: Limacodidae	NO2
Miresa inornata	I	Lepidoptera: Limacodidae	NO2
Mitrastethus baridioides	I	Coleoptera: Curculionidae	NO2
Mocis ancilla	I	Lepidoptera: Noctuidae	NO2
Mocis annetta	I	Lepidoptera: Noctuidae	NO2
Mocis undata	I	Lepidoptera: Noctuidae	NO2
Monema flavescens	I	Lepidoptera: Heterogeneidae	NO2
Monilia polystroma	F	Ascomycota	NO3
Monilinia fructicola	F	Ascomycota	NO1, NO3
Monilinia fructigena	F	Ascomycota	NO3
Monilinia laxa	F	Ascomycota	NO3
Monilinia laxa f.sp. mali	F	Ascomycota	NO1
Monilinia laxa f.sp. *mali*	F	Ascomycota	NO3
Monodictys melanopa	F	Ascomycota	NO2
Monomorium antarcticum	I	Hymenoptera: Formicidae	NO2
Mucor mucedo	F	Zygomycota	NO3
Mucor piriformis	F	Zygomycota	NO3
Mucor racemosus	F	Zygomycota	NO3
Mycelia sterilia	F	Ascomycota	NO3
Mycetophila spp.	I	Diptera: Mycetophilidae	NO5
Mycosphaerella pyri	F	Ascomycota	NO3
Mylabris calida	I	Coleoptera: Meloidae	NO2
Mylabris cichorii	I	Coleoptera: Meloidae	NO2
Myllocerus pallipes	I	Coleoptera: Curculionidae	NO2
Mynoglenes sp.	A	Araneida: Linyphiidae	NO5
Mythimna separata	I	Lepidoptera: Noctuidae	NO2
Mytilaspis conchiformis	I	Hemiptera: Diaspididae	NO2
Myzus persicae	I	Hemiptera: Aphididae	NO3
Nabis kinbergii	I	Hemiptera: Nabidae	NO5
Naenia contaminata	I	Lepidoptera: Noctuidae	NO2
Napocheima robiniae	I	Lepidoptera: Geometridae	NO2
Naratettix zonatus	I	Hemiptera: Cicadellidae	NO2
Narosa corusca	I	Lepidoptera: Limacodidae	NO2
Narosa edoensis	I	Lepidoptera: Limacodidae	NO2
Narosa nigrisigna	I	Lepidoptera: Limacodidae	NO2
Narosoideus flavidorsalis	I	Lepidoptera: Limacodidae	NO2
Narosoideus fuscicostalis	I	Lepidoptera: Limacodidae	NO2
Narosoideus vulpinus	I	Lepidoptera: Limacodidae	NO2
Naupactus leucoloma	I	Coleoptera: Curculionidae	NO1
Naupactus xanthographus	I	Coleoptera: Curculionidae	NO4
Navomorpha sulcatus	I	Coleoptera: Cerambycidae	NO2

Species		Taxonomy	Reason
Nectria cinnabarina	F	Ascomycota	NO3
Nectria coccinea	F	Ascomycota	NO2, NO3
Nectria discophora	F	Ascomycota	NO2
Nectria sanguinea	F	Ascomycota	NO2
Nectriella versoniana	F	Ascomycota	NO3
Neocrepidodera obscuritarsis	I	Coleoptera: Chrysomelidae	NO2
Neofabraea alba	F	Ascomycota	NO3
Neofabraea corticola	F	Ascomycota	NO2
Neofabraea malicorticis	F	Ascomycota	NO3
Neofabraea perennans	F	Ascomycota	NO3
Neonectria ditissima	F	Ascomycota	NO3
Neopheosia fasciata	I	Lepidoptera: Notodontidae	NO2
Neoris haraldi	I	Lepidoptera: Saturniidae	NO2
Neoscytalidium dimidiatum	F	Ascomycota	NO3
Neoseiulus cucumeris	A	Acarida: Phytoseiidae	NO3
Neoseiulus fallacis	A	Acari: Phytosiidae	NO5
Neoseiulus womersleyi	A	Acari: Phytosiidae	NO5
Neoterius mystax	I	Coleoptera: Bostrichidae	NO4
Neotituria kongosana	I	Hemiptera: Cicadellidae	NO2
Neozephyrus taxila	I	Lepidoptera: Lycaenidae	NO2
Nephotettix cincticeps	I	Hemiptera: Cicadellidae	NO2
Nesothrips propinquus	I	Thysanoptera: Phlaeothripidae	NO2
Nezara viridula	I	Hemiptera: Pentatomidae	NO3
Nipaecoccus aurilanatus	I	Hemiptera: Pseudococcidae	NO2
Nippolachnus pyri	I	Hemiptera: Aphididae	NO2
Nolathripa lactaria	I	Lepidoptera: Noctuidae	NO2
Nomadacris japonica	I	Orthoptera: Acrididae	NO2
Nonarthra postfasciata	I	Coleoptera: Chrysomelidae	NO2
Notocelia rosaecolana	I		NO2
Numonia pyrivorella	I	Lepidoptera: Pyralidae	NO1
Nychiodes obscuraria	I	Lepidoptera: Geometridae	NO2
Nysius huttoni	I	Hemiptera: Lygaeidae	NO2
Nysius plebejus	I	Hemiptera: Lygaeidae	NO2
Oberea japonica	I	Coleoptera: Cerambycidae	NO2
Ochropsora ariae	F	Basidiomycota	NO2
Odezia atrata	I	Lepidoptera: Geometridae	NO2
Odites issikii	I	Lepidoptera: Lecithoceridae	NO2
Odites leucostola	I	Lepidoptera: Lecithoceridae	NO2
Odites lividula	I	Lepidoptera: Lecithoceridae	NO2
Odites malivora	I	Lepidoptera: Gelechiidae	NO2
Odites ricinella	I	Lepidoptera: Gelechiidae	NO2
Odonestis laeta	I	Lepidoptera: Lasiocampidae	NO2
Odonestis pruni	I	Lepidoptera: Lasiocampidae	NO2
Odontotermes formosanus	I	Isoptera: Termitidae	NO2
Oecanthus longicauda	I	Orthoptera: Gryllidae	NO2
Oechalia schellenbergii	I	Hemiptera: Pentatomidae	NO5
Oemona hirta	I	Coleoptera: Cerambycidae	NO2
Oides decempunctata	I	Coleoptera: Chrysomelidae	NO2
Olethreutes mori	I	Lepidoptera: Tortricidae	NO2
Oligonychus biharensis	A	Acarida: Tetranychidae	NO2
Oligonychus yothersi	A	Acarida: Tetranychidae	NO2
Omias saccatus	I	Coleoptera: Curculionidae	NO2
Oncopsis mali	I	Hemiptera: Cicadellidae	NO2
Oncotympana maculaticollis	I	Hemiptera: Cicadidae	NO2
Opatrum subaratum	I	Coleoptera: Tenebrionidae	NO2

Species		Taxonomy	Reason
Operophtera brumata	I	Lepidoptera: Geometridae	NO3
Operophtera fagata	I	Lepidoptera: Geometridae	NO2
Operophtera rectipostmediana	I	Lepidoptera: Geometridae	NO2
Operophtera relegata	I	Lepidoptera: Geometridae	NO2
Ophiusa tirhaca	I	Lepidoptera: Noctuidae	NO2
Ophryastes cinerascens	I	Coleoptera: Curculionidae	NO2
Ophryastes geminatus	I	Coleoptera: Curculionidae	NO2
Opodiphthera eucalypti	I	Lepidoptera: Saturniidae	NO2
Opogona omoscopa	I	Lepidoptera: Tineidae	NO4
Oraesia excavata	I	Lepidoptera: Noctuidae	NO2
Orgyia antiqua	I	Lepidoptera: Lymantriidae	NO3
Orgyia ericae	I	Lepidoptera: Lymantriidae	NO2
Orgyia postica	I	Lepidoptera: Lymantriidae	NO2
Orgyia recens	I	Lepidoptera: Lymantriidae	NO3
Orgyia thyellina	I	Lepidoptera: Lymantriidae	NO2
Oribatid mites	A	Acari: Oribatidae	NO5
Orientus ishidae	I	Hemiptera: Cicadellidae	NO3
Orientus ishidai	I		NO2
Orius vicinus	I	Hemiptera: Anthocoridae	NO5
Orocrambus spp.	I	Lepidoptera: Pyralidae	NO5
Orthosia angustipennis	I	Lepidoptera: Noctuidae	NO2
Orthosia carnipennis	I	Lepidoptera: Noctuidae	NO2
Orthosia cerasi	I	Lepidoptera: Noctuidae	NO3
Orthosia cruda	I	Lepidoptera: Noctuidae	NO2
Orthosia ella	I	Lepidoptera: Noctuidae	NO2
Orthosia evanida	I	Lepidoptera: Noctuidae	NO2
Orthosia gothica	I	Lepidoptera: Noctuidae	NO2
Orthosia gracilis	I	Lepidoptera: Noctuidae	NO2
Orthosia hibisci	I	Lepidoptera: Noctuidae	NO2
Orthosia ijimai	I	Lepidoptera: Noctuidae	NO2
Orthosia incerta	I	Lepidoptera: Noctuidae	NO2
Orthosia limbata	I	Lepidoptera: Noctuidae	NO2
Orthosia lizetta	I	Lepidoptera: Noctuidae	NO2
Orthosia munda	I	Lepidoptera: Noctuidae	NO2
Orthosia odiosa	I	Lepidoptera: Noctuidae	NO2
Orthosia paromoea	I	Lepidoptera: Noctuidae	NO2
Orthotydeus californicus	A	Acari: Tydeidae	NO3
Orthotylus marginalis	I		NO3
Orygia antiqua	I	Lepidoptera: Lymantriidae	NO3
Ostrinia nubilalis	I	Lepidoptera: Pyralidae	NO3
Otiorhynchus cribricollis	I	Coleoptera: Curculionidae	NO3
Otiorhynchus ligustici	I	Coleoptera: Curculionidae	NO2
Otiorhynchus meridionalis	I	Coleoptera: Curculionidae	NO3
Otiorhynchus ovatus	I	Coleoptera: Curculionidae	NO2
Otiorhynchus raucus	I	Coleoptera: Curculionidae	NO2
Otiorhynchus singularis	I	Coleoptera: Curculionidae	NO2
Otiorhynchus sulcatus	I	Coleoptera: Curculionidae	NO2
Otthia spiraeae	F	Ascomycota	NO2
Ovalisia bellula	I	Coleoptera: Buprestidae	NO4
Ovatus crataegarius	I	Hemiptera: Aphididae	NO3
Ovatus malisuctus	I	Hemiptera: Aphididae	NO2
Oxya chinensis	I	Orthoptera: Acrididae	NO2
Oxya shanghaiensis	I	Orthoptera: Acrididae	NO2
Oxya velox	I	Orthoptera: Acrididae	NO2
Oxycetonia jucunda	I	Coleoptera: Scarabaeidae	NO2
Pachybrachius inornatus	I	Hemiptera: Lygaeidae	NO2
Pales feredayi	I	Diptera: Tachinidae	NO5
Pales funesta	I	Diptera: Tachinidae	NO2

Species		Taxonomy	Reason
Palimna liturata	I	Coleoptera: Cerambycidae	NO2
Pammene rhediella	I	Lepidoptera: Tortricidae	NO3
Pandemis cerasana	I	Lepidoptera: Tortricidae	NO3
Pandemis chlorograpta	I	Lepidoptera: Tortricidae	NO2
Pandemis chondrillana	I	Lepidoptera: Tortricidae	NO2
Pandemis cinnamomeana	I		NO2
Pandemis corylana	I	Lepidoptera: Tortricidae	NO2
Pandemis dumetana	I	Lepidoptera: Tortricidae	NO2
Pandemis heparana	I	Lepidoptera: Tortricidae	NO3
Pandemis lamprosana	I	Lepidoptera: Tortricidae	NO2
Pandemis limitata	I	Lepidoptera: Tortricidae	NO2
Pangrapta obscurata	I	Lepidoptera: Noctuidae	NO2
Panonychus citri	A	Acari: Tetranychidae	NO2
Panonychus ulmi	A	Acarida: Tetranychidae	NO3
Panscopus aequalis	I	Coleoptera: Curculionidae	NO2
Pantaleon dorsalis	I	Hemiptera: Membracidae	NO2
Pantomorus cervinus	I	Coleoptera: Curculionidae	NO3
Parabaliothrips grandiceps	I	Thysanoptera: Thripidae	NO2
Paracercopis assimilis	I	Hemiptera: Cercopidae	NO2
Paracoccus glaucus	I	Hemiptera: Pseudococcidae	NO2
Paraconiothyrium sp.	F	Ascomycota	NO5
Paraconiothyrium variabile	F	Ascomycota	NO2
Paracycnotrachelus longiceps	I	Coleoptera: Curculionidae	NO2
Paralebeda plagifera	I	Lepidoptera: Lasiocampidae	NO2
Parallelia maturata	I	Lepidoptera: Noctuidae	NO2
Paranerice hoenei	I	Lepidoptera: Notodontidae	NO2
Paranthrene regalis	I	Lepidoptera: Sesiidae	NO4
Parapleurus alliaceus	I	Orthoptera: Gryllidae	NO2
Paraptochus sellatus	I	Coleoptera: Curculionidae	NO2
Parasa consocia	I	Lepidoptera: Limacodidae	NO2
Parasa hilarata	I	Lepidoptera: Limacodidae	NO2
Parasa lepida	I	Lepidoptera: Limacodidae	NO2
Parasa ostia	I	Lepidoptera: Limacodidae	NO2
Parasa pastoralis	I	Lepidoptera: Limacodidae	NO2
Parasa pseudorepanda	I	Lepidoptera: Limacodidae	NO2
Parasa sinica	I	Lepidoptera: Limacodidae	NO2
Parasaissetia nigra	I	Hemiptera: Coccidae	NO3
Paratrachelophorus longicornis	I	Coleoptera: Curculionidae	NO2
Paratrichodorus minor	N	Dorylaimida: Trichodoridae	NO2
Parlatoria cinerea	I	Hemiptera: Diaspididae	NO3
Parlatoria desolator	I	Hemiptera: Diaspididae	NO4
Parlatoria oleae	I	Hemiptera: Diaspididae	NO3
Parlatoria pergandii	I	Hemiptera: Diaspididae	NO3
Parlatoria proteus	I	Hemiptera: Diaspididae	NO3
Parlatoria theae	I	Hemiptera: Diaspididae	NO2
Parthenolecanium corni	I	Hemiptera: Coccidae	NO3
Parthenolecanium glandi	I	Hemiptera: Coccidae	NO2
Parthenolecanium persicae	I	Hemiptera: Coccidae	NO3
Pasiphila rectangulata	I	Lepidoptera: Geometridae	NO3
Passalora sp.	F	Ascomycota	NO5
Patanga japonica	I	Orthoptera: Acrididae	NO2
Pear blister canker viroid	V		NO3
Peltaster sp.	F	Ascomycota	NO5
Penicillium aurantiogriseum	F	Ascomycota	NO3
Penicillium expansum	F	Ascomycota	NO3

Species		Taxonomy	Reason
Penicillium griseofulvum	F	Ascomycota	NO3
Pentatoma rufipes	I	Hemiptera: Pentatomidae	NO2
Pentatoma semiannulata	I	Hemiptera: Pentatomidae	NO2
Penthimia nitida	I	Hemiptera: Cicadellidae	NO2
Percnia giraffata	I	Lepidoptera: Geometridae	NO2
Peridroma saucia	I	Lepidoptera: Noctuidae	NO2
Pestalotia concentrica	F	Ascomycota	NO2
Pestalotia hartigii	F	Ascomycota	NO3
Pestalotiopsis maculans	F	Ascomycota	NO3
Petrobia latens	A	Acarida	NO3
Pezicula pruinosa	F	Ascomycota	NO2
Phacidiopycnis washingtonensis	F	Ascomycota	NO3
Phalera bucephala	I	Lepidoptera: Notodontidae	NO2
Phalera flavescens	I	Lepidoptera: Noctuidae	NO2
Phanerochaete sacrata	F	Basidiomycota	NO2
Phassus xizangensis	I	Lepidoptera: Hepialidae	NO4
Phellinus igniarius	F	Basidiomycota	NO3
Phenacoccus aceris	I	Hemiptera: Pseudococcidae	NO3
Phenacoccus graminicola	I	Hemiptera: Pseudococcidae	NO3
Phenacoccus pergandei	I	Hemiptera: Pseudococcidae	NO2
Phigalia sinuosaria	I	Lepidoptera: Geometridae	NO2
Philaenus spumarius	I	Hemiptera: Cercopidae	NO3
Philudoria albomaculata	I	Lepidoptera: Lasiocampidae	NO2
Phlossa conjuncta	I	Lepidoptera: Limacodidae	NO2
Phoma bismarckii	F	Ascomycota	NO2
Phoma cava	F	Ascomycota	NO3
Phoma exigua	F	Ascomycota	NO3
Phoma fuliginea	F	Ascomycota	NO2
Phoma glomerata	F	Ascomycota	NO3
Phoma macrostoma	F	Ascomycota	NO3
Phoma pomorum	F	Ascomycota	NO3
Phomopsis sp.	F	Ascomycota	NO5
Phomopsis truncicola	F	Ascomycota	NO2
Phorodon canabis	I	Hemiptera: Aphididae	NO2
Phraortes illepidus	I	Phasmatodea: Bacteriidae	NO2
Phrissogonus laticostatus	I	Lepidoptera: Geometridae	NO4
Phrixolepia sericea	I	Lepidoptera: Limacodidae	NO2
Phthonesema tendinosaria	I	Lepidoptera: Geometridae	NO2
Phthorimaea operculella	I	Lepidoptera: Gelechiidae	NO3
Phyllachora pomigena	F	Ascomycota	NO3
Phyllacteophaga froggatti	I	Hymenoptera: Pergidae	NO2
Phyllactinia guttata	F	Ascomycota	NO2
Phyllactinia mali	F	Ascomycota	NO3
Phyllobius armatus	I	Coleoptera: Curculionidae	NO2
Phyllobius longicornis	I	Coleoptera: Curculionidae	NO2
Phyllobius oblongus	I	Coleoptera: Curculionidae	NO2
Phyllobius pruni	I	Coleoptera: Curculionidae	NO2
Phyllobrotica ornata	I	Coleoptera: Chrysomelidae	NO2
Phyllodesma tremulifolia	I	Lepidoptera: Lasiocampidae	NO3
Phyllodesma tremulifolium	I	Lepidoptera: Lasiocampidae	NO2
Phyllonorycter blancardella	I	Lepidoptera: Gracillariidae	NO3
Phyllonorycter crataegella	I	Lepidoptera: Gracillariidae	NO2
Phyllonorycter crataegella	I	Lepidoptera: Gracillariidae	NO2
Phyllonorycter elmaella	I	Lepidoptera: Gracillariidae	NO2
Phyllonorycter malivorella	I	Lepidoptera: Gracillariidae	NO2
Phyllonorycter	I	Lepidoptera: Gracillariidae	NO3

