

# THE WHITEFLIES OF THE NETHERLANDS, INCLUDING TWO SPECIES NEW FOR THE DUTCH FAUNA (HEMIPTERA: ALEYRODIDAE)

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An annotated list is given of whitefly species of the Netherlands, occurring in the open, indoors in greenhouses and living rooms and those intercepted during import inspections. In this paper over 50 species are mentioned, 14 of which occur in the open, 6 species have been only found in greenhouses and 42 species have been intercepted during quarantine inspections. The majority of the observations stem from the period 1970-2010. *Aleurotuba jelinekii* and *Siphoninus immaculatus* are new for the Netherlands, occurring outdoors. Due to regular introductions of species living on traded plants the chance that new species will establish is enhancing.

## INTRODUCTION

Whiteflies (Aleyrodidae) are a poorly studied, small group of insects which are related to the scale insects (Coccoidea) and the aphids (Aphidoidea). It is one of the economically most important groups of insects found on crops and ornamental plants. In the past only Bink-Moenen (1976) paid attention to Aleyrodidae in the Netherlands resulting in the first inventory of this species group which occur in the open (Bink et al. 1980) and the discovery of a species new to science (Bink-Moenen 1976). Jansen (1998) listed the species found in greenhouses and during import interceptions. New and interesting observations were reported in the Annual Reports of the Plant Protection Service (Burger & Vierbergen 1991, Jansen 1994a, 1994b, 1994c, 1996, 1998, 1999, 2001a, 2001b, 2002a, 2002b). Because of regular trade and import resulting in new introductions, an update is needed concerning these three categories. In this paper over 50 species in total are mentioned, 14 of which occur outdoors, six species have been only found in greenhouses and 42 species have been intercepted during quarantine inspections. From the last two groups about 15 species could not be identified, partly due to the poor quality of the material but especially because of a lack of taxonomical knowledge. Taxa which could be identified to the genus level

were included in the species list. Aleyrodidae and the aforementioned related groups share the host induced variability: the phenomenon that the morphology of structures is dependent of the host plant. It has resulted in a lot of synonyms of e.g. *Bemisia tabaci* and *Trialeurodes vaporariorum* and this hampers the description of new taxa.

From the species occurring in the open two are of economic importance. *Aleyrodes proletella* was locally present on *Chelidonium majus* and *Brassica* crops but during the last fifteen years it has been spreading all over the country. It is quite common and very abundant in private gardens where it didn't occur before. It has become a pest on commercially grown cabbage crops as well. The related *A. loniceræ* occurs in high numbers in cold greenhouses. Two species are new to the Dutch fauna. The viburnum whitefly, *Aleurotuba jelinekii* is an exotic species originating from the Mediterranean region and *Siphoninus immaculatus* occurs in the open and has probably been overlooked in the past.

In greenhouses predominantly two species are found: *Bemisia tabaci* and *Trialeurodes vaporariorum* in commercial greenhouses. *Dialeurodes citri* and *Aleurothrixus floccosus* are found occasionally in greenhouses with a restricted use of pesticides or in which pesticides are prohibited in favour of biological control. A population of *Aleurotulus*



Figure 1. Microscopic view of *Aleurochiton aceris* on *Acer platanoides*, 27.x.2009, Heveadorp. Jansen.

All photos Maurice Jansen, unless stated otherwise.

Figuur 1. Microscopisch beeld van *Aleurochiton aceris* op *Acer platanoides*, 27.x.2009, Heveadorp. Alle foto's Maurice Jansen, tenzij anders vermeld.



Figure 2. Detail of posterior part of abdomen of *Aleurochiton aceris*.

Figuur 2. Detail van het achterste deel van het achterlijf van *Aleurochiton aceris*.

*nephrolepidis* has established on *Nephrolepis* in a botanical garden in Utrecht for more than fifteen years now. The last few years *Aleyrodes proletella* caused problems to greenhouse *Gerbera* crops near Rotterdam.