Species		Taxonomy	Reason
messaniella			
Phyllopertha horticola	I	Coleoptera: Scarabaeidae	NO2
Phyllosticta clypeata	F	Ascomycota	NO2
Phyllosticta solitaria	F	Ascomycota	NO1
Phylloxera sp.	I	Hemiptera: Phylloxeridae	NO5
Phymatodes albofasciatus	I	Coleoptera: Cerambycidae	NO2
Phymatotrichopsis omnivora	F	Ascomycota	NO1
Physopelta cincticollis	I	Hemiptera: Largidae	NO2
Phytophthora cactorum	C	Heterokonta: Oomycota	NO3
Phytophthora cambivora	C	Heterokonta: Oomycota	NO3
Phytophthora citricola	C	Heterokonta: Oomycota	NO2
Phytophthora cryptogea	C	Heterokonta: Oomycota	NO3
Phytophthora drechsleri	C	Heterokonta: Oomycota	NO3
Phytophthora gonapodyides	C	Heterokonta: Oomycota	NO2
Phytophthora megasperma	C	Heterokonta: Oomycota	NO3
Phytophthora syringae	C	Heterokonta: Oomycota	NO2
Phytoplasma asteris	B	Tenericutes: Acholeplasmatales	NO3
Phytoplasma aurantifolia	B	Phytoplasma	NO3
Phytoplasma mali	B	Tenericutes: Acholeplasmatales	NO1, NO3
Phytoplasma pyri	B	Phytoplasma	NO3
Phytoscaphus gossypii	I	Coleoptera: Curculionidae	NO2
Plagiodera cupreata	I	Coleoptera: Chrysomelidae	NO2
Planococcus citri	I	Hemiptera: Pseudococcidae	NO3
Platycorynus plebejus	I	Coleoptera: Chrysomelidae	NO2
Platygaster demades	I	Hymenoptera: Platygasteridae	NO3, NO5
Platymycteropsis ignarus	I	Coleoptera: Curculionidae	NO2
Platynota stultana	I	Lepidoptera: Tortricidae	NO3
Platypleura kaempferi	I	Hemiptera: Cicadidae	NO2
Plenodomus sp.	F	Ascomycota	NO5
Pleonomus canaliculatus	I	Coleoptera: Elateridae	NO2
Pleospora herbarum	F	Ascomycota	NO3
Plinthisus spp.	I	Hemiptera: Lygaeidae	NO5
Ploiaria antipoda	I	Hemiptera: Reduviidae	NO2
Plutella xylostella	I	Lepidoptera: Yponomeutidae	NO3
Podosphaera clandestina	F	Ascomycota	NO3
Podosphaera leucotricha	F	Ascomycota	NO3
Podosphaera pannosa	F	Ascomycota	NO3
Poecilocampa populi	I	Lepidoptera: Lasiocampidae	NO2
Poecilopachys australasia	A	Araneida: Araneidae	NO5
Polistes olivaceus	I	Hymenoptera: Vespidae	NO2
Polydrusus impressifrons	I	Coleoptera: Curculionidae	NO2
Polyphylla decemlineata	I	Coleoptera: Scarabaeidae	NO2
Polyporus arcularius	F	Basidiomycota	NO3
Popillia japonica	I	Coleoptera: Scarabaeidae	NO1
Porthesia xanthocampa	I	Lepidoptera: Lymantriidae	NO2
Pratylenchus coffeae	N	Tylenchida: Pratylenchidae	NO3
Pratylenchus crenatus	N	Tylenchida: Pratylenchidae	NO3
Pratylenchus loosi	N		NO3
Pratylenchus neglectus	N	Tylenchida: Pratylenchidae	NO3
Pratylenchus penetrans	N	Tylenchida: Pratylenchidae	NO3
Pratylenchus pratensis	N	Tylenchida: Pratylenchidae	NO3
Pratylenchus scribneri	N	Tylenchida: Pratylenchidae	NO2
Pratylenchus vulnus	N	Tylenchida: Pratylenchidae	NO3
Prionus imbricornis	I	Coleoptera: Cerambycidae	NO2

Species		Taxonomy	Reason
Prionus insularis	I	Coleoptera: Cerambycidae	NO2
Prionus laticollis	I	Coleoptera: Cerambycidae	NO2
Proagopertha lucidula	I	Coleoptera: Scarabaeidae	NO2
Prociphilus aurus	I	Hemiptera: Pemphigidae	NO2
Prociphilus crataegicola	I	Hemiptera: Aphididae	NO2
Prociphilus kuwanai	I	Hemiptera: Aphididae	NO2
Prociphilus oriens	I	Hemiptera: Aphididae	NO2
Procris pruni	I	Lepidoptera: Zygaenidae	NO2
Protaetia brevitarsis	I	Coleoptera: Scarabaeidae	NO2
Protalcis concinnata	I	Lepidoptera: Geometridae	NO2
Prunus necrotic ringspot virus	V	Bromoviridae: Ilarvirus	NO3
Psalidoremus inclinatus	I	Coleoptera: Lucanidae	NO4
Pseudaulacaspis pentagona	I	Hemiptera: Diaspididae	NO3
Pseudexentera mali	I	Lepidoptera: Tortricidae	NO2
Pseudoaulacaspis	I	Hemiptera: Diaspididae	NO3
Pseudocercospora mali	F	Ascomycota	NO2
Pseudocercosporella sp.	F	Ascomycota	NO5
Pseudocneorhinus bifasciatus	I	Coleoptera: Curculionidae	NO2
Pseudococcus aceris	I	Hemiptera: Pseudococcidae	NO3
Pseudococcus calceolariae	I	Hemiptera: Pseudococcidae	NO3
Pseudococcus comstocki	I	Hemiptera: Pseudococcidae	NO3
Pseudococcus longispinus	I	Hemiptera: Pseudococcidae	NO3
Pseudococcus viburni	I	Hemiptera: Pseudococcidae	NO3
Pseudocoremia suavis	I	Lepidoptera: Geometridae	NO4
Pseudomonas cichorii	B	Pseudomonadales: Pseudomonadaceae	NO3
Pseudomonas syringae	B	Pseudomonadaceae	NO3
Pseudomonas syringae pv. *papulans*	B	Pseudomonadaceae	NO3
Pseudomonas syringae pv. *syringae*	B	Pseudomonadaceae	NO3
Pseudomonas viridiflava	B		NO3
Pseudosciaphila branderiana	I	Lepidoptera: Tortricidae	NO2
Psoricoptera gibbosella	I	Lepidoptera: Gelechiidae	NO2
Psylla mali	I	Hemiptera: Psyllidae	NO2
Psylla malivorella	I	Hemiptera: Psyllidae	NO2
Pterochloroides persicae	I		NO3
Ptilodon capucina	I	Lepidoptera: Notodontidae	NO2
Ptinus tectus	I	Coleoptera: Anobiidae	NO2
Ptycholoma lecheana	I		NO2
Pulvinaria horii	I		NO2
Pylargosceles steganioides	I	Lepidoptera: Geometridae	NO2
Pyramidotettix mali	I	Hemiptera: Cicadellidae	NO2
Pyramidotettix minuta	I	Hemiptera: Cicadellidae	NO2
Pyrolachnus pyri	I	Hemiptera: Aphididae	NO2
Pyronota festiva	I	Coleoptera: Scarabaeidae	NO2
Pyrrhalta semifulva	I	Coleoptera: Chrysomelidae	NO2
Pythium arrhenomanes	C	Heterokonta: Oomycota	NO3
Pythium debaryanum	C	Heterokonta: Oomycota	NO3
Pythium echinulatum	C	Heterokonta: Oomycota	NO5
Pythium irregulare	C	Heterokonta: Oomycota	NO3
Pythium paroecandrum	C	Heterokonta: Oomycota	NO4
Pythium rostratum	C	Heterokonta: Oomycota	NO3
Pythium ultimum	C	Heterokonta: Oomycota	NO3
Pythium vexans	C	Heterokonta: Oomycota	NO3

Species		Taxonomy	Reason
Quadraspidiotus forbesi	I	Hemiptera: Diaspididae	NO4
Quadraspidiotus ostreaeformis	I	Hemiptera: Diaspididae	NO3
Quadraspidiotus perniciosus	I	Hemiptera: Diaspididae	NO3
Ramularia eucalypti	F	Ascomycota	NO3
Ramularia magnusiana	F	Ascomycota	NO2
Ramularia sp.	F	Ascomycota	NO5
Recurvaria nanella	I	Lepidoptera: Gelechiidae	NO3
Recurvaria syrictis	I	Lepidoptera: Gelechiidae	NO2
Reticulitermes speratus	I	Isoptera: Rhinotermitidae	NO2
Rhagoletis indifferens	I	Diptera: Tephritidae	NO1
Rhagoletis pomonella	I	Diptera: Tephritidae	NO1
Rhamphus pulicarius	I		NO2
Rhaphigaster nebulosa	I	Hemiptera: Pentatomidae	NO2
Rhinocladiella sp.	F	Ascomycota	NO5
Rhinocyllus conicus	I	Coleoptera: Curculionidae	NO2
Rhizopus stolonifer	F	Zygomycota	NO3
Rhodococcus sariuoni	I	Hemiptera: Coccidae	NO2
Rhodococcus turanicus	I	Hemiptera: Coccidae	NO2
Rhomborrhina unicolor	I	Coleoptera: Scarabaeidae	NO2
Rhopalosiphum insertum	I	Hemiptera: Aphididae	NO3
Rhopalosiphum padi	I	Hemiptera: Aphididae	NO3
Rhopalus maculatus	I	Hemiptera: Rhopalidae	NO2
Rhopobota unipunctana	I	Lepidoptera: Tortricidae	NO2
Rhopobota ustomaculana	I	Lepidoptera: Tortricidae	NO2
Rhynchites auratus	I	Coleoptera: Attelabidae	NO3
Rhynchites auricapillus	I	Coleoptera: Curculionidae	NO2
Rhynchites bacchus	I	Coleoptera: Curculionidae	NO3
Rhynchites giganteus	I	Coleoptera: Curculionidae	NO3
Rhyncholaba acteus	I	Lepidoptera: Sphingidae	NO2
Rhypodes clavicornis	I	Hemiptera: Lygaeidae	NO2
Rhypodes serricatus	I	Hemiptera: Lygaeidae	NO2
Rhyzobius ventralis	I	Coleoptera: Coccinellidae	NO5
Ricania japonica	I	Hemiptera: Ricaniidae	NO2
Ricania simulans	I	Hemiptera: Ricaniidae	NO2
Ricania speculum	I	Hemiptera: Ricaniidae	NO2
Riptortus pedestris	I	Hemiptera: Alydidae	NO2
Rosellinia necatrix	F	Ascomycota	NO3
Rubiconia intermedia	I	Hemiptera: Pentatomidae	NO2
Rynchaenus pallicornis	I	Coleoptera: Curculionidae	NO2
Saissetia citricola	I	Hemiptera: Coccidae	NO4
Saissetia oleae	I	Hemiptera: Coccidae	NO3
Salurnis marginella	I	Hemiptera: Flatidae	NO2
Saperda candida	I	Coleoptera: Cerambycidae	NO3
Sarcinodes carnearia	I	Lepidoptera: Geometridae	NO2
Saturnia pavonia	I	Lepidoptera: Saturniidae	NO3
Saturnia pyri	I	Lepidoptera: Saturniidae	NO3
Satyrium grandis	I	Lepidoptera: Lycaenidae	NO2
Satyrium percomis	I	Lepidoptera: Lycaenidae	NO2
Satyrium v-album	I	Lepidoptera: Lycaenidae	NO2
Scardamia aurantiacaria	I	Lepidoptera: Geometridae	NO2
Scepticus insularis	I	Coleoptera: Curculionidae	NO2
Scepticus tigrinus	I	Coleoptera: Curculionidae	NO2
Schizophyllum commune	F	Basidiomycota	NO3
Sciopithes obscurus	I	Coleoptera: Curculionidae	NO2
Sclerotinia sclerotiorum	F	Ascomycota	NO3
Scoliopteryx libatrix	I	Lepidoptera: Noctuidae	NO3
Scolytoplatypus mikado	I	Coleoptera: Curculionidae	NO2

Species		Taxonomy	Reason
Scolytus aratus	I	Coleoptera: Curculionidae	NO2
Scolytus rugulosus	I	Coleoptera: Curculionidae	NO3
Scoparia spp.	I	Lepidoptera: Pyralidae	NO2
Scopodes fossulatus	I	Coleoptera: Carabidae	NO2
Scopula nigropunctata	I	Lepidoptera: Geometridae	NO2
Scopula rubraria	I	Lepidoptera: Geometridae	NO2
Scopula subpunctaria	I	Lepidoptera: Geometridae	NO2
Scythropus yasumatsui	I	Coleoptera: Curculionidae	NO2
Scytinostroma galactinum	F	Basidiomycota	NO2
Sejanus albisignatus	I	Hemiptera: Miridae	NO2
Selenaspidus articulatus	I	Hemiptera: Diaspididae	NO4
Selenia tetralunaria	I	Lepidoptera: Geometridae	NO2
Septobasidium bogoriense	F	Basidiomycota	NO2
Septoria sp.	F	Ascomycota	NO5
Setora postornata	I	Lepidoptera: Limacodidae	NO2
several Wood decay fungi of pome fruit (*Armillaria, Chondrostereum, Schizophyllum, Stereum, Trametes* spp.)	F	Basidiomycota	NO2
Siciunguis decima	I	Hemiptera: Aphididae	NO2
Sigmothrips aotearoana	I	Thysanoptera: Thripidae	NO2
Signiphora merceti	I	Hymenoptera: Signiphoridae	NO3
Sinna extrema	I	Lepidoptera: Noctuidae	NO2
Siphanta acuta	I	Hemiptera: Flatidae	NO2
Siphoninus phillyreae	I	Hemiptera: Aleyrodidae	NO3
Siphonius	I	Hemiptera: Aleyrodidae	NO3
Sitona californius	I	Coleoptera: Curculionidae	NO2
Sitona discoideus	I	Coleoptera: Curculionidae	NO3
Sitophilus oryzae	I	Coleoptera: Curculionidae	NO3
Sivaloka damnosus	I	Hemiptera: Issidae	NO2
Smaragdina semiaurantiaca	I	Coleoptera: Chrysomelidae	NO2
Smerinthus ocellatus	I	Lepidoptera: Sphingidae	NO3
Smerinthus planus	I	Lepidoptera: Sphingidae	NO2
Solus drepanoides	I	Lepidoptera: Saturniidae	NO2
Soritia pulchella	I	Lepidoptera: Zygaenidae	NO2
Sparganothis pilleriana	I	Lepidoptera: Tortricidae	NO2
Spatalistis christophana	I	Lepidoptera: Tortricidae	NO2
Sphaerolecanium prunastri	I	Hemiptera: Coccidae	NO2
Sphinx ligustri	I	Lepidoptera: Sphingidae	NO2
Sphrageidus similis	I	Lepidoptera: Lymantriidae	NO2
Spilarctia infernalis	I	Lepidoptera: Arctiidae	NO2
Spilarctia seriatopunctata	I	Lepidoptera: Arctiidae	NO2
Spilonota lechriaspis	I	Lepidoptera: Tortricidae	NO2
Spilonota ocellana	I	Lepidoptera: Tortricidae	NO3
Spilosoma imparilis	I	Lepidoptera: Arctiidae	NO2
Spilosoma inaequalis	I	Lepidoptera: Arctiidae	NO2
Spilosoma lubricipedum	I	Lepidoptera: Arctiidae	NO2
Spilosoma niveus	I	Lepidoptera: Arctiidae	NO2
Spirama helicina	I	Lepidoptera: Noctuidae	NO2
Spodoptera frugiperda	I	Lepidoptera: Noctuidae	NO1, NO3? (under eradication)
Spodoptera littoralis	I	Lepidoptera: Noctuidae	NO1, NO3
Spodoptera litura	I	Lepidoptera: Noctuidae	NO1
Sporocadus lichenicola	F	Ascomycota	NO2

Species		Taxonomy	Reason
Sporormia sp.	F	Ascomycota	NO5
Stachybotrys albipes	F	Ascomycota	NO2
Staphylinidae indet	I	Coleoptera: Staphylinidae	NO5
Stathmopoda auriferella	I	Lepidoptera: Stathmopodidae	NO2
Stauropus fagi	I		NO2
Stelidota geminata	I	Coleoptera: Nitidulidae	NO3
Stelorrhinus chinensis	I	Coleoptera: Curculionidae	NO2
Stenella sp.	F	Ascomycota	NO5
Stephanitis ambigua	I	Hemiptera: Tingidae	NO2
Stephanitis nashi	I	Hemiptera: Tingidae	NO2
Stephanitis pyri	I	Hemiptera: Tingidae	NO3
Stethorus bifidus	I	Coleoptera: Coccinellidae	NO5
Stethorus histrio	I	Coleoptera: Coccinellidae	NO5
Stomiopeltis spp.	F	Ascomycota	NO5
Strepsicrates macropetana	I	Lepidoptera: Tortricidae	NO2
Strymonidia w-album	I	Lepidoptera: Lycaenidae	NO2
Suana divisa	I	Lepidoptera: Lasiocampidae	NO2
Sucra jujuba	I	Lepidoptera: Geometridae	NO2
Swammerdamia pyrella	I	Lepidoptera: Yponomeutidae	NO3
Syllepte derogata	I	Lepidoptera: Pyralidae	NO2
Symmetrischema plaesiosema	I	Lepidoptera: Gelechiidae	NO2
Sympiesis sp.	I	Hymenoptera: Eulophidae	NO5
Sympiezomias velatus	I	Coleoptera: Curculionidae	NO2
Synanthedon haitangvora	I	Lepidoptera: Sesiidae	NO2
Synanthedon hector	I	Lepidoptera: Sesiidae	NO2
Synanthedon myopaeformis	I	Lepidoptera: Sesiidae	NO3
Synanthedon pyri	I	Lepidoptera: Sesiidae	NO4
Synanthedon scitula	I	Lepidoptera: Sesiidae	NO4
Synanthedon unocingulata	I	Lepidoptera: Sesiidae	NO2
Syndemis musculana	I	Lepidoptera: Tortricidae	NO2
Sypnoides picta	I	Lepidoptera: Noctuidae	NO2
Sypnoides simplex	I	Lepidoptera: Noctuidae	NO2
Syrphidae (hoverflies)	I	Diptera: Syrphidae	NO5
Tachystola acroxantha	I	Lepidoptera: Oecophoridae	NO2
Taeniothrips inconsequens	I	Thysanoptera: Thripidae	NO3
Takahashia japonica	I	Hemiptera: Coccidae	NO2
Tanymecus circumdatus	I	Coleoptera: Curculionidae	NO2
Tanymecus urbanus	I	Coleoptera: Curculionidae	NO2
Taphrina bullata	F	Ascomycota	NO2
Tarsonemus confusus	A	Acarida: Tarsonemidae	NO2
Taxonus glabratus	I	Hymenoptera: Tenthredinidae	NO3
Teleogryllus mitratus	I	Orthoptera: Gryllidae	NO2
Teleogryllus testaceus	I	Orthoptera: Gryllidae	NO2
Telorta divergens	I	Lepidoptera: Noctuidae	NO2
Telorta edentata	I	Lepidoptera: Noctuidae	NO2
Telphusa chloroderces	I	Lepidoptera: Gelechiidae	NO2
Tenuipalpus aberrans	A	Acari: Tenuipalpidae	NO2
Tessaratoma quadrata	I	Hemiptera: Pentatomidae	NO2
Tetracnemoidea peregrina	I	Hymenoptera: Encyrtidae	NO3
Tetracnemoidea sydneyensis	I	Hymenoptera: Encyrtidae	NO5
Tetranychus canadensis	A	Acarida: Tetranychidae	NO2
Tetranychus cinnabarinus	A	Acarida: Tetranychidae	NO3
Tetranychus kanzawai	A	Acarida: Tetranychidae	NO2
Tetranychus lambi	A	Acarida: Tetranychidae	NO2

Species		Taxonomy	Reason
Tetranychus ludeni	A	Acari: Tetranychidae	NO3
Tetranychus mcdanieli	A	Acarida: Tetranychidae	NO3
Tetranychus neocaledonicus	A	Acarida: Tetranychidae	NO2
Tetranychus pacificus	A	Acarida: Tetranychidae	NO2
Tetranychus turkestani	A	Acarida: Tetranychidae	NO3
Tetranychus urticae	A	Acarida: Tetranychidae	NO3
Tetranychus viennensis	A	Acarida: Tetranychidae	NO3
Tettigades chilensis	I	Hemiptera: Cicadidae	NO2
Tettigella ferruginea	I	Hemiptera: Cicadellidae	NO2
Thanatephorus cucumeris	F	Basidiomycota	NO3
Thanatopsyche chilensis	I	Lepidoptera: Psychidae	NO2
Thaumatotibia leucotreta	I	Lepidoptera: Tortricidae	NO4
Theocolax formiciformis	I	Hymenoptera: Pteromalidae	NO3
Theretra latreillii	I	Lepidoptera: Sphingidae	NO2
Therioaphis trifolii	I	Hemiptera: Aphididae	NO3
Thosea baibarana	I	Lepidoptera: Limacodidae	NO2
Thosea sinensis	I	Lepidoptera: Limacodidae	NO2
Thrips australis	I	Thysanoptera: Thripidae	NO3
Thrips flavidulus	I	Thysanoptera: Thripidae	NO2
Thrips flavus	I	Thysanoptera: Thripidae	NO3
Thrips hawaiiensis	I	Thysanoptera: Thripidae	NO3
Thrips obscuratus	I	Thysanoptera: Thripidae	NO2
Thrips tabaci	I	Thysanoptera: Thripidae	NO3
Thyatira batis	I	Lepidoptera: Thyatiridae	NO2
Tineola bisselliciata	I	Lepidoptera: Tineidae	NO3
Tingena spp.	I	Lepidoptera: Oecophoridae	NO5
Tiracola plagiata	I	Lepidoptera: Noctuidae	NO2
Tischeria malifoliella	I	Lepidoptera: Tischeriidae	NO2
Tobacco mosaic virus	V		NO3
Tobacco necrosis virus	V	Tombusviridae: Necrovirus	NO3
Tobacco ringspot virus	V	Secoviridae: Nepovirus	NO1, NO3
Tomato ringspot virus	V	Secoviridae: Nepovirus	NO1, NO3
Tortrix sinapina	I	Lepidoptera: Tortricidae	NO2
Torymus varians	I	Hymenoptera: Torymidae	NO3
Toxoptera citricidus	I	Hemiptera: Aphididae	NO3
Trabala vishnou	I	Lepidoptera: Lasiocampidae	NO2
Trachea atriplicis	I	Lepidoptera: Noctuidae	NO2
Trachea auriplena	I	Lepidoptera: Noctuidae	NO2
Trametes ochracea	F	Basidiomycota	NO3
Trametes pubescens	F	Basidiomycota	NO2
Trametes versicolor	F	Basidiomycota	NO3
Trichoderma sp.	F	Ascomycota	NO5
Trichodorus viruliferus	N	Dorylaimida: Trichodoridae	NO3
Trichoferus campestris	I	Coleoptera: Cerambycidae	NO3
Trichogramma funiculatum	I	Hymenoptera: Trichogrammatidae	NO5
Trichogrammanza funiculatum	I	Hymenoptera: Trichogrammatidae	NO5
Trichogrammatoidea bactrae	I	Hymenoptera: Trichogrammatidae	NO5
Tricholochmaea semifulva	I	Coleoptera: Chrysomelidae	NO2
Trichosporum sp.	F	Basidiomycota	NO2
Trichothecium roseum	F	Ascomycota	NO3
Trigonospila brevifacies	I	Diptera: Tachinidae	NO5
Trimmatostroma sp.	F	Ascomycota	NO5
Triphosa dubitata	I	Lepidoptera: Geometridae	NO2
Trissolcus basalis	I	Hymenoptera: Scelionidae	NO3, NO5

Species		Taxonomy	Reason
Trite spp.	A	Araneida: Salticidae	NO5
Tsunozemia mojiensis	I	Hemiptera: Membracidae	NO2
Tuberocephalus momonis	I	Hemiptera: Aphididae	NO2
Tuberolachnus salignus	I	Hemiptera: Aphididae	NO3
Tuckerellid mites	A	Acari: Tuckerellidae	NO2
Tulare apple mosaic virus	V	Bromoviridae: Ilarvirus	NO5
Tychius picirostris	I	Coleoptera: Curculionidae	NO2
Typhlocyba pomaria	I	Hemiptera: Cicadellidae	NO2
Typhlocyba rosae	I	Hemiptera: Cicadellidae	NO3
Typhlodromus khosrovensis	A	Acarida: Phytoseiidae	NO2
Typhlodromus perlongisetus	A	Acarida: Phytoseiidae	NO2, NO5
Typhlodromus pyri	A	Acarida: Phytoseiidae	NO3
Tyroglyphid mites	A	Acarida: Acaridae	NO5
Uclesiella irregularis	I	Diptera: Tachinidae	NO4
Ulocladium consortiale	F	Ascomycota	NO2
Vallonia excentrica	G	Gastropoda: Valloniidae	NO3
Valsa ambiens	F	Ascomycota	NO2
Valsa ceratosperma	F	Ascomycota	NO3
Valsa cincta	F	Ascomycota	NO3
Valsa leucostoma	F	Ascomycota	NO2
Valsa malicola	F	Ascomycota	NO3
Valsa papyriferae	F	Ascomycota	NO2
Valsella melastoma	F	Ascomycota	NO2
Venturia asperata	F	Ascomycota	NO3
Venturia carpophila	F	Ascomycota	NO3
Venturia inaequalis	F	Ascomycota	NO3
Venturia pyrina	F	Ascomycota	NO3
Verticillium dahliae	F	Ascomycota	NO3
Vespa crabro	I		NO2
Vespa mandarina	I	Hymenoptera: Vespidae	NO2
Vespula germanica	I	Hymenoptera: Vespoidea	NO3
Viminia rumicis	I		NO2
Wallemia sebi	F	Basidiomycota	NO5
Wilemania nitobei	I	Anamorphic Wallemiales	NO2
Wilemanus bidentatus	I	Lepidoptera: Notodontidae	NO2
Xanthocryptus novozelandicus	I	Hymenoptera: Ichneumonidae	NO5
Xanthopimpla rhopaloceros	I	Hymenoptera: Ichneumonidae	NO5
Xenostigmina sp.	F	Ascomycota	NO5
Xerophloea viridis	I	Hemiptera: Cicadellidae	NO2
Xestia c-nigrum	I		NO2

Species		Taxonomy	Reason
Xestia formosa	I	Lepidoptera: Noctuidae	NO2
Xestia fumosa	I	Lepidoptera: Noctuidae	NO2
Xiphinema americanum	N	Dorylaimida: Longidoridae	NO1
Xiphinema diversicaudatum	N	Dorylaimida: Longidoridae	NO3
Xiphinema index	N		NO3
Xiphinema rivesi	N	Dorylaimida: Longidoridae	NO3
Xiphinema vuittenezi	N	Dorylaimida: Longidoridae	NO3
Xylaplothrips fuliginosus	I	Thysanoptera: Phlaeothripidae	NO3
Xylaria mali	F	Ascomycota	NO2
Xyleborinus saxeseni	I	Coleoptera: Scolytidae	NO3
Xyleborus adumbratus	I		NO2
Xyleborus dispar	I	Coleoptera: Curculionidae	NO3
Xylena exsoleta	I	Lepidoptera: Noctuidae	NO2
Xylena formosa	I	Lepidoptera: Noctuidae	NO2
Xylena fumosa	I	Lepidoptera: Noctuidae	NO2
Xylena vetusta	I	Lepidoptera: Noctuidae	NO2
Xylinophorus mongolicus	I	Coleoptera: Curculionidae	NO2
Xylosandrus crassiusculus	I	Coleoptera: Scolytidae	NO3
Xylosandrus germanus	I		NO3
Xyloteles laetus	I	Coleoptera: Cerambycidae	NO2
Xylotrechus chinensis	I	Coleoptera: Cerambycidae	NO2
Xylotrechus namanganensis	I	Coleoptera: Cerambycidae	NO2
Xylotrupes gideon	I	Coleoptera: Scarabaeidae	NO2
Yala pyricola	I	Lepidoptera: Geometridae	NO2
Yemma signatus	I	Hemiptera: Berytidae	NO2
Yponomeuta evonymellus	I	Lepidoptera: Yponomeutidae	NO2
Yponomeuta malinellus	I	Lepidoptera: Yponomeutidae	NO3
Yponomeuta padella	I	Lepidoptera: Yponomeutidae	NO2
Yponomeuta polystictus	I	Lepidoptera: Yponomeutidae	NO2
Zamacra excavate	I	Lepidoptera: Geometridae	NO2
Zethenia albonotaria	I	Lepidoptera: Geometridae	NO2
Zetiasplozna thuemenii	F	Ascomycota	NO3
Zetzellia subreticulata	A	Acarida: Stigmaeidae	NO2
Zeuzera coffeae	I	Lepidoptera: Cossidae	NO2
Zeuzera leuconotum	I	Lepidoptera: Cossidae	NO2
Zeuzera multistrigata	I	Lepidoptera: Cossidae	NO4
Zeuzera pyrina	I	Lepidoptera: Cossidae	NO3

ANNEX 4. List of pests remaining for consideration for the Alert List at step 2

This list includes all pests retained for consideration.

Alert List pests are in bold

Type of pests: A = Arachnida, I = Insecta, F = Fungi, V = Viruses and Virus-like organisms

Species	Type	Taxonomy
Acrobasis tokiella	I	Lepidoptera: Pyralidae
Acrosternum hilare	I	Hemiptera: Pentatomidae
Adoxophyes cyrtosema	I	Lepidoptera: Tortricidae
Adris tyrannus	I	Lepidoptera: Noctuidae
Aegorhinus phaleratus	I	Coleoptera: Curculionidae
Aegorhinus superciliosus	I	Coleoptera: Curculionidae
Agrotis tokionis	I	Lepidoptera: Noctuidae
Alternaria malorum	F	Ascomycota
Alternaria pomicola	F	Ascomycota
Amsacta lactinea	I	Lepidoptera: Arctiidae
Anomala heydeni	I	Coleoptera: Scarabaeidae
Anomala mongolica	I	Coleoptera: Scarabaeidae
Anomala octiescostata	I	Coleoptera: Scarabaeidae
Anomala plagiicollis	I	Coleoptera: Scarabaeidae
Anomala rufithorax	I	Coleoptera: Scarabaeidae
Anomala sauteri	I	Coleoptera: Scarabaeidae
Anomala sinica	I	Coleoptera: Scarabaeidae
Anomis commoda	I	Lepidoptera: Noctuidae
Anomis fulvida	I	Lepidoptera: Noctuidae
Anomis mesogona	I	Lepidoptera: Noctuidae
Apple green mottle virus	V	unknown
Apple McIntosh depression agent	V?	unknown
Archips argyrospilus	I	Lepidoptera: Tortricidae
Archips asiaticus	I	Lepidoptera: Tortricidae
Archips breviplicanus	I	Lepidoptera: Tortricidae
Archips endoi	I	Lepidoptera: Tortricidae
Archips fuscocupreanus	I	Lepidoptera: Tortricidae
Archips ingentanus	I	Lepidoptera: Tortricidae
Archips micaceana	I	Lepidoptera: Tortricidae
Archips nigricaudanus	I	Lepidoptera: Tortricidae
Archips philippa	I	Lepidoptera: Tortricidae
Archips pomivora	I	Lepidoptera: Tortricidae
Argyresthia assimilis	I	Lepidoptera: Yponomeutidae
Argyrotaenia citrana	I	Lepidoptera: Tortricidae
Argyrotaenia pomililiana	I	Lepidoptera: Tortricidae
Argyrotaenia sphaleropa	I	Lepidoptera: Tortricidae
Argyrotaenia velutinana	I	Lepidoptera: Tortricidae
Aspergillus clavatus	F	Ascomycota
Boisea rubrolineata	I	Hemiptera: Aphididae
Bonagota cranaodes	I	Lepidoptera: Tortricidae
Brahmina intermedia	I	Coleoptera: Scarabaeidae

Species	Type	Taxonomy
Brevipalpus chilensis	A	Acarida: Tenuipalpidae
Cahara jugatoria	I	Hemiptera: Pentatomidae
Calguia defiguralis	I	Lepidoptera: Pyralidae
Caligula jonasii	I	Lepidoptera: Saturniidae
Calyptra gruesa	I	Lepidoptera: Noctuidae
Capua semiferana	I	Lepidoptera: Tortricidae
Carpophilus davidsoni	I	Coleoptera: Nitidulidae
Carpophilus gaveni	I	Coleoptera: Nitidulidae
Cephalosporium carpogenum	F	Ascomycota
Cerogria popularis	I	Coleoptera: Tenebrionidae
Ceroplastes rubens	I	Hemiptera: Coccidae
Chrysorithrum amata	I	Lepidoptera: Noctuidae
Cletus punctiger	I	Hemiptera: Coreidae
Cletus trigonus	I	Hemiptera: Coreidae
Cnephasia jactanata	I	Lepidoptera: Tortricidae
Colletotrichum fructicola	F	Ascomycota
Colletotrichum karstii	F	Ascomycota
Conistra albipuncta	I	Lepidoptera: Noctuidae
Conistra grisescens	I	Lepidoptera: Noctuidae
Coprinopsis psychromorbida	F	Basidiomycota
Coptosoma punctatissimum	I	Hemiptera: Plataspidae
Cristulariella moricola	F	Ascomycota
Ctenopseustis herana	I	Lepidoptera: Tortricidae
Ctenopseustis obliquana	I	Lepidoptera: Tortricidae
Dalpada smaragdina	I	Hemiptera: Pentatomidae
Diabrotica speciosa	I	Coleoptera: Chrysomelidae
Diaspidiotus ancylus	I	Hemiptera: Diaspididae
Dichocrocis punctiferalis	I	Lepidoptera: Crambidae
Dictyotus caenosus	I	Hemiptera: Pentatomidae
Dissoconium mali	F	Ascomycota
Dissoconium multiseptatae	F	Ascomycota
Ellisembia asterinum	F	Ascomycota
Ergania doriae	I	Coleoptera: Curculionidae
Ericerus pela	I	Hemiptera: Coccidae
Erythricium salmonicolor	F	Basidiomycota
Eudocima salaminia	I	Lepidoptera: Noctuidae
Eurhodope hollandella	I	Lepidoptera: Pyralidae
Euschistus conspersus	I	Hemiptera: Pentatomidae
Euschistus servus	I	Hemiptera: Pentatomidae
Euschistus tristigmus	I	Hemiptera: Pentatomidae
Eusthenes cupreus	I	Hemiptera: Pentatomidae
Euzophera pyriella	I	Lepidoptera: Pyralidae