During the past two decades trade has increased enormously, resulting in an increasing number of whitefly species that were inadvertently transported. Almost each year new whitefly species are being detected in traded plants but due to the enormous quantities it is to be expected that



Figure 3. Puparia of *Aleurochiton aceris*, Wageningen, 27.x.2009.

Figuur 3. Poppen van *Aleurochiton aceris*, Wageningen, 27.x.2009.

only a part of the introductions are discovered. Regular inspections were carried out on consignments originating from 220 countries and more than 1700 plant species, resulting in 25 identified species and about 15 species that could not be identified yet. Most whitefly species were found on bonsai (penjing) plants imported from East-Asia and many other species were found on ornamental plants originating from countries across the world. The number of species on imported cut flowers is very low and is almost restricted to *Bemisia tabaci* and *Trialeurodes vaporariorum*. In Europe 26 alien whitefly species are listed to have become successfully established (Anonymous 2009), 17 of which were never observed during import interceptions in the Netherlands.

#### MATERIAL AND METHODS

Most samples were collected by inspectors of one of the inspection services: General Inspection Service (NAKTuinbouw), Plant Protection Service (PPS) and the Quality Inspection Service (KCB). Furthermore private persons, private companies, research institutes and universities contributed to the knowledge of this group by submitting specimens for identification. The majority of the ob-



Figure 4. Puparium of *Aleurochiton pseudoplatani* on *Acer pseudoplatanus*, Den Bosch, De Heinis 23.x.2008.  
 Figuur 4. Pop van *Aleurochiton pseudoplatani* op *Acer pseudoplatanus*, Den Bosch, De Heinis 23.x.2008.



Figure 5. Microscopic view of *Aleurochiton pseudoplatani*.  
 Figuur 5. Microscopisch beeld van *Aleurochiton pseudoplatani*.

servations stem from in the period 1970-2010. The specimens were studied using the technical and slide making procedures of the Dutch PPS. At present, for microscopic slides, specimens were macerated in 10% KOH, cleaned in ethanol 70%, stained in a mixture of lignin pink, Essig's aphid fluid and acid fuchsin, dehydrated in acetic acid and clove oil and mounted in Canada balsam. Slide-mounted and sometimes dry pinned specimens have been deposited at the collection of the PPS.

For the identification of species occurring in the open Martin et al. (2000) was used. The identification of greenhouse species and species of imports is very complicated. There is only a very limited number of keys available and a lot of species are still undescribed. Papers from various authors have been used such as Bink-Moenen (1983), Jensen (2001), Martin (1999) and Russell (1986).

#### SPECIES ACCOUNTS

The nomenclature is after Martin (1999). Unless otherwise stated the data mentioned are based on slide material from the PPS Wageningen and the collection of the Zoological Museum Amsterdam which includes the collection Bink-Moenen.

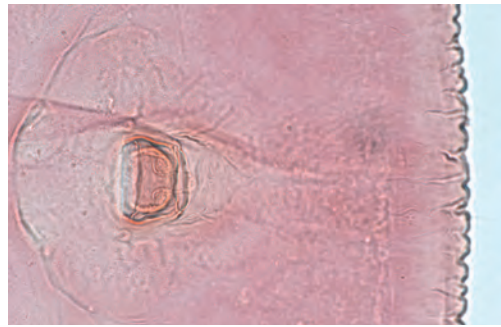


Figure 6. Detail of posterior part of abdomen of *Aleurochiton pseudoplatani*.  
 Figuur 6. Detail van het achterste deel van het achterlijf van *Aleurochiton pseudoplatani*.

#### Species occurring in the open

Records under Published observations are derived from Bink et al. (1980), unless stated otherwise. Host plants are only mentioned with the exception that observations of monophagous species that are always recorded on their host.

#### *Aleurochiton aceris* (Modeer, 1778) (fig. 1-3)

**Published observations** Amerongen, Arnhem, Bennekom, Broekhuizen, Leersum, Venlo.

**New observations** Venlo, 22.x.1969,

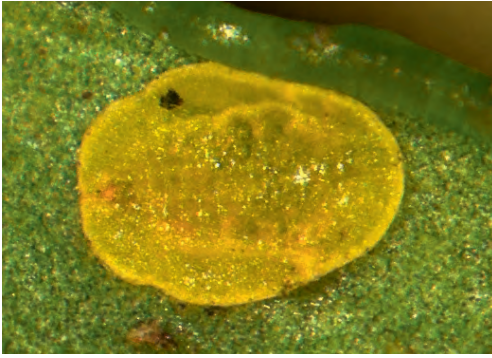


Figure 7. Puparium of *Aleuroclava similis* on a leaf of *Vaccinium vitis-idaea*, Ede, Planken Wambuis, 22.X.2009.

Figuur 7. Pop van *Aleuroclava similis* op een blad van *Vaccinium vitis-idaea*, Ede, Planken Wambuis, 22.X.2009.



Figure 8. Microscopic view of *Aleuroclava similis*.

Figuur 8. Microscopisch beeld van *Aleuroclava similis*.

A. van Frankenhuijzen; Valkenswaard, 5.IX.1995, M. Jansen; Heveadorp, 9.XI.200, M. Jansen & A. Loomans; Deelen, Deelensestart, 10.IX.2007, A. van Wely; Leersum, 16.VII.1976, R. Bink-Moenen, idem, 4.X.1976; idem, 16.VIII.1978; Ede, 5.VII.1976, R. Bink-Moenen; Rhenen, Grebbeberg, 26.X.2003, M. Jansen; idem, 6.X.2009; idem, 16.X.2010; Leersum, nabij Leersumse veld, 16.X.2010, M. Jansen; Heveadorp, 22.IX.2011, M. Cioffi & M. Jansen.

**Hosts** Monophagous on *Acer platanoides*.



Figure 9. Detail of posterior part of the abdomen of *Aleuroclava similis*.

Figuur 9. Detail van het achterste deel van het achterlijf van *Aleuroclava similis*.

### *Aleurochiton pseudoplatani* Visnya, 1936 (fig. 4-6)

**Published observations** Amerongen, Leersum, Lunteren, Rhenen, Schinveld, Valkenburg.

**New observations** Roermond, 18.XI.1994, J.

Woets; Heveadorp, 9.XI.2001, leg. M. Jansen & A. Loomans; Amerongen, IV.1977, F. Bink; idem, 28.IX.1975; Leersum, 8.VII.1976, F. Bink & R. Bink-Moenen; Schinveld, 21.VII.1976, F. Bink & R. Bink-Moenen; Valkenburg, 5.X.1976, F. Bink & R. Bink-Moenen; Heveadorp, Westerbouwing, 9.XI.2001, M. Jansen & A. Loomans; Den Bosch, de Heinis, 23.X.2008, 2 ex., W. den Hartog & M. Jansen; Heveadorp, 22.IX.2011, M. Cioffi & M. Jansen.

**Hosts** Monophagous on *Acer pseudoplatanus*.

### *Aleuroclava similis* (Takahashi, 1938) (fig. 7-9)

**Published observations** Arnhem, Ermelo, Mantinge, Korenburgerveen.

**New observations** Rozendaal, 3.VI.1976,

J. Woets, on *Vaccinium vitis-idaea*; Ede, Planken Wambuis, 22.X.2009, 15 ex. on *Vaccinium vitis-idaea*, M. Jansen.





Figure 10. Puparia of *Aleurotuba jelinekii* on *Viburnum tinus*, Tiel, 17.VII.2010.

Figuur 10. Poppen van *Aleurotuba jelinekii* op *Viburnum tinus*, Tiel, 17.VII.2010.



Figure 11. Puparium of *Aleurotuba jelinekii* on *Viburnum tinus*.

Figuur 11. Pop van of *Aleurotuba jelinekii* op *Viburnum tinus*.