Species	Type	Taxonomy
Frankliniella australis	I	Thysanoptera: Thripidae
Geniocremmus chilensis	I	Coleoptera: Curculionidae
Glaucias subpunctatus	I	Hemiptera: Pentatomidae
Gonzalezinus squamosus	I	Hemiptera: Miridae
Graphania mutans	I	Lepidoptera: Noctuidae
Greeneria uvicola	I	Ascomycota
Gymnosporangium libocedri	F	Basidiomycota
Gymnosporangium nelsoni	F	Basidiomycota
Halyomorpha picus	I	Hemiptera: Pentatomidae
Helminthosporium papulosum	F	Ascomycota
Heterocordylus malinus	I	Hemiptera: Miridae
Holotrichia aequabilis	I	Coleoptera: Scarabaeidae
Holotrichia cochinchina	I	Coleoptera: Scarabaeidae
Holotrichia kiotoensis	I	Coleoptera: Scarabaeidae
Holotrichia kunmina	I	Coleoptera: Scarabaeidae
Holotrichia lata	I	Coleoptera: Scarabaeidae
Holotrichia maxima	I	Coleoptera: Scarabaeidae
Holotrichia pilipyga	I	Coleoptera: Scarabaeidae
Holotrichia titanis	I	Coleoptera: Scarabaeidae
Holotrichia trichophora	I	Coleoptera: Scarabaeidae
Homalogonia obtusa	I	Hemiptera: Pentatomidae
Homoeocerus unipunctatus	I	Hemiptera: Coreidae
Homona magnanima	I	Lepidoptera: Tortricidae
Hoplosternus japonicus	I	Coleoptera: Scarabaeidae
Hoplosternus nepalensis	I	Coleoptera: Scarabaeidae
Hyboma adauctum	I	Lepidoptera: Noctuidae
Hypocala subsatura	I	Lepidoptera: Noctuidae
Inurois fletcheri	I	Lepidoptera: Geometridae
Inurois tenuis	I	Lepidoptera: Geometridae
Lacanobia subjuncta	I	Lepidoptera: Noctuidae
Lagoptera juno	I	Lepidoptera: Noctuidae
Leptoglossus chilensis	I	Hemiptera: Coreidae
Leptoglossus phyllopus	I	Hemiptera: Coreidae
Leucania stenographa	I	Lepidoptera: Noctuidae
Lygidea mendax	I	Hemiptera: Miridae
Lygocoris communis	I	Hemiptera: Miridae
Lygocoris lucorum	I	Hemiptera: Miridae
Lygus elisus	I	Hemiptera: Miridae
Lygus hesperus	I	Hemiptera: Miridae
Lygus lineolaris	I	Hemiptera: Miridae
Macrodactylus subspinosus	I	Coleoptera: Scarabaeidae
Maruca vitrata	I	Lepidoptera: Pyralidae
Melanchra picta	I	Lepidoptera: Noctuidae
Melolontha furcicauda	I	Coleoptera: Scarabaeidae
Menida violacea	I	Hemiptera: Pentatomidae

Species	Type	Taxonomy
Mesolecanium nigrofasciatum	I	Hemiptera: Coccidae
Mycosphaerella pomacearum	F	Ascomycota
Mycosphaerella pomi	F	Ascomycota
Neocoenorrhinus assimilis	I	Coleoptera: Rhynchitidae
Nezara antennata	I	Hemiptera: Pentatomidae
Notagonum submetallicum	I	Coleoptera: Carabidae
Oiketicus platensis	I	Lepidoptera: Psychidae
Oospora otophila	F	Ascomycota
Ophiusa coronata	I	Lepidoptera: Noctuidae
Oraesia emarginata	I	Lepidoptera: Noctuidae
Ostrinia furnacalis	I	Lepidoptera: Pyralidae
Otthia amica	F	Ascomycota
Palomena angulosa	I	Hemiptera: Pentatomidae
Pandemis pyrusana	I	Lepidoptera: Tortricidae
Paracentrocorynus nigricollis	I	Coleoptera: Attelabidae
Parlatoria pittospori	I	Hemiptera: Diaspididae
Parlatoria yanyuanensis	I	Hemiptera: Diaspididae
Peltaster fructicola	F	Ascomycota
Pempelia heringii	I	Lepidoptera: Pyralidae
Penicillium verrucosum	F	Ascomycota
Pentatoma japonica	I	Hemiptera: Pentatomidae
Peribleptus foveatus	I	Coleoptera: Curculionidae
Pestalotia breviseta	F	Ascomycota
Pestalotia disseminata	F	Ascomycota
Phaeosclerotinia nipponica	F	Ascomycota
Phlyctinus callosus	I	Coleoptera: Curculionidae
Phyllopertha diversa	I	Coleoptera: Scarabaeidae
Piazomias validus	I	Coleoptera: Curculionidae
Planococcus mali	I	Hemiptera: Pseudococcidae
Planotortrix octo	I	Lepidoptera: Tortricidae
Plateumeta aurea	I	Lepidoptera: Psychidae
Platynota flavedana	I	Lepidoptera: Tortricidae
Platynota idaeusalis	I	Lepidoptera: Tortricidae
Plautia stali	I	Hemiptera: Pentatomidae
Poecilophilides rusticola	I	Coleoptera: Scarabaeidae
Ponticulothrips diospyrosi	I	Thysanoptera: Phlaeothripidae
Popillia quadriguttata	I	Coleoptera: Scarabaeidae
Potebniamyces pyri	F	Ascomycota
Potosia aerata	I	Coleoptera: Scarabaeidae
Potosia famelica	I	Coleoptera: Scarabaeidae
Potosia marginicollis	I	Coleoptera: Scarabaeidae
Potosia speculifera	I	Coleoptera: Scarabaeidae
Proeulia auraria	I	Lepidoptera: Tortricidae
Proeulia chrysopteris	I	Lepidoptera: Tortricidae
Pseudanthonomus crataegi	I	Coleoptera: Curculionidae

Species	Type	Taxonomy
Pseudaonidia duplex	I	Hemiptera: Diaspididae
Pseudococcus citriculus	I	Hemiptera: Pseudococcidae
Pseudococcus maritimus	I	Hemiptera: Pseudococcidae
Ptycholoma imitator	I	Lepidoptera: Tortricidae
Pyrgotis plagiatana	I	Lepidoptera: Tortricidae
Rapala arata	I	Lepidoptera: Lycaenidae
Rapala nissa	I	Lepidoptera: Lycaenidae
Retithrips syriacus	I	Thysanoptera: Thripidae
Rhadopterus picipes	I	Coleoptera: Chrysomelidae
Rhomborrhina fulvopilosa	I	Coleoptera: Scarabaeidae
Rhomborrhina opalina	I	Coleoptera: Scarabaeidae
Rhynchites heros	I	Coleoptera: Attelabidae
Rhynchocoris humeralis	I	Hemiptera: Pentatomidae
Rhynchocoris nigridens	I	Hemiptera: Pentatomidae
Riptortus clavatus	I	Hemiptera: Alydidae
Roestelia fenzeliana	F	Basidiomycota
Sarcopolia illoba	I	Lepidoptera: Noctuidae
Sastragala scutellata	I	Hemiptera: Acanthosomatidae
Schizothyrium pomi	F	Ascomycota
Scolypopa australis	I	Hemiptera: Ricaniidae
Seiridium unicorne	F	Ascomycota
Septobasidium tanakae	F	Basidiomycota
Sericania fuscolineata	I	Coleoptera: Scarabaeidae
Serrodes campana	I	Lepidoptera: Noctuidae
Sidnia kinbergi	I	Hemiptera: Miridae
Simplicia niphona	I	Lepidoptera: Noctuidae
Sparganothis sulfureana	I	Lepidoptera: Tortricidae
Sphaeropsis pyriputrescens	F	Ascomycota
Spilococcus pacificus	I	Hemiptera: Coccidae
Spilonota albicana	I	Lepidoptera: Tortricidae
Spilonota prognathana	I	Lepidoptera: Tortricidae
Spirama retorta	I	Lepidoptera: Noctuidae
Stathmopoda horticola	I	Lepidoptera: Oecophoridae
Stathmopoda plumbiflua	I	Lepidoptera: Oecophoridae
Stemphylium congestum	F	Ascomycota
Stemphylium graminis	F	Ascomycota
Stenozygum speciosum	I	Hemiptera: Pentatomidae
Strangaliodes mutuarius	I	Coleoptera: Curculionidae
Strelitziana mali	F	Ascomycota
Sympiezomias lewisi	I	Coleoptera: Curculionidae
Teia anartoides	I	Lepidoptera: Lymantriidae
Tenuipalpus taonicus	A	Acarida: Tenuipalpidae
Tetranychus desertorum	A	Acarida: Tetranychidae
Tetranychus truncatus	A	Acarida: Tetranychidae
Thrips imaginis	I	Thysanoptera: Thripidae
Tortrix excessana	I	Lepidoptera: Tortricidae
Toxoptera odinae	I	Hemiptera: Aphididae
Trigonophorus saundersi	I	Coleoptera: Scarabaeidae
Trigonophorus xizangensis	I	Coleoptera: Scarabaeidae
Ulodemis trigrapha	I	Lepidoptera: Tortricidae
Urochela luteovaria	I	Hemiptera: Pentatomidae
Valsa mali	F	Ascomycota
Wallemia longxianensis	F	Basidiomycota
Wallemia qiangyangesis	F	Basidiomycota
Zygophiala cryptogama	F	Ascomycota
Zygophiala jamaicensis	F	Ascomycota
Zygophiala liquanensis	F	Ascomycota
Zygophiala taiyuensis	F	Ascomycota
Zygophiala tardicrescens	F	Ascomycota
Zygophiala wisconsinensis	F	Ascomycota

ANNEX 5. Apple alert list

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

In Part 1 pest organisms with high economic importance and more likely to transfer are listed (1 TOP and 2 TOP). Part 2 contains species with lesser economic importance and more likely to transfer or high economic importance and less likely to transfer. The pests in both parts are in alphabetical order and not further ranked by categories. Except the Ascomycetes *Colletotrichum fructicola*, *Helminthosporium papulosum* and *Sphaeroopsis pyriputrescens* all listed pests are insects.

The Alert List was finalized at December 2016, 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

Colletotrichum fructicola (Ascomycota)

Fruit pathway: Yes. In laboratory tests, *C. fructicola* isolated from fruit lesions was able to infect wounded and non-wounded fruits and leaves of apple (Velho *et al.* 2015). Infections of fruit are mentioned amongst others for *Malus*, *Persea americana*, *Pyrus*, *Capsicum*.

Other pathways: plants for planting, cut plant parts, leaves.

Hosts: Polyphagous, hosts include *Malus domestica*, *Citrus reticulata*, *Fortunella margarita* (Huang *et al.* 2013), *Citrus sinensis*, *Gleditsia caspica*, *Sambucus ebulus* (Arzanlou *et al.* 2015); *Pyrus bretschneideri* (Jiang *et al.* 2014), *Pyrus pyrifolia* (Zhang *et al.* 2015), *Capsicum annuum* (new host; Shoji *et al.* 2015), *Coffea arabica* (Prihastuti *et al.* 2009), *Limonium sinuatum*, *Fragaria × ananassa*, *Persea americana*, *Ficus edulis*, *Dioscorea*, *Camellia sinensis*, *Theobroma cacao* (Weir *et al*. 2012), *Lycium chinense* (Paul *et al.* 2014).

Distribution: Asia: China (Jiang *et al.* 2014), Iran (Arzanlou *et al*. 2015), Japan (Shoji *et al.* 2014), Korea Rep (Paul *et al.* 2014), Thailand, Israel, Indonesia; North America: USA; Africa: Nigeria (Weir *et al.* 2012); South America: Brazil, Uruguay; Central America: Panama (Weir *et al.* 2012); Oceania: Australia.
Doubtful record: Germany (Weir *et al.* 2012). This record arises from one detection in a glasshouse in 1936 in botanical garden on a *Ficus edulis* leaf spot. No other record was found. The fungus is considered absent in Europe, with an uncertainty. Mainly a tropical and subtropical species (Phoulivong *et al.* 2012) that needs warm and humid conditions for host infections (Chatimbar 2016).

Damage: *C. fructicola* belongs to the highly agressive *C. gloeosporioides* species complex causing Apple bitter rot (ABR) and Glomerella leaf spot (GLS) on *Malus domestica*. ABR symptoms are light brown fruit lesions which change their colour to dark brown while they enlarge and sunk v-shaped to the core into the apple. ABR is very destructive with up to 50% pre and post-harvest losses. GLS is an emerging disease (North and South America) which causes reddish-purple leaf spots, irregular necrotic lesions, yellow coloration of the leaf and finally leaf fall (Velho *et al.* 2015). *C. fructicola* is the dominant species that causes ABR in Uruguay (Alaniz *et al.* 2015). On *Pyrus bretschneideri*, *C. fructicola* causes black spots on young fruit, always followed by severe bitter rot on mature fruits (Jiang *et al.* 2013); market losses typically range from 60 to 90% (Li *et al.* 2013). On sweet pepper, it was found associated to a severe fruit rot (Shoji *et al.* 2014).

Other information: *C. fructicola* and related *Colletotrichum* species (*C. fioriniae*, *C. nymphaeae*, *C. siamense*, *C. theobromicola*) cause visually not distinguishable symptoms on apple (Munir 2015). *C. ignotum* and *Glomerella cingulata* var. *minor* are synonyms of *C. fructicola* (Weir *et al*. 2012). The Brazilian and Uruguayan populations are genetically distinct and differ in their abilities to infect leaves, when isolated from infected apples (Rockenbach *et al.* 2016). *C. fructicola* was intercepted several times to California with Chinese evergreen (*Aglaonema* sp.) from Costa Rica, a mango fruit shipment from Puerto Rico, *Cymbidium* orchid leaves, mango and black sapote fruits from Florida, *Dracaena massangeana* cuttings from Costa Rica (Chitambar 2016).

Impact: High	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:

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Arzanlou M, Bakhshi M, Karimi K, Torbati M 2015. Multigene phylogeny reveals three new records of Colletotrichum spp. And several new host records for the mycobiota of Iran. Journal of Plant Protection Research, 55(2), p. 198-211.

Chitambar J 2016. California Pest Rating Proposal for *Colletotrichum fructicola* Prihastuti, L. Cai & K.D. Hyde, 2009. http://blogs.cdfa.ca.gov/Section3162/?tag=colletotrichum-fructicola

Huang F, Chen GQ, Hou X, FuYS, Cai L, Hyde KD, Li HY 2013. Colletotrichum species associated with cultivated citrus in China. Fungal Diversity 61, p. 61–74.

Jiang J, Zhai H, Li H, Chen Y, Hong N, Wang G, Chofong GN, Xu W 2014. Identification and characterization of *Colletotrichum fructicola* causing black spots on young fruits related to bitter rot of pear (Pyrus bretschneideri Rehd.) in China. Crop Protection 58, p.41-48.

Li HN, Jiang JJ, Hong N, Wang GP, Xu WX 2013. First Report of *Colletotrichum fructicola* Causing Bitter Rot of Pear (Pyrus bretschneideri) in China. Plant Disease, 97(7), p. 1000.

Munir M 2015. Characterization of colletotrichum species causing bitter rot of apples in Kentucky orchards. Theses and Dissertations, Plant Pathology Paper 18.

Paul NC, Yu SH, Lee JH, Shin KS, Ryu TH, Kwon HR, Kim YK, Youn YN, Yu SH 2014. Endophytic Fungi from Lycium chinense Mill and Characterization of Two New Korean Records of Colletotrichum. International Journal of Molecular Sciences 15, p. 15272-15286.

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Rockenbach M, Velho AC, Gonçalves AE, Mondino PE, Alaniz SM, Stadnik MJ 2016. Genetic Structure of *Colletotrichum fructicola* Associated to Apple Bitter Rot and Glomerella Leaf Spot in Southern Brazil and Uruguay. Phytopathology 106(7), p. 774-781.
Shoji K, Kurose D, Satou I, Yoshida S, Tsushima S, Tashiro N 2014. First report of *Colletotrichum fructicola* as a causal pathogen of Sweet Pepper Anthracnose in Japan. The 2014 Korea-Japan Joint Symposium, Plant Pathology Oct 2014.
Velho AC, Alaniz S, Casanova L , Mondino P, Stadnik MJ 2015. New insights into the characterization of Colletotrichum species associated with apple diseases in southern Brazil and Uruguay. Fungal Biology 119, p. 229-244.
Weir BS, Johnston PR, Damm U 2012. The *Colletotrichum gloeosporioides* species complex. Studies in Mycology, 73, p.115-180.
Zhang PF, Zhai LF, Zhang XK, Huang XZ, Hong N, Xu W, Wang G 2015. Characterization of *Colletotrichum fructicola*, a new causal agent of leaf black spot disease of sandy pear (Pyrus pyrifolia). European Journal of Plant Pathology 143, p. 651.

Insects

Aegorhinus superciliosus (Coleoptera: Curculionidae)

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

Other pathways: plants for planting, soil; adults also feed on buds, shoots and leaves, larvae feed on roots and collars of the plant and pupate in plant collars, eggs can be in soil (Parra *et al.* 2009, Biosecurity Australia 2011).

Hosts: Polyphagous on a wide range of hosts, incl. *Malus domestica*, *Vaccinium corymbosum, Rubus idaeus, Fragaria* x *ananassa, Ribes uva-crispa, Rubus, Ribes, 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: In apples control is occasionally required (Parra *et al.* 2009). 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). In apples control is occasionally required (Parra *et al.* 2009). 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). *A. superciliosus* has passed from its native hosts to exotic crops (Parra *et al.* 2009).

Other information: The pest is listed in EU Commission Decision 2003/249/EC of 9 April 2003 authorising Member States to provide for temporary derogations from certain provisions of Council Directive 2000/29/EC in respect of plants of strawberry (*Fragaria* L.), intended for planting, other than seeds, originating in Chile (EUR-Lex 2015). *A. superciliosus* is regulated in Australia for dormant rooted cuttings of hazelnut (Biosecurity Australia 2011).

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

References:

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Koch CK, Waterhouse DF 2000. The distribution and importance of arthropods associated with agriculture and forestry in Chile. Australian Centre for International Agricultural Research (ACIAR) Monograph 68, 234 pp.
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Parra LB, Mutis AT, Aguilera AP, Rebolledo RR, Quiroz AC 2009. Estado del conocimiento sobre el cabrito del frambueso (CF), *Aegorhinus superciliosus* (Guérin) (Coleoptera: Curculionidae) knowledge of the “cabrito del frambueso” weevil (cf) Aegorhinus superciliosus (guerin) (Coleoptera: Curculionidae). Idesia (Arica) 27(1): 57-65.

***Argyrotaenia sphaleropa* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed externally on fruit (Meneguim and Hohmann 2007), in apple trees, it is common for them to feed on leaves and fruit at the same time (Bentancourt *et al*. 2003)

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. *Malus domestica, M. sylvestris, 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: *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). On apple trees, the larvae often feed on shoots, concomitantly connecting the leaves with silk threads; they damage fruit surface, and make them unmarketable (Bentancourt *et al.* 2003; SATA 2012). Damage was observed in 85% of sampled persimmon orchards in one region of Brazil (Bavaresco *et al.* 2005). 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, persimmon (Botton *et al.* 2003) and grapevine (SATA 2012). Feeding on fruit decreases its value and favours fungal infections (Botton *et al.* 2003).

Impact: High	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Bavaresco A, Botton M, Garcia MS, Nondillo A 2005. Danos e insetos em frutos de caquizeiro em pomares da Serra Gaucha. (In Portuguese.) Agropecuaria Catarinense 18(3): 56-59.

Bentancourt CM, Scatoni IB, Gonzalez A, Franco J 2003. Effects of Larval Diet on the Development and Reproduction of Argyrotaenia sphaleropa (Meyrick) (Lepidoptera: Tortricidae). Neotropical Entomology 32(4):551-557 (2003)

Botton M, Bavaresco A, Garcia MS 2003. Ocorrência de Argyrotaenia sphaleropa (Meyrick) (Lepidoptera: Tortricidae) Danificando Pêssegos na Serra Gaúcha, Rio Grande do Sul. Neotropical Entomology 32(3):503-505.

Meneguim AM, Hohmann CL 2007. Argyrotaenia sphaleropa (Meyrick) (Lepidoptera: Tortricidae) in Citrus in the State of Paraná, Brazil. Neotropical Entomology 36(2):317-319 (2007)

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.

SATA 2012. Argyrotaenia sphaeleropa (from Betancourt et al., 2010). SATA. Guia para la proteccion y nutricion vegetal. http://laguiasata.com/joomla/index.php?view=article&catid=68%3Anombres%C2%ADcientifico&id=610%3Aargyrotaenia%C2%ADsphaleropa&tmpl=component&print=1&la%E2%80%A6

Trematerra P, Brown JW 2004. Argentine Argyrotaenia (Lepidoptera: Tortricidae): Synopsis and descriptions of two new species. Zootaxa 574: 1–12.

***Phlyctinus callosus* (Coleoptera: Curculionidae)**

Fruit pathway: adult *P. callosus* feed on fruit (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 include *Malus domestica*, *Daucus carota* subsp. *sativus*, *Vitis vinifera*, vegetables (EPPO GD). *Citrus* (PaDIL, nd), *Vaccinium corymbosum* (Bredenhand *et al.* 2010). 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 (native); Oceania: Australia (introduced), New Zealand (introduced) (EPPO GD, 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).

Other information: frequently intercepted to the USA including on fruit (table grapes) (CABI CPC)

Impact: High	**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. URL: http://www.cabi.org/cpc

EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. https://gd.eppo.int/

PaDil no Date. Species factsheet: garden weevil *Phlyctinus callosus* (Schoenherr, 1826). http://www.padil.gov.au/pests-and-diseases/pest/commodity%20type-pests-and-diseases/135874 (accessed September 2016).

Proeulia auraria **(Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed externally on fruit (Gilligan and Epstein 2014).

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, mummified fruit) (Arysta 2003). Uncertain pathway: cut flowers and branches.

Hosts: polyphagous, hosts include *Malus domestica*, *Actinidia deliciosa, Citrus sinensis, Platanus orientalis, Prunus armeniaca, Prunus avium, Prunus domestica, Prunus persica, Pyrus communis, Robinia pseudoacacia, Vitis vinifera* (CABI CPC), *Juglans regia, Vaccinium* (Blueberries Chile, 2011-2012) *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: serious damage is confined mainly to grapevine, either direct by destroying buds and berries or indirect due to Botrytis rots developing inside infested bunches (Biosecurity Australia 2005); the whole genus Proeulia is considered an emergent pest problem of fruit trees and vineyards, because *Proeulia* spp. have moved at a rather slow pace from their natural habitat into crop systems (CABI CPC). Damage is caused by larvae feeding on buds, flowers, leaves and fruit and 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 extended its host range to new hosts like 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). 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. 34 interceptions to USA on blueberries, also 2 interceptions in Japan (BlueberriesChile 2011-2012)

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

References:

ArystaLifeScience 2003. Descripción y Biología de Eulia. http://www.arystalifescience.cl/productos/trampas/descripcion/EULIA_BIOLOGIA.pdf (Accesses August 2015)

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.

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

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/Proeulia_spp.htm

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

Spilonota albicana **(Lepidoptera: Tortricidae)**

Fruit pathway: eggs of the summer generation are laid on the surface or calyx of fruit, larvae bore into fruit from the calyx or stem end (Biosecurity Australia 2010).

Other pathways: plants for planting; larvae also feeds on leaves and buds, pupae in folded leaves (Ovsyannikova and Grichanov 2013)

Hosts: polyphagous, hosts include *Malus domestica*, *Pyrus*, *Crataegus*, *Prunus* (Australia 2010, Liu and Liu 1994)

Distribution: Asia: China, Japan, Korea, Russia (Transbaikalia, Russian Far East) (Biosecurity Australia 2010)

Damage: has been a serious pest in apple production in North China in the 1950s and 1960s. Since then, it has rarely occurred because of the control measures applied to this pest and other leafrollers. However, 50% infested fruits were reported in uncontrolled orchards from 2000-2010 (Biosecurity Australia 2010); serious pest of hawthorn (Liu and Liu 1994). *S. albicana* is a significant pest, requiring the use of labour intensive cultural and chemical control measures to reduce impacts on host plants. *S. albicana* damages foliage, buds and fruits of cultural rosaceous fruit trees. In some areas of Primorskii Territory, yield losses of 77-85% of large-fruited apple varieties were recorded. Additionally, pear, cherry and plum trees and wild rosaceous trees in parks and forests are damaged by this species (Ovsyannikova and Grichanov 2013).

Other information: It has been recorded as intercepted on bonsai trees (*Malus*) from Japan into the Netherlands (Ovsyannikova and Grichanov 2013). It is a pest of quarantine concern at least for Australia (Biosecurity Australia 2010).

Impact: High	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Biosecurity Australia 2010. Final import risk analysis report for fresh apple fruit from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra, 370 p.

Liu Y, Liu B 1994. A new sibling species of Spilonota albicana (Motschulsky)(Lepidoptera: Tortricidae). Insect Science 1(2): 140-145.

USDA 2014. Importation of apples (*Malus pumila*) from China into the Continental United States - A Qualitative, Pathway-Initiated Pest Risk Assessment. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, 293 p.

Ovsyannikova, Grichanov 2013 URL: http://www.agroatlas.ru/en/content/pests/Spilonota_albicana/index.html

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

Pathogens

Helminthosporium papulosum (Ascomycota)

Fruit pathway: causes lesions on apple fruit (Horton *et al.* 1991)

Other pathways: plants for planting; also causes lesions on bark and leaves (Horton *et al.* 1991)

Hosts: *Malus* spp., *Pyrus communis*, *Liquidambar styraciflua* (Farr and Rossman 2015)

Distribution: North America: USA (Farr and Rossman 2015)

Damage: The fungus causes circular lesions on the fruit. It has caused severe losses in apples in Southestern USA (Horton *et al.* 1991); in pears, heavily infected twigs and branches grow poorly, become defoliated prematurely and then die back (Acedo and Agrios 1970). Possible damage on other hosts was not considered here.

Other information: Synonym *Ellisembia asterinum* used in Farr and Rossman (2015).

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

References:

Acedo GN, Agrios GN 1970. Helminthosporium blister canker of pear. Plant Disease Reporter 54(4): 296-299.

Farr DF, Rossman AY 2015. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA. URL: http://nt.ars-grin.gov/fungaldatabases/ (retrieved 2015 August 26)

Horton DL, Pfeiffer DG, Hendrix FF Jr. 1991. Southeastern apple integrated pest management. Sustainable agriculture research and education in the field: a Proceedings. National Academy Press, Washington DC, 165-182. https://www.nap.edu/read/1854/chapter/5#164

Sphaeropsis pyriputrescens (Ascomycota)

Fruit pathway: infects stem, calyx and lenticels of apple fruit (Xiao *et al.* 2014). Infected fruit may be symptomless.

Other pathways: plants for planting; pycnidia of *S. pyriputrescens* were also observed on diseased twigs and bark (Xiao *et al*. 2014)

Hosts: *Malus*, *Pyrus* (Xiao *et al.* 2014)

Distribution: North America: USA (Kim *et al.* 2014), Canada (Sholberg *et al.* 2009)

Damage: *S. pyriputrescens* was first recognized as a post-harvest rot of apple in Washington, USA (Kim and Xiao 2008). It has since been found in British Columbia and New York State. In Washington, it caused up to 17% of total decay in stored apples (Oregon State University 2015), while the severe rot is of low incidence (to date) in New York (Kim et al. 2014); *S. pyriputrescens* is also the cause of a twig dieback and canker disease of apple (Xiao *et al.* 2014).

Other information: Recently described species. Infection of apple fruit by the fungus is believed to occur in the orchard, and symptoms develop during storage (Xiao *et al.* 2014). Uncertain if records in Eastern USA represent spread of the pest and if this is an emerging disease.

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Yes (uncertain)

References:

Kim YK, Curry EA, Xiao CL 2014. Infection of apple fruit by *Sphaeropsis pyriputrescens* in the orchard in relation to Sphaeropsis rot in storage. European Journal of Plant Pathology 140(1): 133-143.

Kim YK, Xiao CL 2008. Distribution and incidence of Sphaeropsis rot in apple in Washington State. Plant disease, 92(6), 940-946.

Oregon State University 2015. Pacific Northwest Plant Disease Management Handbook: Apple (*Malus* spp.)-Storage Problems. URL http://pnwhandbooks.org/plantdisease/apple-malus-spp-storage-problems (accessed 01 December 2015)
Sholberg PL, Stokes SC, O'Gorman DT 2009. First report of a new postharvest disease of pear fruit caused by *Sphaeropsis pyriputrescens* in Canada. Plant Disease 93(8): 843-843.
Xiao CL, Kim YK, Boal RJ 2014. Sources and availability of inoculum and seasonal survival of *Sphaeropsis pyriputrescens* in apple orchards. Plant Disease 98(8): 1043-1049.

Insects

Archips argyrospilus (Lepidoptera: Tortricidae)

Fruit pathway: larvae feed on young fruit (Government of British Columbia 2015)

Other pathways: plants for planting, cut branches; eggs on branches, larvae also feed on buds, flowers, leaves (Government of British Columbia 2015)

Hosts: Polyphagous, hosts incl. *Malus*, *Citrus* (CABI CPC), *Prunus*, *Pyrus*, *Ribes*, *Fraxinus*, *Quercus*, *Salix*, *Rosa* (Brunner 1993)

Distribution: North America: USA, Canada (CABI CPC)

Damage: Larvae enter buds and feed on flower parts, moving to leaves after bloom. They feed on leaves and nearby fruit, causing deep irregular holes in small fruit resulting in large russeted scars in mature fruit (Government of British Columbia 2016). *A. argyrospilus* is rare in commercial orchards in Washington, but a serious problem in some British Columbia orchards (Brunner 1993; Washington State University 2015) On apple damage levels of 20% were observed in the absence of control methods (Deland 1992). In the past, heavy damage was reported both in the USA and Canada, with serious outbreaks mostly on Rosaceae (esp. apple, pear – 40% fruit losses in some cases), but also citrus and complete defoliation of forest trees (from the end of the 1800s to 1960s) (Paradis 1964). Serious but sporadic pest in British Columbia apple orchards (Vakenti *et al.* 1984).

Other information: was intercepted on fresh citrus fruit in New Zealand (Biosecurity New Zealand 2009)

Impact: High (in the past)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Biosecurity New Zealand 2009. Import Risk Analysis: Fresh stonefruit from Idaho, Oregon and Washington. Draft for public consultation. MAF Biosecurity New Zealand.
Brunner JF 1993. Leafrollers - Pandemis leafroller *Pandemis pyrusana* Kearfott, Obliquebanded leafroller *Choristoneura rosaceana* (Harris), Fruittree leafroller Archips argyrospilus (Walker), European leafroller *Archips rosanus* (Linnaeus). Orchard Pest Management Online, Washington State University. http://jenny.tfrec.wsu.edu/opm/displaySpecies.php?pn=48 (accessed August 2015)
Deland JP 1992. Mating disruption of fruit tree leafroller Archips argyrospilus and effects on other leafroller species. MSc thesis. Simon Fraser University. Canada.
Government of British Columbia 2016. Fruittree and European Leafrollers (*Archips argyrospilus*, *Archips rosanus*). URL: http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/plant-health/phu-tree-fruit-leafrollers.pdf
Paradis RO 1964. Recherches sur la biologie et la dynamique des populations naturelles *d'Archips argyrospilus* (Wlk.) (Lepidopteres: Tortricidae) dans le sud-ouest du Quebec. PhD thesis. McGill University, Canada.
Vakenti JM, Campbell CJ, Madsen HF 1984. A strain of fruittree leafroller, *Archips argyrospilus* (Lepidoptera: Tortricidae), tolerant to azinphos-methyl in an apple orchard region of the Okanagan Valley of British Columbia. The Canadian Entomologist 116(1): 69-73.
Washington State University 2015. URL: http://jenny.tfrec.wsu.edu/opm/displaySpecies.php?pn=98

Archips breviplicanus (Lepidoptera: Tortricidae)

Fruit pathway: larvae attack young fruit (Biosecurity Australia 2010, citing others)

Other pathways: plants for planting; larvae also feed on buds, flowers and leaves (Biosecurity Australia 2010, citing others)

Hosts: Polyphagous, incl. *Malus domestica, Pyrus communis* (CABI CPC), *Alnus japonica, Camellia japonica, Cephalotaxus koreana, Citrus, Glycine max, Morus bombycis, Populus deltoides, Populus nigra, Fragaria, Malus baccata, M. pumila, Prunus persica, P. salicina, Prunus serrulata* var. *spontanea, P. yedoensis, Pyrus serotina, Castanea crenata, Quercus mongolica, Ribes grossularia, Pyrus, Alnus, Morus* (Park *et al.* 2014, citing others).

Distribution: Asia: China (Biosecurity Australia 2010), Korea Rep. (CABI CPC), Japan (AQIS 1998), Russia (Far-East) (Park *et al.* 2014).

Damage: Only general information on damage was found. *Archips breviplicanus* is a major pest of apple leaves. It also damages apple buds and makes shallow feeding scars on fruit in contact with leaves (Biosecurity Australia 2010, citing others). In Japan, *A. breviplicanus* is a pest in apple orchards and control measures are applied (Toyoshima *et al.* 2005, Okazaki *et al.* 2001). In Korea Rep., *A. breviplicanus* is mentioned as a pest of pear (low incidence) (Cho *et al.* 2011) and of apple (no details) (Sony *et al.* 2009).

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

References:

AQIS 1998. Final import risk analysis of the importation of fruit of Fuji apple (*Malus pumila* Miller var. domestica Schneider) from Aomori prefacture in Japan. Australian Quarantine and Inspection Service, Canberra, Australia, 61 p.

Biosecurity Australia 2010. Final import risk analysis report for fresh apple fruit from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra, 370 p.

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

Cho YS, JH, Hwang HS, Jo HW, Park CW 2011. Current occurrence of the major Lepidoptera pests in the oriental pear orchards in Korea. XI International Pear Symposium, Patagonia, Argentina, 16-19 November 2010 (eds Sanchez EE, Sugar D, Webster AD). Acta Horticulturae, 909:491-496. (abstract).