**Hosts** *Eurya japonica*, *Ilex Leucothoe*, *Pieris japonica*, *Rhododendron* and *Vaccinium vitis-idaea*.

### *Aleurotuba jelinekii* (Frauenfeld, 1867) (fig. 10-12)

New to the Dutch fauna

**Observations** Capelle aan de IJssel, 4.IV.2003, R. van Donk; Capelle aan de IJssel, three shrubs which were bought 7-10 years ago 25.IV.2003, M. Jansen; Wageningen, on *V. tinus* and *V. davidii*, 13.XI.2003, A. Loomans; Goes, 12.II.2009, J. Woets, *V. tinus*; 's-Heer Arendskerke, 16.III.2009, J. Woets; Den Bosch, de Heinis, 23.X.2008, 2 ex., W. den Hartog & M. Jansen; Boskoop, grower, 13.X.2010, M. Jansen & A. de Wit, on *V. tinus*; Tiel, in public green, on *V. Tinus*, 17.VII.2010, 20 ex, M. Jansen.

**Hosts** *Viburnum tinus* is the normal host but it was also observed on *V. davidii* (pers. comm. A. Loomans). Elsewhere recorded from *Arbutus unedo*, *Arctostaphylos uva-ursi*, *Teucrium flavum* and *Myrtus communis* (Rapisarda 1982).

**Remarks** An introduced species originating from the Mediterranean region where it is a common and widespread species (Martin et al. 2000). The first interception was at the auction of Aalsmeer



Figure 12. Microscopic view of a puparium of *A. jelinekii*, Den Bosch, De Heinis, 23.X.2008.

Figuur 12. Microscopisch beeld van een pop van *A. jelinekii*, Den Bosch, De Heinis, 23.X.2008.

on *Viburnum* cut flowers, originating from Italy (Jansen 2002a). Its presence is a result of regular trade of the host plant to the Netherlands. New for the Dutch fauna and to consider as a synantropic and exotic species occurring in urban areas. It is to be expected in private gardens and in the public green where the main host plant *V. tinus* is growing. The species can be recognized by its evenly shining black puparium with white flocculent waxy curls. Adults aggregate on the underside of new leaves where the eggs are laid in wax-covered clusters, each containing up to thirty eggs. The species is univoltine with the adults



Figure 13. Microscopic view of the tubercles on the middorsum of the abdomen of the puparium of *Aleyrodes loniceræ* on *Ribes rubrum*, Randwijk, 29.III.2010.  
 Figuur 13. Microscopisch beeld van de tuberkels in het midden van het dorsale deel van de pop van *Aleyrodes loniceræ* op *Ribes rubrum*, Randwijk, 29.III.2010.

emerging at the end of May or early June and reaching peak numbers one or two weeks after their first appearance (Southwood et al. 1989).

***Aleyrodes loniceræ* Walker, 1852**  
**(fig. 13)**

strawberry whitefly

**Published observations** Amerongen, Amsterdam, Belt en Schutsloot, Bergen Bierlap, Castricum, De Cocksdorp, De Wijk, Emmeloord, Ermelo, 's Gravenzande, Havelte, Heemskerk, Heimans-tuin, Leiden, Mantinge, Oostvoorne, Oud Gastel, Rhenen, Rucphen, Schinveld, Savelsbos, Slenaken, Sorghvliet, Utrecht, Valkenburg, Vijlen, Wageningen, Wassenaar, Winterswijk, Zweeko.

**New observations** Zonnemaire, 15.I.1991, M. Jansen; Geldermalsen, 23.VIII.1993, M. Jansen; idem, 15.X.1993; Wageningen, on *Rubus*, 13.XI.2003, M. Jansen; Hoogezaand, on *Fragaria*, K. Amerika; Naarden, on *Aquilegia*, 2.XI.1981, A. van Frankenhuijzen; Dronten, on *Fragaria*, VIII.1967, PD Dronten; Bennekom, on *Fragaria*, 17.VII.1978, W. Vlasveld; Schiedam, on *Campanula*, 9.VIII.1989, G. Jonkers; Wilhelminadorp, 6.XI.1997, J. Woets; Zundert, 16.XI.2001,