Okazaki K, Arakawa A, Noguchi H, Mochizuki F 2001. Further studies on mating disruptants for the summerfruit tortrix moth, *Adoxophyes orana fasciata*. Japanese Journal of Applied Entomology and Zoology, 45:3, 137-141

Park KT, Lee BW, Bae YS, Han HL, Byun BK 2014. Tortricinae (Lepidoptera, Tortricidae) from Province Jilin, China. Journal of Asia-Pacific Biodiversity 7 (2014) 355-363.

Sony S, Alim MA, Kim SW, Kwon MS, Lee DK, Kim YG 2009. Diagnostic molecular markers of six lepidopteran insect pests infesting apples in Korea. Journal of Asia-Pacific Entomology; 2009. 12(2):107-111. (abstract).

Toyoshima S, Yaginuma K, Takanashi M 2005. Trends in the Prevention of Insect Pest Infestation in an Unsprayed Apple Orchard Using the Mating Disruption Technique Bull. Natl. Inst. Fruit Tree Sci. 4 : 71-81.

Archips fuscocupreanus **(Lepidoptera: Tortricidae)**

Fruit pathway: larvae may feed on young fruit (Maier 2003)

Other pathways: plants for planting, cut branches, cut flowers; eggs on trunks, branches, stems, pupae in soil (CABI CPC), larvae also feed on leaves and flowers (Maier 2003). Egg masses on hosts are suspected for the introduction into the USA (CABI CPC).

Hosts: though it is most abundant on *Malus, Pyrus* and *Morus*, 87 host plants in 15 families are known (CABI CPC)

Distribution: Asia: China (Byun *et al.* 2003), Japan, Korea (Rep. and DPR), Russia (Far-East); North America: USA (introduced, first record in 1982)(CABI CPC)

Damage: important pest of apple in Japan (Maier 2003), defoliation of trees as well as direct crop loss due to feeding on fruit possible (CABI CPC). No noteworthy damage of managed orchards is reported from the USA so far (Maier 2012). Possible damage on other hosts was not considered here.

Other information: *A. fuscocupreanus* has spread from Japan to the USA, where subsequent further spread is observed (CABI CPC)

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Yes

References:

Byun B, Yan S, Li C 2003. Revision of Tribe Archipini (Tortricidae: Tortricinae) in Northeast China. Journal of Forestry Research, 14(2): 93-102.

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

Maier CT 2003. Distribution, hosts, abundance, and seasonal flight activity of the exotic leafroller, *Archips fuscocupreanus* Walsingham (Lepidoptera: Tortricidae), in the North Eastern United States. Annals of the Entomological Society of America 96(5): 660-666.
Maier CT 2012. Apple Tortrix-*Archips fuscocupreanus*. The Connecticut Agricultural Experiment Station. URL: http://www.ct.gov/caes/cwp/view.asp?a=2815&q=376728

***Archips micaceana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae bore into fruit (USDA 2014, citing others)

Other pathways: plants for planting, cut branches; larvae also feed on leaves (Sottikul 1989)

Hosts: *Malus* spp.*, Glycine max, Citrus* spp.*, Annona squamosa, Mangifera indica, Morus* spp. (USDA 2014, citing others), *Vanilla* (Vanitha *et al.* 2011), *Albizia procera, Arachis hypogaea, Artocarpus altilis, Coffea, Eucalyptus, Glycine max* (CABI CPC)

Distribution: Asia: China (USDA 2014, citing others), India, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam (CABI CPC, Vanitha *et al.* 2011)

Damage: serious pest of apples in Himachal Pradesh, India (USDA 2014, citing a reference of 1983); in Thailand, defoliation and crop losses of up to 30 % in peanuts were observed (Sottikul 1989), reported a minor pest e.g of groundnut, longan, litchi (Hill 1983).

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

References:

CABI CPC. Crop Protection Compendium. CAB International, UK. URL: http://www.cabi.org/cpc
Hill DS 1983. Agricultural insect pests of the tropics and their control. Cambridge University Press, Cambridge, UK, 746 p.
Sottikul A 1989. Yield loss of groundnut due to leaf roller caterpillar *Archips micaceana* (Walker). Kasetsart University, Bangkok, Thailand, 184 p.
USDA 2014. Importation of apples (*Malus pumila*) from China into the Continental United States - A Qualitative, Pathway-Initiated Pest Risk Assessment. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, 293 p.
Vanitha K, Karuppuchami P, Sivasubramanian P 2011. Pest of vanilla (*Vanilla planifolia* Andrews) and their natural enemies in Tamil Nadu, India. International Journal of Biodiversity and Conservation 3(4): 116-120.

***Archips pomivora* (Lepidoptera: Tortricidae)**

Fruit pathway: in apples, larvae feed on damaged fruitlets (USDA 2014, citing others), in stone fruit, primarily ripe fruit are attacked (Janjua 1940)

Other pathways: plants for planting; larvae also feed on buds, flowers, leaves (Janjua (1940)

Hosts: Polyphagous. Hosts include *Malus, Prunus* (Bhardwaj 1987, Janjua 1940), *Acacia, Rosa, Citrus, Coffea* (Brown *et al.* 2008)

Distribution: Asia: China (USDA 2014, citing others), India (CABI CPC), Pakistan (Janjua (1940). Brown *et al.* (2008) lists collection specimen from Bhutan (from the British Museum of Natural History).

Damage: Reports of damage on apple in the 1980s-90s in Northern India, as well as specific studies at the beginning of the 2000s (e.g. Sharma *et al.* 2005). Predominating apple infesting tortricid in Himachal Pradesh, India (Bhardwaj 1987). First report as a pest of apple in Jammu and Kashmir (India) in the 1990s (Bhagat *et al.* 1994). Possible damage on other hosts was not considered here.

Other information: Synonyms *Archips termias* used in CABI CPC and Brown *et al.* 2008, and *Cacoecia sarcosiega* in Janjua (1940).

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Yes

References:

Bhagat KC, Masoodi MA, Koul VK 1994. Note on the incidence of Archips pomivora Meyrick (Lepidoptera: Tortricidae) as a new pest of apple in Kashmir. Journal of Insect Science; 1994. 7(1):112-113.

Bhardwaj, SP 1987. Investigations on the response of lepidopteran sex pheromones of temperate fruit pests in Himachal Pradesh, India. Agriculture, ecosystems & environment, 19(1), 87-91.
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. URL: http://www.cabi.org/cpc
Janjua NA 1940. On the Biology of *Cacoecia sarcosiega* Meyr. in Baluchistan. Indian Journal of Entomology 2(2): 145-154.
Sharma S, Bhardwaj SP, Thakur M 2005. Morphology and life cycle of apple leaf roller, Archips termias Meyrick infesting apple in Himachal Pradesh. Indian Journal of Entomology, 67(4), 289.
USDA 2014. Importation of apples (*Malus pumila*) from China into the Continental United States - A Qualitative, Pathway-Initiated Pest Risk Assessment. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, 293 p.

Argyresthia assimilis **(Lepidoptera: Yponomeutidae)**

Fruit pathway: *A. assimilis* lays eggs on fruit (near calyx) and larvae bore into fruit of apple (Biosecurity Australia 2010, citing others)

Other pathways: soil; pupae develop in soil (Biosecurity Australia 2010, citing others)

Hosts: *Malus* spp. (Biosecurity Australia, citing others)

Distribution: Asia: China (Biosecurity Australia 2010, citing others), Japan (Lewis and Sohn 2015)

Damage: Newly hatched larvae bore into the fruit from the calyx. Feeding damage is obvious as fruit juices seep from the entry hole and dry as white powder. *A. assimilis* caused 30-67% fruit infestation in apples in Shaanxi and Gansu provinces of China in the early 1980s (Biosecurity Australia 2010, citing others). No information was found on the situation in Japan.

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

References:

Biosecurity Australia 2010. Final import risk analysis report for fresh apple fruit from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra, 370 p.
Lewis JA, Sohn J-C 2015. Lepidoptera: Yponomeutoidea I (Argyresthiidae, Attevidae, Praydidae, Scythropiidae and Yponomeutidae). Koninklijke Brill, Leiden, Netherlands, 278 p.

Argyrotaenia citrana **(Lepidoptera: Tortricidae)**

Fruit pathway: eggs may be on fruit, larvae feed on developing fruit (Gilligan and Epstein 2009)

Other pathways: plants for planting, soil; eggs and feeding larvae may also be on leaves and twigs; Larvae overwinter on the ground or in plants (Gilligan and Epstein 2009)

Hosts: Highly polyphagous (Walker and Welter 2009), hosts incl. *Malus* spp., *Citrus*, *Persea americana*, *Vaccinium*, *Prunus armeniaca*, *Rubus*, *Vitis* (Gilligan and Epstein 2009)

Distribution: North America: USA, Canada (Gilligan and Epstein 2009), Mexico (AQIS 1999)

Damage: An important pest on apple and other important fruit crops in Western USA; pest populations usually remain low in orchards treated against codling moth; *A. citrana* can cause significant damage even at relatively low populations (Walker and Welter 2009, Zalom and Pickel 1988). Larvae cause economic damage by directly feeding on developing fruit in citrus, apple and grape (Gilligan and Epstein 2009). On grape, it is an occasional pest in California (UC IPM 2014); damage levels of 25% are mentioned. The damage caused by larvae feeding in fruit clusters facilitates the entry of organisms that induce rots (AQIS 1999).

Other information: *A. citrina* was intercepted in Japan (no indication of the commodity; Amano and Higo 2015). *A. citrana* was intercepted on table grapes to New Zealand (Biosecurity New Zealand 2009). The species is uni- or bivoltine (Gilligan and Epstein 2009). Gilligan and Epstein (2009) and Amano and Higo (2015) use the synonym *Argyrotaenia franciscana*.

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.

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

UC IPM 2014. Grape - Orange Tortrix. Scientific name: *Argyrotaenia franciscana* (= *A. citrana*). Available at http://www.ipm.ucdavis.edu/PMG/r302300411.html (accessed August 2015)

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.

Argyrotaenia pomililiana **(Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on apple fruit (Trematerra and Brown 2004)

Other pathways: plants for planting: larvae also feed on leaves of apple trees (Trematerra and Brown 2004).

Hosts: *Malus* (Trematerra and Brown 2004)

Distribution: South America: Argentina (Trematerra and Brown 2004)

Damage: Important pest of apples in Argentina, damage to fruit is economically significant and mainly caused by the feeding damage through larvae on leaves and fruit (Trematerra and Brown 2004, Cichón *et al.* 2004)

Other information: New species described in 2004. Little information is available for this species.

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

References:

Cichón LI, Trematerra P, Coracini MD, Fernandez D, Bengtsson M, Witzgall P 2004. Sex pheromone of *Argyrotaenia pomililiana* (Lepidoptera: Tortricidae), a leafroller pest of apples in Argentina. Journal of Economic Entomology 97(3): 946-949.

Trematerra P, Brown JW 2004. Argentine *Argyrotaenia* (Lepidoptera: Tortricidae): Synopsis and descriptions of two new species. Zootaxa 574: 1-12.

Argyrotaenia velutinana **(Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on fruit and continue feeding on fallen fruit. They even may remain on fruits during transport (Gilligan and Epstein 2014).

Other pathways: plants for planting; eggs on bark and leaves, larvae also feed on leaves (Gilligan and Epstein 2014), pupae in leaves on the ground.

Hosts: highly polyphagous, primary hosts are *Malus* and other Rosaceae (Gilligan and Epstein 2014). Other hosts incl.*Vaccinium* (Brown et al. 2008), *Vitis vinifera*, coniferous or deciduous trees (e.g. in genera *Abies, Pinus, Picea, Larix, Tsuga, Betula, Alnus, Populus, Salix, Ulmus*), ornamentals (e.g. *Chrysanthemum, Geranium, Viola*) (Gilligan and Epstein 2014).

Distribution: North America: USA, Canada (CABI CPC)

Damage: In apples, feeding of larvae causes rot and early drop of fruit; considered a major apple pest in the Eastern USA around the middle of the 20th century, today mostly under control with IPM strategies (Gilligan and Epstein 2014). Possible damage on other hosts was not considered here.

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

References:

CABI CPC. Crop Protection Compendium. CAB International, UK. URL: 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/Argyrotaenia_velutinana.htm

***Bonagota cranaodes* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae develop on fruit (Betancourt *et al.* 2004)

Other pathways: plants for planting; larvae also develop on leaves (Betancourt *et al.* 2004), eggs on leaves (Sutton *et al.* 2014)

Hosts: polyphagous, hosts incl. *Malus*, *Pyrus*, *Prunus*, *Vitis*, ornamentals, some weeds (Betancourt *et al.* 2004)

Distribution: South America: Argentina, Brazil, Uruguay (Sutton *et al.* 2014). Brown and Razowski (2003) also mention collection specimen from Paraguay.

Damage: Larvae damage leaves and fruit, but the economical damage is due to damage to fruit (Sutton *et al.* 2014). The damage to fruit is sometimes severe; on apple, *B. cranaodes* causes irregular superficial damage, which reduces the commercial value of the fruit; in Brazil, in the main apple producing regions, yield losses amounted to 3-5 %, sometimes *B. cranaodes* attacks jointly with *Argyrotaenia sphaleropa*, resulting an increase in damage to the crop (Betancourt *et al.* 2004, Botton *et al.* 2000). In the 1980s, damage on apple in Brazil reached 15% in commercial apple orchards, but was reduced to less than 2% by the beginning of the 2000s by appropriate control strategies (Sutton et al. 2014), and are currently estimated to less than 1% (Botton *et al.* 2013). Possible damage on other hosts was not considered here.

Other information: Synonym *Bonagota salubricola* used in Botton *et al.* 2013.

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

References:

Bentancourt CM, Scatoni IB, Gonzalez A, Franco J 2004. Biology of *Bonagota cranaodes* (Meyrick)(Lepidoptera: Tortricidae) on seven natural foods. Neotropical Entomology 33(3): 299-306.

Botton M, Arioli CJ, Ringenberg R, Morandi Filho WJ (2009). Controle químico de *Bonagota salubricola* (Meyrick, 1937)(Lepidoptera: Tortricidae) em laboratório e pomar de macieira. Arquivos do Instituto Biológico, São Paulo, 76(2): 225-231.

Botton M, Nakano O, Kovaleski A 2000. Controle químico da lagarta-enroladeira *Bonagota cranaodes* (Meyrick) na cultura da macieira. Pesq. Agropec. Bras. 35(11): 2139-2144.

Brown JW, Razowski J 2003. Description of Ptychocroca, a new genus from Chile and Argentina, with comments on the Bonagota Razowski group of genera (Lepidoptera: Tortricidae: Euliini). Zootaxa, 303(1): 1-31.

Sutton TB, Aldwinckle HS, Agnello AM, Walgenbach JF 2014. Compendium of apple and pear diseases and pests. APS Press, St. Paul (Minnesota), USA, 218 p.

***Ctenopseustis obliquana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on the fruit surface, young larvae may also enter the interior of the fruit through the calyx (Biosecurity Australia 2006).

Other pathways: plants for planting, cut branches; eggs are laid on leaves, larvae also feed on leaves (Biosecurity Australia 2006, Stevens *et al.* 1995).

Hosts: polyphagous, common hosts include *Malus*, *Pyrus*, *Vitis*, *Actinidia*, *Citrus*, *Prunus*, berry fruit (Biosecurity Australia 2006), *Diospyros kaki*, *Ribes*, *Syzygium smithii*, *Cyclamen*, *Rosa*, *Citrus*, *Veronica*, *Camellia japonica* (Gilligan and Epstein 2014).

Distribution: Oceania: New Zealand (Shaw *et al.* 1994)

Damage: *C. obliquana* causes damage by feeding on leaves, buds and fruit, and by webbing leaves to fruits (Gilligan and Epstein 2014). Belongs to the economically important species in New Zealand apple orchards (Shaw *et al.* 1994). It is a cause of rejection of fruit at export for *Vaccinium* (Tomkins and Koller 1985) and avocado (up to 30% of the fruit because of larval damage from unsprayed orchards - Stevens *et al.* 1995; egg rafts are a quarantine problem on fruit for export - NZ avocado growers association 2004). It causes occasional

damage in *Pinus radiata* (Brockerhoff *et al.* 2002). It is considered as a pest of kiwi (controlled; Smith and Graham 1980).

Other information: intercepted on blueberry (2 interceptions on fruit, USDA 2008). *C. obliquana* and *C. herana* cannot be morphologically distinguished but have different pheromones (Stevens *et al.* 1995). Regulated in the USA for Citrus fruit (USDA fruit and vegetable manual https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/fv.pdf).

Impact: Moderate	**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 EG, Jactel H, Leckie AC, Suckling DM 2002. Species composition and abundance of leafrollers in a Canterbury pine plantation. New Zealand Plant Protection, 85-89.

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

NZ Avocado Growers Association 2004. Growers' manual. New Zealand Avocado Growers' Association.

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.

Smith BN, Graham DPF 1980. Citrus and kiwifruit insect pest control with pirimiphos methyl and permethrin. Proceedings of the thirty third New Zealand weed and pest control conference Willow Park Motor Hotel, Tauranga, August 12th to 14th, 1980: 105-109 (abstract)

Stevens PS, McKenna CE, Steven D 1995. Management for Avocados in New Zealand. Proceedings of The World Avocado Congress III, pp. 429-432.

Tomkins AR, Koller MS. 1985. A preliminary investigation of highbush blueberry pest and disease control. Proceedings of the 38th NZ weed and pest control conference.

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.