M. Jansen & A. Loomans; idem, 14.X.2004; Rucphen, on *Rubus*, *Lonicera*, *Heracleum sphondylium*, *Lythrum salicaria* and *Filipendula ulmaria*; idem, 14.X.2004, M. Jansen & A. Loomans; Randwijk (in unheated greenhouse), 23.VI.2003, M. Jansen & K. van Zuidam; Haamstede, 21.IX.1992, 7 adults on *Lonicera*, M. Jansen; Boven-Leeuwen, in cold greenhouse, VI.2004, M. Jansen; Roosendaal, on *Rubus parviflorus*, 16.XI.2001, A. Loomans; Oud-Alblas, 27.III.2003, P. van de Meijden; Geldermalsen, 28.X.1993, M. Jansen; Amerongen, on *Campanula rapunculoides*, 4.VIII.1979, F. Bink & R. Bink-Moenen; Wijlre, on *Campanula trachelium*, 9.X.1976, F. Bink & R. Bink-Moenen; Oud Valkenburg, on *Campanula trachelium* and *Lapsana communis*, 5.X.1976, F. Bink & R. Bink-Moenen Meppel, on *Rubus*, 3.IV.1975, F. Bink & R. Bink-Moenen; Ubbergen, 4.II.1975, F. Bink & R. Bink-Moenen; Den Bosch, De Heinis, on *Symphoricarpus*, *Aegopodium podagrariae* and *Rubus caesius*, 23.X.2008, M. Jansen & W. den Hartog; Zaltbommel, heemtuin, on *Heracleum sphondylium*, 23.X.2008, M. Jansen & W. den Hartog; Zaltbommel, heemtuin on *Aegopodium podagraria*, *Heracleum sphondylium*, *Geum urbanum*, *Rubus caesius*, *Stachys sylvatica*, 22.IX.2011 M. Cioffi & M. Jansen.

**Hosts** Mound & Halsey (1978) and Evans (2007) recorded representatives of 23 plant families. Adults overwinter on their host. Although polyphagous, *Rubus caesius* is a host whereas on *R. fruticosus* it is much less common even when both species are growing together. Evans (2007) recorded a US Port interception on *Carthamus* (family Asteraceae) originating from the Netherlands.

***Aleyrodes proletella* (Linnaeus, 1758)**  
**(fig. 14-16)**

cabbage whitefly

**Published observations** Amerongen, Amstenrade, Axel, Bennekom, Castricum, 's-Gravenhage, 's- Gravenzande, Leersum, Lienden, Oostvoorne, Rockanje, Rucphen, St.-Annaland, Sittard,



Figure 14. Adult of *Aleyrodes proletella* on *Brassica*, Westmaas, 8.VI.2006.

Figuur 14. Adult van *Aleyrodes proletella* op *Brassica*, Westmaas, 8.VI.2006.



Figure 15. *Aleyrodes proletella* on *Euphorbia amygdaloides*, Raamsdonksveer, 11.IV.2008. The absence of tubercles and the presence of very short caudal setae are characteristic.

Figuur 15. *Aleyrodes proletella* op *Euphorbia amygdaloides*, Raamsdonksveer, 11.IV.2008. Het ontbreken van tuberkels en de aanwezigheid van heel korte caudale setae zijn karakteristiek.



Figure 16. Microscopic view of the puparium of *Aleyrodes proletella* on *Euphorbia amygdaloides*.

Figuur 16. Microscopisch beeld van de pop van *Aleyrodes proletella* op *Euphorbia amygdaloides*.

Terneuzen, Valkenburg, Veenendaal, Vlaardingen, Wijlre, Wijchen.

**New observations** Terhole, 16.VII.1973, M. Jansen; Hoorn, 7 adults, 2.II.1983, PD Hoorn; Haarlem, 10 adults 19.XI.1982, A.E. Wunderink; Axel, 10 pupae and 20 adults, 25.XI.1971, PD Terneuzen; Slenaken, on *Brassica*, 15.XII.1992, M. Jansen; Assen, on *Chelidonium majus*, 6.X.2005, A. Loomans; Woudenberg, on *Brassica oleracea* in a private garden, IX.2001, W. Schipper; Woudenberg, in very big numbers on *Brassica oleracea*, 7.X.2005; 's-Hertogenbosch, 23.X.2008, W. den Hartog & M. Jansen; Raamsdonksveer, on

*Euphorbia amygdaloides*, 11.IV.2008, M. Koning; Zevenhuizen, Plasweg, 2003, on *Brassica* culture, without natural enemies, 26.VIII.2003, leg. M. Jansen, A. Loomans & M. Vlaswinkel; Heinenoord, alongside N217, commercial culture of *Brassica*, heavy infestation, 23.VIII.2003; Heerjansdam, commercial *Brassica* culture, 23.VIII.2003, M. Jansen, A. Loomans & M. Vlaswinkel; Rijsoord, high infestation in culture with organic production, 23.VIII.2003, M. Jansen, A. Loomans & M. Vlaswinkel; Heveadorp, on *Chelidonium majus*, 22.IX.2011, leg. M. Cioffi & M. Jansen.

**Hosts** The species is recorded from representatives of 14 plant families (Mound & Halsey 1978, Evans 2007) from which *Chelidonium majus*, *Brassica* especially the varieties borecole (kale), Brussels sprout and green cabbage are the main host plants.

**Remarks** The presence in the field showed a dramatic change in the mid ninetens of the 20<sup>th</sup> century. At first a lot of private owners announced the species in their vegetable garden, followed by the presence in greenhouses and problems in commercial cabbage fields. Many persons noted





Figure 17. Puparium of *Aleyrodes* sp., Ridderkerk, *Cucumis sativus*, greenhouse, 2.XI.2006.

Figuur 17. Pop van *Aleyrodes* sp., Ridderkerk, *Cucumis sativus*, greenhouse, 2.XI.2006.

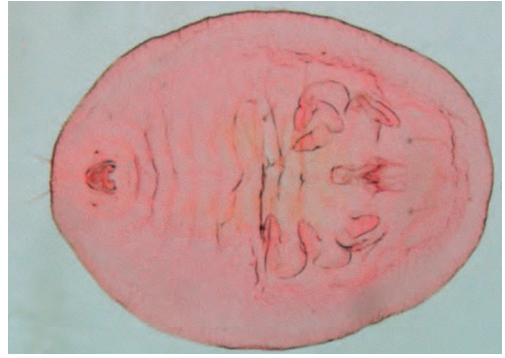


Figure 18. Microscopic view of the puparium of *Aleyrodes* sp., Westmaas, 8.VI.2006 on *Sinapis arvensis* between cultivated *Brassica* infested with *A. proletella*. The combination of long caudal setae, long dorsal disc setae and the absence of tubercles are striking.

Figuur 18. Microscopisch beeld van de pop van *Aleyrodes* sp., Westmaas, 8.VI.2006 op *Sinapis arvensis* tussen koolplanten met *A. proletella*. De combinatie van lange caudale setae, lange dorsale seate op de rest van het lichaam en de afwezigheid van tuberkels is opvallend.

that the species didn't occur in the preceding five decades. Although sometimes abundant the species had a fairly local presence on *Brassica* crops up to 1995 although it was common present on *Chelidonium majus*. Within a few years the species became an important pest species in commercial cabbage fields in the neighbourhood of Rotterdam where it was present in very high densities which were hardly affected by spraying with pesticides. In other parts of the country however the populations stayed very small. The species has four or five overlapping generations per year.