***Diabrotica speciosa* (Coleoptera: Chrysomelidae)**

Fruit pathway: adults feed on fruit (Collins *et al.* 2014).

Other pathways: plants for planting, cut flowers, vegetables, soil; eggs and larvae can be in soil, larvae feed on roots (mainly of maize), adults also feed on flowers and leaves (Collins *et al.* 2014)

Hosts: highly polyphagous, hosts include *Malus domestica* (minor host), *Phaseolus vulgaris*, *Solanum tuberosum*, *Triticum aestivum*, *Zea mays* (Major), *Arachis hypogaea*, *Brassica napus*, *Brassica oleracea* var. *capitata f. alba*, *Citrus*, *Cucurbita maxima*, *Cucurbita pepo*, *Glycine max*, *Ipomoea batatas*, *Prunus*, *Solanum lycopersicum* (Minor) (EPPO GD)

Distribution: South America: Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Uruguay, Venezuela (EPPO GD). Unconfirmed records: Central America: Costa Rica, Panama (listed in CABI CPC and Collins *et al.* 2014, with records from 1957 and 1962); doubtful record: Mexico (EPPO 2005)

Damage: adults feed on the foliage, flowers and fruit of many hosts. In Brazil, *D. speciosa* causes considerable damage to watermelon, squash, potatoes, tomatoes and wheat (CABI CPC); it is considered to be an important pest in South America (maize, groundnuts, potatoes, wheat, tomatoes, watermelon, ornamental flowers), particularly Argentina and Brazil. It can vector several pathogens (Collins *et al.* 2014).

Other information: 2 interception records in the USA (USDA 2007, incl. on *Malus pumila* fruit from Brazil but Collins *et al.* 2014 also report 2 interceptions in USA once on *Solanum lycopersicum* (tomato) originating from Argentina and once on *Lactuca* sp. (lettuce) originating from Peru); 1 interception in France on apples (Collins *et al.* 2014). *D. speciosa* is on the EPPO A1 List of pests recommended for regulation. An Rapid PRA concluded that the introduction into the EU is unlikely, but Listing in Annex IAI of the EC Plant Health Directive should be considered since it is likely to establish and cause much greater damage in southern Europe (Collins *et al.* 2014).

Impact: Moderate (on another crop, also as vector)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

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

Collins L, Baker R, Eyre D, Korycinska A, Macleod A 2014. Rapid Pest Risk Analysis for *Diabrotica speciosa* (Germar). The Food and Environment Research Agency

EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. URL: https://gd.eppo.int

EPPO 2005. *Diabrotica speciosa*. Data sheets on quarantine pests. Bulletin OEPP/EPPO Bulletin 35, 374–376.

USDA 2007. United States Department of Agriculture - Animal and Plant Health Inspection Service. A pathway-initiated risk assessment: importation of fresh highbush and rabbit-eye blueberry (*Vaccinium corymbosum* L & *V. virgatum* Aiton) fruit into the Continental United States from Uruguay. 56 p.

***Dichocrocis punctiferalis* (Lepidoptera: Crambidae)**

Fruit pathway: eggs laid on fruit surface, larvae bore into fruit (CABI CPC).

Other pathways: plants for planting; larvae overvinter in stems or under the bark of fruit trees, adults feed on nectar (CABI CPC, Biosecurity New Zealand 2009)

Hosts: Polyphagous, primary hosts include *Prunus persica*, *Sorghum bicolor* and *Helianthus annuus*, other hosts are e.g. *Malus domestica*, *Carica papaya*, *Citrus nobilis*, *Diospyros*, *Ficus carica*, *Zea mays*, *Mangifera indica*, *Morus alba*, *Nephelium lappaceum*, *Vitis vinifera* (CABI CPC)

Distribution: Asia: China, India, Indonesia, Japan, Korea DPR, Malysia, Myanmar, Sri Lanka, Taiwan; Oceania: Australia, Papua New Guinea (EPPO GD). The pest occurs mostly in the subtropics, but it is also recorded from Hokkaido prefecture (north Japan), and northern China (Korycinska 2012). CABI CPC includes several countries that were not listed when the distribution was studied in EPPO GD, and are therefore considered uncertain: Asia: Brunei Darussalam, Cambodia, Korea Rep., Laos, Philippines, Thailand, Vietnam (originating from one publication). Doubtful record: Pakistan (interception only; Korycinska 2012). Absent, intercepted only: UK is recorded in Fauna Europeae (de Jong *et al.* 2014), but the pest is not present (intercepted only) (Korycinska 2012).

Damage: Damage is caused by larvae, which bore into stems, shoots, buds, fruits, and seeds of many plants. Boring by this species can predispose the fruits to secondary pathogens (Molet 2015). One of the most important insect pests of peaches in South China and important pest of apples in North China (CABI CPC); in north Queensland it is one of the major pests on *Nephelium lappaceum* (rambutan) and *Durio zibathinus* (durian), 5% yield loss reported in Chinese maize (Korycinska 2012). Uncontrolled it is able to destroy 90% of rambutan fruit clusters and is an important pest of chestnut (Biosecurity New Zealand 2009). *D. punctiferalis* can reach high population levels, due to multiple generations per year and damages the stem, fruit and seeds of their host plant. Their excretions have a high sugar content, which promote secondary infections with other arthropods and pathogens (Biosecurity New Zealand 2009). There is an uncertainty on the impact; however the information available tends to indicate a high impact.

Other information: Intercepted on fruit from several countries in the UK (18 interceptions in 2007-2012, on *Annona squamosa*, *Mangifera indica*, *Psidium*) and in the Netherlands (Korycinska 2012). Synonym *Conogethes punctiferalis* used in Korycinska 2012, CABI CPC and Biosecurity Australia (2010). *C. punctiferalis* is a very poorly defined species complex, and there is confusion in the literature over the identity of the species studied (Korycinska 2012). Listed as pest of phytosanitary concern by New Zealand and Canada (Biosecurity New Zealand 2009, Canadian Food inspection Agency 2016).

Impact: High (on another crop, uncertain)	**Intercepted:** Yes	**Spreading/invasive:** Not known

References:

Biosecurity Australia 2010. Final import risk analysis report for fresh apple fruit from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra, 370 p.

Biosecurity New Zealand 2009. Import Risk Analysis: Pears (*Pyrus bretschneideri*, *Pyrus pyrifolia*, and *Pyrus* sp. nr. *communis*) fresh fruit from China. Ministry of Agriculture and Forestry.

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

Canadian Food Inspection Agency 2016. D-95-08: Phytosanitary import requirements for fresh temperate fruits and tree nuts. URL: http://www.inspection.gc.ca/plants/plant-pests-invasive-species/directives/horticulture/d-95-08/eng/1322413085880/1322413275292#a2_2
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.
EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. URL: https://gd.eppo.int
Korycinska A 2012. Rapid assessment of the need for a detailed Pest Risk Analysis for *Conogethes punctiferalis* (Guenée). The Food and Environment Research Agency.
Molet T 2015. CPHST Pest Datasheet for *Conogethes punctiferalis*. USDA-APHIS-PPQ-CPHST.

Euzophera pyriella **(Lepidoptera: Pyralidae)**

Fruit pathway: larvae feed on skin, flesh and seeds of fruit, pupae may be in fruit (Biosecurity Australia 2010, citing others)

Other pathways: plants for planting; eggs on bark, larvae also bore into wood, pupae can also be in branches (Ma *et al.* 2014)

Hosts: Polyphagous, hosts incl. *Malus, Pyrus, Ziziphus, Prunus, Ficus carica* (Ma *et al.* 2014, citing references in Chinese). It is uncertain if *Malus* is really a host: there has been occasional reports on apple from China in just one article (Song *et al.* 2014, in Chinese). USDA (2014) assumed no regular impact on apples.

Distribution: Asia: China (Ma *et al.* 2014)

Damage: one of the most important insect pests in Xinjiang fragrant pear orchards with crop losses reaching 90% (Ma *et al.* 2014), may cause death of trees (ShiXing *et al.* 2011). This pest can kill host plants and is difficult to control (USDA 2014 citing Hou *et al.* 2011). While specific data are not available, additional control measures have been required in China in recent years in order to mitigate damage (USDA 2014 citing Sun and Wang 2010).

Other information: listed by USDA and Biosecurity Australia as a pest of quarantine significance in a PRA for apple from China (USDA 2014, Biosecurity Australia 2010).

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

References:

Biosecurity Australia 2010. Final import risk analysis report for fresh apple fruit from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra, 370 p.
Ma T, Li Y, Sun Z, Wen X 2014. (Z, E)-9, 12-Tetradecadien-1-Ol: a major sex pheromone component of *Euzophera pyriella* (Lepidoptera: Pyralididae) in Xinjiang, China. Florida Entomologist 97(2): 496-503.
USDA 2014. Importation of apples (*Malus pumila*) from China into the Continental United States - A Qualitative, Pathway-Initiated Pest Risk Assessment. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, 293 p.
Song MJ, Zhou NL, Zai YD, Zhang X (1994) A preliminary study on *Euzophera pyriella* Yang. *Plant Protection* **20**, 13-15
ShiXing H, Junbao HSW, Hua P 2011. Research Progress of *Euzophera pyriella*. Scientia Silvae Sinicae 9: 148-152.

Lacanobia subjuncta **(Lepidoptera: Noctuidae)**

Fruit pathway: larvae bore into fruit (Washington State University 2015).

Other pathways: plants for planting, soil; eggs on leaves, larvae also feed on leaves, pupae in soil (Washington State University 2015), larvae also attack shoots (Doerr *et al.* 2004)

Hosts: *Malus* (main), *Pyrus*, other trees, shrubs, weeds (Washington State University 2015)

Distribution: North America: USA (Doerr *et al.* 2004), Canada (PNM 2016).

Damage: larvae feed primarily on foliage and can defoliate entire growing shoots. Mature larvae can also cause significant levels of fruit injury when present in high densities. *L. subjuncta* is native to Washington but was not considered a pest in Washington State orchards before the 1990s (Washington State University 2015). Damage

became important in the late 1990s, when it caused more severe crop loss than any other pest in apple orchards in northwestern USA (Doerr *et al.* 2004). No new publication after 2005.

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

References:

Doerr MD, Brunner JF, Schrader LE 2004. Integrated pest management approach for a new pest, *Lacanobia subjuncta* (Lepidoptera: Noctuidae), in Washington apple orchards. Pest Management Science 60(10): 1025-1034.

Washington State University 2015. Orchard Pest Management, internet database. URL: http://jenny.tfrec.wsu.edu/opm/index.php (retrieved 2015 August 26)

PNM 2015. Pacific Northwest Moths Lacanobia subjuncta http://pnwmoths.biol.wwu.edu/browse/family-noctuidae/subfamily-noctuinae/tribe-hadenini/lacanobia/lacanobia-subjuncta/ (retrieved 2015 August 26)

***Lygocoris communis* (Heteroptera: Miridae)**

Fruit pathway: adults and nymphs feed on fruit; nymphs are more damaging than adults (Michaud *et al*. 1990)

Other pathways: plants for planting; eggs on twigs, nymphs also damage blossoms, adults also damage buds (Michaud *et al.* 1990)

Hosts: Polyphagous incl. *Malus domestica* (CABI CPC), *Pyrus* (Michigan State University 2015), *Rhus typhina* (CABI CPC), *Cornus racemosa*, *Ilex ambigua*, *Salix humifis* (Wheeler *et al.* 1983).

Distribution: North America: Canada, USA (Michaud *et al.* 1990, Wheeler *et al.* 1983)

Damage: The pest causes deformation, as well as scars or depressions in the fruit. Important pest in apple orchards in Quebec (Michaud *et al.* 1990); it has been an important pest of pears and apples in Nova Scotia in the 1920s, where damage sometimes resulted in total loss of an apple harvest (Wheeler 2001). Possible damage on other hosts was not considered here.

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

References:

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

Michaud OD, Stewart RK, Boivin G 1990. Susceptibility of apples to damage by *Lygocoris communis* and *Lygus lineolaris* (Hemiptera: Miridae). Phytoprotection 71(1): 25-30.

Michigan State University 2015. Integrated Pest management: Pear plant bug (green apple bug) *Lygus communis*. URL: http://www.ipm.msu.edu/insects/pear_plant_bug_green_apple_bug (accessed 2015 November 03)

Wheeler AG 2001. Biology of the plant bugs (Hemiptera: Miridae): pests, predators, opportunists. Cornell University Press, Ithaca, USA, 507 p.

Wheeler AG, Henry TJ, Mason TL 1983. An annotated list of the Miridae of West Virginia (Hemiptera-Heteroptera). Transactions of the American Entomological Society 109(1): 127-158.

***Lygus lineolaris* (Heteroptera: Miridae)**

Fruit pathway: eggs may be laid on fruit, nymphs and adults suck plant juice from fruit (Biosecurity New Zealand 2009)

Other pathways: plants for planting; eggs are also laid on stems, leaves and flowers, nymphs and adults also suck plant juice from buds, flowers and leaves (CABI CPC)

Hosts: Highly polyphagous, hosts include *Malus*, *Fragaria ananassa*, *Prunus*, *Pyrus*, *Rubus*, *Phaseolus*, *Solanum tuberosum*, *Zea mays* (CABI CPC)

Distribution: North America: USA, Canada, Mexico; Central America and Caribbean: Bermuda, El Salvador, Guatemala, Honduras (EPPO GD)

Damage: one of the key pests in Quebec apple orchards, may damage 30 % of apple buds in orchards (Michaud *et al.* 1990). Feeding on buds and new growth can cause yellowing and distortion of growing points. Feeding upon immature fruits can cause abscission of the fruiting body ('blasting'). Apples, peaches and other fruits can develop dimpling (catfacing) around the feeding sites (CPC). Damage has also been recorded in other crops, such as cucumber, blackberry, raspberry, grape, pepper, pear (EPPO 2015). *L. lineolaris* is regarded as most important pest of grain amaranth in North America (Wheeler 2001)

Other information: Was formerly present on the EPPO Alert list (1998-2008). A PRA was performed in 2000 (EPPO 2002) and concluded that the risk was not unacceptable (limited damage and restricted economic impact). However, there is still evidence of damage in the literature and this species was retained here. Quarantine pest for Israel 2009, Brazil 1995, Costa Rica 2012, Ecuador 2008, Japan 2011 (EPPO 2015). Biosecurity New Zealand requires risk mitigation measures for *L. lineolaris* for apple and other fruits from USA (Biosecurity New Zealand 2009).

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

References:

Biosecurity New Zealand 2009. Import Risk Analysis: Fresh stonefruit from Idaho, Oregon and Washington. Draft for public consultation. MAF Biosecurity New Zealand.

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

EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. URL: https://gd.eppo.int

EPPO 2002. Report of a Pest Risk Assessment: Lygus lineolaris (Palisot de Beauvois), the tarnished plant bug.

EPPO 2015. EPPO Technical Document No. 1068: EPPO Study on Pest Risks Associated with the Import of Tomato Fruit. European and Mediterranean Plant Protection Organization, Paris, France, 182 p.

Michaud OD, Stewart RK, Boivin G 1990. Susceptibility of apples to damage by *Lygocoris communis* and *Lygus lineolaris* (Hemiptera: Miridae).

Wheeler AG 2001. Biology of the plant bugs (Hemiptera: Miridae): pests, predators, opportunists. Cornell University Press, Ithaca, USA, 507 p.

***Pandemis pyrusana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on fruit (Dunley *et al.* 2006), eggs laid on fruit (Gilligan and Epstein 2014)

Other pathways: plants for planting; cut flowers, cut branches; eggs also laid on leaves, larvae also feed on foliage and overwinter on the bark, pupae in leaves (Gilligan and Epstein 2014)

Hosts: polyphagous, hosts include *Malus*, *Pyrus*, *Ribes*, *Prunus*, *Alnus*, *Rosa*, *Salix* (TortAI)

Distribution: North America: Canada, USA (Gilligan and Epstein 2014)

Damage: important pest in apples in Western USA (Dunley et al. 2006, Pfannenstiel et al. 2004), moderately important pest of apple, pear, cranberries in the Western US states and British Columbia (Cranshaw 2015)

Other information: *P. limitata* is a similar species in the distribution area of *P. pyrosana*, but its larvae feed only occasionally on fruit. Therefore *P. limitata* was not included in this List.

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Cranshaw W 2015. Garden insects of North America: the ultimate guide to backyard bugs. Princeton University Press.

Dunley JE, Brunner JF, Doerr MD, Beers EH 2006. Resistance and cross-resistance in populations of the leafrollers, *Choristoneura rosaceana* and *Pandemis pyrusana*, in Washington apples. Journal of Insect Science 6(1), article 14, 7 p.

Pfannenstiel RS, Szymanski M, Lacey LA, Brunner JF, Spence K 2004. Discovery of a granulovirus of *Pandemis pyrusana* (Lepidoptera: Tortricidae), a leafroller pest of apples in Washington. Journal of Invertebrate Pathology 86(3): 124-127.

Gilligan, Epstein 2014. TortAI. Internet database on tortricids of agricultural importance by TM Gilligan and ME Epstein. URL: http://idtools.org/id/leps/tortai/Pandemis_pyrusana.htm (accessed 2015 August 28)

***Platynota flavedana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on fruit (Gilligan and Epstein 2014).

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

Hosts: Polyphagous, hosts incl. *Malus* (Carde and Minks 1995), *Prunus*, *Citrus*, *Fragaria*, *Rosa*, *Gossypium*, *Rhododendron*, *Helianthemum* (Gilligan and Epstein 2014)

Distribution: North America: USA (Eastern part - Gilligan and Epstein 2014; Maine to North Carolina and west to Minnesota and Arizona - VirginiaFruit 2016); Caribbean; Jamaica (EPPO GD). Unconfirmed records from Hispaniola (Dominican Republic and Haiti) (Korycinska *et al.* 2014 citing others).