### *Aleyrodes* sp. (fig. 17-18)

**New observations** Strijen, adults on *Sonchus asper*, *Thlaspi arvense*, *Heracleum sphondylium* and *Symphytum officinale* next to a cabbage field, 8.XI.2006, M. Jansen & P. van der Meijden; Boskoop, on *Hypericum*, 24.XI.2003, J. Budding; Zaltbommel, on *Rumex crispus*, *Plantago major* and *Impatiens glandulifera*, 23.X.2008, W. den Hartog & M. Jansen; Westmaas, 6 adults, 10 pupal cases and eggs on *Sinapis arvensis* between *Brassica*, 8.XI.2006, M. Jansen, P. van der Meijden & M. Vlaswinkel; Rucphen, adults on *Lamium maculatum* and *Geum urbanum*,

3.III.2009, M. Jansen; Vierpolders, on *Raphanus sativus*, 13.X.2006, P. van der Meijden.

**Remarks** The abovementioned specimens could not be properly identified because of the presence of intermediate characters between *A. proletella* and *A. loniceriae*, as reported by Láska & Zelenková (1988) from greenhouses.

A comparison of morphological and molecular characters is needed to confirm the status of these species. The characters seem related to the host plant which suggests that these are not separate species. *Aleyrodes proletella* has predominantly been recorded from *Brassica* and *Chelidonium majus* whereas *A. loniceriae* is recorded from *Rubus* and *Fragaria*. Between both extremes there are populations with intermediate morphological structures on less recorded host plants such as *Hypericum* and *Cucumis*. Host induced variability is a common phenomenon in the Aleyrodidae, Coccoidea and Aphidoidea. The expression of the extreme plasticity of characters of the whiteflies *Trialeurodes vaporariorum*, *Bemisia tabaci* and of the soft scales *Pulvinaria vitis* and *Parthenolecanium corni*





Figure 19. Microscopic view of the puparium of *Asterobemisia carpini* on *Vaccinium myrtillus*, 22.x.2009.  
 Figuur 19. Microscopisch beeld van de pop van *Asterobemisia carpini* op *Vaccinium myrtillus*, 22.x.2009.



Figure 20. Microscopic view of the posterior part of abdomen of the puparium of *Asterobemisia carpini*.  
 Figuur 20. Microscopisch beeld van het achterste deel van het achterlijf van de pop van *Asterobemisia carpini*

not only suggests that it is a common phenomenon in these species groups but also that research is needed to clarify the status of the species.

### *Asterobemisia carpini* (Koch, 1857) (fig. 19-21)

**Published observations** Rhenen, Sint Geertruid, Slenaken, Vijlen on *Rubus fruticosus*, Amerongen on *Vaccinium myrtillus*, Wijchen possibly on *Corylus avellana*.

**New observations** Borgharen, on *Rubus fruticosus*, 3/18.xi.1977, J. Woets; Ede, Planken Wambuis, 15 ex. on *Vaccinium myrtillus*, 22.x.2009, M. Jansen.

**Hosts** Known to be associated with the representatives of 15 plant families listed by Mound & Halsey (1978).

### *Massilieuroides chittendeni* (Laing, 1928) (fig. 22-24)

**Published observations** Bennekom, Deventer, Leersum, Amerongen, Smilde.

**New observations** Vorden, 9.vi.1958, PD Assen; Deventer, 8 pupal cases, 9.iv.1958, PD Wage-



Figure 21. Puparium of *Asterobemisia carpini* on *Vaccinium myrtillus*.  
 Figuur 21. Pop van *Asterobemisia carpini* op *Vaccinium myrtillus*.

ningen; Boskoop, 6.viii.1991, PD Boskoop; Driebergen, v.1982, W. v.d. Kam; Epe, 1 adult and 10 pupal cases, 7.vi.1982, E. Leenaars; Nationaal Park De Hoge Veluwe, 6.vi.2000, M. Jansen; Heveadorp, 9.xi.2001 M. Jansen & A. Loomans; Heveadorp, 22.ix.2011, M. Cioffi & M. Jansen; Heijen, 20.x.2004, H. Lemmen; Leersum, Boswachterij, 2 pupal cases, 8.vi.1997, M. Jansen; Leersum, Boswachterij, 1 nymph, 16.x.2010, M. Jansen; Wassenaar, 30.v.2007, J.G. de Zeeuw. All observations on *Rhododendron*.