Damage: in Eastern USA important pest in apple production (Carde and Minks 1995). Even if, *P. flavedana* damaged up to 75% of apples in an area of Virginia, it is usually considered as a relatively minor apple pest, with varying damage potential depending on geographic region (FERA 2014). Possible damage on other hosts was not considered here.

Other information: Was present on the EPPO Alert list from 1998 to 2002, but deleted as alert has been given and no further concern raised. FERA 2014 concluded that "continued exclusion would seem the best option for the UK".

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Carde RT, Minks AK 1995. Control of moth pests by mating disruption: successes and constraints. Annual review of entomology 40(1): 559-585.

EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. URL: https://gd.eppo.int

FERA 2014. Rapid Pest Risk Analysis (PRA) for *Platynota flavedana*, *Platynota idaeusalis*, *Platynota rostrana*. The Food & Environment Research Agency, 22pp.

Gilligan and Epstein 2014 TortAI. Internet database on tortricids of agricultural importance by TM Gilligan and ME Epstein. URL: http://idtools.org/id/leps/tortai/Platynota_flavedana.htm (accessed 2015 August 28)

***Platynota idaeusalis* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on fruit (Gilligan and Epstein 2014)

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

Hosts: polyphagous, hosts include *Malus*, *Prunus*, *Pyrus* (CABI CPC), *Vaccinium*, *Vitis*, *Solanum*, *Clematis*, *Salix*, *Rubus*, *Betula*, *Pinus* (Gilligan and Epstein 2014)

Distribution: North America: Canada, USA (EPPO GD)

Damage: belongs to the most important leafroller pests in US apple production (Carde and Minks 1995), reduces quality of apples by direct feeding on the fruit (Meissner *et al*. 2001). Damaged fruits (highest damage level in Pennsylvania 6%) may not be marketable fresh, but suitable for processing. The main impact of this species is in apple crops, other hosts seems to be of importance mainly for overwintering (FERA 2014).

Other information: Was present on the EPPO Alert list from 1998 to 2002, but deleted as the alert has been given and no further concern raised. FERA 2014 concluded that "continued exclusion would seem the best option for the UK".

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

References:

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

Carde RT, Minks AK 1995. Control of moth pests by mating disruption: successes and constraints. Annual review of entomology 40(1): 559-585.

EPPO GD. EPPO Global Database, European and Mediterranean Plant Protection Organization, France. URL: https://gd.eppo.int

FERA 2014. Rapid Pest Risk Analysis (PRA) for *Platynota flavedana*, *Platynota idaeusalis*, *Platynota rostrana*. The Food & Environment Research Agency, 22pp.

Meissner HE, Walgenbach JF, Kennedy GG 2001. Effects of mating disruption and conventional pesticide treatments on populations of the tufted apple bud moth, *Platynota idaeusalis*, in North Carolina apple orchards. Crop Protection 20(5): 373-378.

Gilligan, Epstein 2014. Internet database on tortricids of agricultural importance by TM Gilligan and ME Epstein. URL: http://idtools.org/id/leps/tortai/Platynota_idaeusalis.htm (accessed 2015 September 02)

Pseudococcus maritimus **(Hemiptera: Pseudococcidae)**

Fruit pathway: *P. maritimus* is known to infest also the fruit of its host plants and it was intercepted several times on fruits. When mealybug populations are dense, they may enter the calyx ends of fruit, causing contamination problems on processed fruit (Biosecurity New Zealand 2009b).

Other pathways: Plants for planting. Larvae and females feed on leaves; females also wander to shoot forks (Goszczyński and Golan 2011). On any part of plants, incl. leaves, fruit, roots. Early stages damage the young roots of grapevines before moving up onto the vine to damage shoots, stems and fruit. The eggs overwinter in the soil near grapevine roots (Biosecurity Australia 2011). This species is mainly found on leaves and under bark on trunks (Biosecurity New Zealand 2009b).

Hosts: Many incl. *Malus*, *Vitis*, *Vaccinium*, *Persea*, *Passiflora*, *Pyrus*, *Rubus*, *Citrus* (Ben-Dov *et al.* 2016); *Vitis*, *Diospyros kaki* (Koch and Waterhouse 2000). In Poland, found indoors on *Abutilon striatum*, *Citrus grandis*, *Passiflora auriculata*, *P. quadrangularis*, *S. arboricola*; additionally *Pyrus*, *Prunus armeniaca* are mentioned (Goszczyński and Golan 2011).

Distribution: North America: Canada, Mexico, USA; Asia: Armenia, Indonesia (Garcia Morales *et al.* 2016; indicates that the pest seems confined to the New World and has frequently been misidentified as *Pseudococcus affinis*), China (Abudujapa and Sun 2007); South America: Argentina, Brazil, Chile, Colombia, French Guiana; Caribbean: Guadeloupe, Puerto Rico; Central America: Guatemala; Puerto Rico; Madeira (possibly misidentification) (Ben-Dov *et al.* 2016); Europe: Poland (indoors only, greenhouses, offices) (Goszczyński and Golan 2011). Former USSR, Hungary, NL (unconfirmed - CABI CPC). Not present in Hungary according to Kozar *et al.* (2013). No record found for the Netherlands.

Damage: *Pseudococcus maritimus* is the primary North American mealybug pest in vineyards (Daane *et al*. 2012). Since the 1970s *P. maritimus* is an increasingly severe pest of pears and apples in the Pacific Northwest. The most obvious damage it causes is due to secreted honeydew, which serves as a substrate for the development of sooty mould, preventing photosynthesis, but this is likely to be a problem only at high population densities (Biosecurity New Zealand 2009b). *P. maritimus* is one of the five important vineyard mealybug species in Brazil (da Silva *et al.* 2014). Damage also as vector of grapevine leafroll-associated virus-3 (GLRaV-3) (Daane *et al*. 2012, Grasswitz and James 2008).

Other information: The females are wingless, but mealybugs can disperse by wind within vineyards (Grasswitz and James 2008). Intercepted on table grapes (Biosecurity New Zealand 2009a) and apricot and pear fruit (Biosecurity New Zealand 2009b) to New Zealand. *P. maritimus* was intercepted 29 times between 1995 and 2012 in the USA (Miller et al. 2014.). Intercepted on *Citrus* and *Vitis* fruit in Korea, as well as on *Schefflera* (Suh *et al.* 2013). Intercepted on *Malus* fruits from US to Israel (Dropsa review). Proposed in answer to the EPPO questionnaire on pests of concern for *Vitis*. Biosecurity New Zealand requires risk mitigation measures for *P. maritimus* for apple and other fruits from USA (Biosecurity New Zealand 2009b).

Impact: High (also vector)	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:

Abudujapa T, Sun Y 2007. Studies on the occurrence law and control methods of *Pseudococcus maritimus* (Ehrhorn) in Moyu County. Xinjiang Agricultural Sciences 44(4): 476–480.

Ben-Dov Y, Miller DR, Gibson GAP 2016. ScaleNet. http://scalenet.info/catalogue/Pseudococcus%20maritimus/, accessed 2.11.2016.

Biosecurity Australia 2011. Final import risk analysis report for table grapes from the People's Republic of China. Department of Agriculture, Fisheries and Forestry, Canberra.

Biosecurity New Zealand 2009a. Import risk analysis: table grapes (*Vitis vinifera*) from China. MAF Biosecurity New Zealand, Wellington, New Zealand, 314 p.

Biosecurity New Zealand 2009b. Import Risk Analysis: Fresh stonefruit from Idaho, Oregon and Washington. Draft for public consultation. MAF Biosecurity New Zealand..

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

Daane KM, Almeida RPP, Bell VA, Walker JTS, Botton M, Fallahzadeh M *et al*. 2012. Biology and Management of Mealybugs in Vineyards. N.J. Bostanian et al. (eds.), Arthropod Management in Vineyards: Pests, Approaches, 271 and Future Directions, DOI 10.1007/978-94-007-4032-7_12,Springer Science+Business Media B.V. 2012, S. 271–307

Da Silva VCP, Bertin A, Blin A, Germain J, Bernadi, D, Rignol G, Botton M, Thibaut M 2014. Molecular and Morphological Identification of Mealybug species (Hemiptera: Pseudococcidae) in Brazilian Vineyards. PloS one 9(7). http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103267, accessed 2.11.2016.
Dropsa review 2016. Excel file of pests as Deliverable to the project, with background in : Steffen K, Grousset F, Petter F, Suffert M, Schrader G. 2016. EU-project DROPSA: first achievements regarding pathway analyses for fruit pests. Bulletin OEPP/EPPO Bulletin, 45 (1) : 148–152.
García Morales M, Denno BD, Miller DR, Miller GL, Ben-Dov Y, Hardy NB 2016. ScaleNet: A literature-based model of scale insect biology and systematics. Database. doi: 10.1093/database/bav118. http://scalenet.info.
Goszczyński W, Golan K 2011. Scale insects on ornamental plants in confined spaces. APHIDS AND OTHER HEMIPTEROUS INSECTS, 17, p.107-119.
Grasswitz TR, James DG 2008. Movement of grape mealybug, Pseudococcus maritimus, on and between host plants. Entomologia Experimentalis et Applicata 129, p. 268-275.
Miller D, Rung A, Parikh G, Venable G, Redford AJ, Evans GA, Gill RJ 2014. Scale Insects, Edition 2. USDA APHIS Identification Technology Program (ITP). Fort Collins, CO. http://idtools.org/id/scales/
Suh SJ, Yu HM, Hong K-J 2013. List of Intercepted Scale Insects at Korean Ports of Entry and Potential Invasive Species of Scale Insects to Korea (Hemiptera: Coccoidea). Korean J. Appl. Entomol. 52(2): 141-160.
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.
Kozar F, Benedictty ZK, Fetyko K, Kiss B, Szita E 2013. An annotated update of the scale insect checklist of Hungary (Hemiptera, Coccoidea). Zookeys 309, p. 49-66. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3689126/, accessed 2.11.2016.

***Rhynchites heros* (Coleoptera: Attelabidae)**

Fruit pathway: eggs are laid into young fruit (Katsumata 1934), larvae develop in fruit (Leschen and Beutel 2014)

Other pathways: plants for planting, soil; adults feed on buds, pupae in soil (Katsumata 1934)

Hosts: *Malus domestica*, *Pyrus*, *Prunus*, *Cydonia*, *Eriobotrya japonica* (Wilson and Graham 1983)

Distribution: Asia: China, Japan, Korea, Taiwan (Wilson and Graham 1983)

Damage: *R. heros* attacks many fruit crops and other plant species, can cause great damage and requires active management during the growing season. Adults feed on plants and fruit and oviposit in the fruit. Infestation can cause considerable fruit drop. Feeding by larval *Rhynchites* has also been shown to encourage infestations of the fungus *Sclerotinia fructigena* (a synonym of *Monilinia fructigena*) (Biosecurity Australia 2010). Pest of apples and sometimes also serious damage to pear (Katsumata 1934); common on apple throughout Japan, but also attacks pear, peach, plum, loquat and other fruits (Cornell University 2011).

Other information: listed as a medium risk for the import of apple from China in USDA 2014. Synonym: *Rhynchites coreanus, R. foveipennis*.

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

References:

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***Sparganothis sulfureana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on fruit (Gilligan and Epstein 2014)

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

Hosts: polyphagous (nearly 20 families), hosts include *Vaccinium* (main), *Malus, Citrus, Fragaria, Vitis, Aster, Hypericum, Mentha, Lilium, Larix, Picea, Salix, Zea mays* (Gilligan and Epstein 2014)

Distribution: North America: USA (CABI CPC), Canada (Martin 1966)

Damage: On apple, larvae feed on foliage until midsummer and after a second flight, larvae may feed on fruit in late summer causing pinhole or excavation damage. Economic infestations can be controlled by the use of selective (e.g., *Bacillus thuringiensis*) or broad-spectrum insecticides. (Michigan State University 2014). Severe pest in cranberries in a part of North America (Deutsch *et al.* 2014). This pest has become more serious in US apple orchards at some point, because it developed resistance to organophosphate insecticides (Agnello *et al.* 2015). Severe pest of cranberry in the Midwest and North-Eastern USA (Deutsch *et al.* 2014).

Impact: Moderate	**Intercepted:** Not known	**Spreading/invasive:** Not known

References:

Agnello M, Reissig WH, Nyrop JP, Kovach J, Morse RA 2015. Biology and management of apple arthropods. Cornell University Extension, Information Bulletin 231. URL: http://eap.mcgill.ca/CPAP_7.htm (accessed 01 December 2015)

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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Martin JL 1966. The Insect Ecology of Red Pine Plantations in Central Ontario: IV. The Crown Fauna. The Canadian Entomologist 98(01): 10-27.

Michigan State University 2014. Integrated Pest Management: Sparganothis fruitworm - *Sparganothis sulfureana* Clemens. Updated May 2014. URL: http://www.ipm.msu.edu/insects/sparganothis_fruitworm (accessed 01 December 2015)

***Spilonota prognathana* (Lepidoptera: Tortricidae)**

Fruit pathway: eggs are laid in the fruit and larvae bore into apple fruit (Kondo and Miyahara 1930, Gibanov and Sanin 1971, USDA 2014)

Other pathways: plants for planting; larvae also feed on leaves and buds and overwinter in cocoons in fallen leaves or on branches (Gibanov and Sanin 1971)

Hosts: *Malus*, *Crataegus* (Sytenko 1960), *Prunus* (Kondo and Miyahara 1930), *Pyrus* (Gibanov and Sanin 1971)

Distribution: Asia: China (Kondo and Miyahara 1930), Russia (far East) (Sytenko 1960), Japan (Zhang and Li 2005)

Damage: has caused crop losses of 77-85 % in apples in Russia (far East) (Sytenko 1960). Records from 1930 and 1973 indicate that *S. prognathana* has caused damage in northeastern Asia, Japan and Guangdong (Kwangtong), China (Chapman 1973; Kondo and Miyahara 1930 cited in USDA 2014). Possible damage on other hosts was not considered here.

Other information: USDA PRA (2014) concluded that consequences in case of introduction would be unnacceptable.

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

References:

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Kondo T, Miyahara T 1930. Fruit Borers and a Summary of their Life-histories in Kwangtung, China. Journal of Plant Protection 17: 85-94.

Sytenko LS 1960. On the specific composition of fruit moths in the Maritime Province. Entomologicheskoe obozrenie 39(3): 551-555.

USDA 2014. Importation of apples (Malus pumila) from China into the Continental United States - A Qualitative, Pathway-Initiated Pest Risk Assessment. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, 293 p.

Zhang AH, Li HH 2005. Catalogue of Eucosmini from China (Lepidoptera: Tortricidae). SHILAP Revista de Lepidopterología 33(131): 265-298.

***Teia anartoides* (Lepidoptera: Lymantriidae)**

Fruit pathway: considered here that larvae or pupae may become associated with apple fruit or packing material containing apple. No indication of a life stage on fruit, but possible association 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 *Malus*, , *Acacia*, *Eucalyptus*, *Pyrus*, *Prunus* (as cherry, apricot), *Cupressus*, *Pinus radiata*, *Passiflora*, *Rosa*, *Dahlia*, *Salix*, *Musa*, *Primula*, *Gladiolus* (Zespri, no date; CABI CPC), *Vaccinium* (Ireland and Wilk 2006).

Distribution: Oceania: Australia (CABI CPC); an occurence in New Zealand has been eradicated (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: Intercepted in NZ on packaging material (pupae), sea containers (adult) (MPI 2014). Note : the name 'painted apple moth' is used in Ireland and Wilk (2006). Females are flightless, ballooning larvae are the main means of dispersal (Suckling *et al.* 2007).

Impact: Moderate	**Intercepted:** Yes	**Spreading/invasive:** Yes

References:

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

Ireland G, Wilk P 2006. Blueberry production in northern NSW. Primefact 195, State of New South Wales through NSW Department of Primary Industries, 8 p.

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

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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. In: Area-wide Control of Insect Pests, Springer, Netherlands: 603-615.

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)

***Tortrix excessana* (Lepidoptera: Tortricidae)**

Fruit pathway: larvae feed on the fruit surface and young larvae may also enter the interior of an apple or pear through the calyx with no visible external damage (Gilligan and Epstein 2014, Biosecurity Australia 2006).

Other pathways: plants for planting; eggs are laid on leaves, larvae also feed on leaves and buds (Biosecurity Australia 2006)

Hosts: polyphagous, hosts include *Malus domestica*, *Actinidia chinensis*, *Prunus* spp. , *Pyrus*, *Vitis*, *Citrus* spp., *Diospyros*, *Vaccinium*, *Juglans*, *Camellia* (CABI CPC, Biosecurity Australia 2006), 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 (native); North America: Hawaii (USA, introduced) (Gilligan and Epstein 2014)

Damage: may cause economic damage by feeding directly on the surface of fruit (Gilligan and Epstein 2014); 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).

Other information: occasionally intercepted on *Malus*, *Prunus* or *Fragaria* (without indication of commodities; Gilligan and Epstein 2014). The pest was intercepted in the USA on blueberry fruit from NZ in 1985-2007 (USDA 2008) and fresh avocadoes from NZ to Australia. It is regulated in South Africa on fruits of kiwi and Vaccinium from New Zealand (MPI 2013), and in Australia for apple (Biosecurity Australia 2006). Synonym *Planotortrix excessana* used in CABI CPC and Biosecurity Australia (2006).

Impact: Moderate (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, 197 p.

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

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Gilligan and Epstein 2014. Internet database on tortricids of agricultural importance by TM Gilligan and ME Epstein. URL: http://idtools.org/id/leps/tortai/Planotortrix_excessana.htm

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. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Raleigh, USA, 85 p.