**Hosts** Monophagous on *Rhododendron*.



Figure 22. Puparium of *Massilieuroides chittendeni* on *Rhododendron*, Leersum, Boswachterij, 2.VIII.2010.  
 Figuur 22. Pop van *Massilieuroides chittendeni* op *Rhododendron*, Leersum, Boswachterij, 2.VIII.2010.



Figure 23. Adult of *Massilieuroides chittendeni*.  
 Figuur 23. Adult van *Massilieuroides chittendeni*.



Figure 24. Microscopic view of the puparium of *Massilieuroides chittendeni*, Smilde, *Rhododendron* 21.IV.1967.  
 Figuur 24. Microscopisch beeld van de pop van *Massilieuroides chittendeni*, Smilde, *Rhododendron* 21.IV.1967.

***Pealius quercus* (Signoret, 1868)**  
 (fig. 25-26)

**Published observations** Terschelling-Hoorn, Lunteren, Beekbergen, Arnhem, Velp, Rheden, Rozendaal, Leersum, Amerongen, Rhenen, Rijsbergen, Valkenburg, Vijlen.

**New observations** Renkum, on *Quercus*, 27.VII.1995, A. Loomans; Amerongen, Galgenberg, on *Quercus*, 20.VI.1995, M. Jansen; Dieren, on *Fagus sylvatica*, 2.XI.1975, J. Woets; Heveadorp, on *Castanea sativa* and *Corylus avellana*, 9.XI.2001, M. Jansen & A. Loomans; Vijlen, Vijlener bossen,

on *Corylus avellana*, 5.X.1975, Jaap Woets; Velp, on *Fagus sylvatica*, 17.IV.1977, Frits Bink & Rosita Bink-Moenen; Wageningen, about 25 specimens on *Quercus robur* and 2 specimens on *Q. rubra*, 21.V.2004, A. Loomans; Heijen, on *Quercus rubra*, 20.X.2004, H. Lemmen; Leersum, 't Zwart, on *Quercus robur*, 16.V.2004, A. Loomans; Ede, on *Fagus sylvatica*, 21.X.2008, W. den Hartog; Wageningen-Hoog, on *Quercus rubra*, 15.X.2009, A. Loomans; Heveadorp, on *Corylus avellana*, 22.IX.2011, M. Cioffi & M. Jansen.

**Hosts** Mound & Halsey (1978) and Evans (2007) recorded this species from representatives of four plant families: Betulaceae, Fagaceae, Tiliaceae and Urticaceae. In the Netherlands the species has been found on *Castanea sativa*, *Fagus sylvatica*, *Corylus avellana*, *Quercus robur*, *Quercus rubra* and *Quercus petraea*.

***Siphoninus immaculatus* (Heeger, 1856)**  
 (fig. 27)

New to the Dutch fauna

**Observations** Vlodrop-Station, Nationaal Park De Meinweg, on *Hedera helix*, 17.VI.2004, M. Jansen, 15 pupal cases on one top leaf of a branch of the host growing on the bark of a *Fagus* tree alongside the road in a sheltered position in the wood. The first three nymphal stages are almost translucent



Figure 25. Microscopic view of the posterior part of the abdomen of a puparium of *Pealius quercus* on *Fagus sylvatica*, Ede, 21.x.2008.

Figuur 25. Microscopisch beeld van het achterste deel van het achterlijf van de pop van *Pealius quercus* on *Fagus sylvatica*, Ede, 21.x.2008.

whereas the last nymphal stage or puparium has a wide dark brown to black dorsal line, hampering their recognition in the field with the naked eye. Scrutinizing the leaves under the stereo microscope greatly enhances the chance to find species.

**Hosts** In the Netherlands monophagous on *Hedera helix*. Abroad also known from *Hedera canariensis* and *Citrus* (Evans 2007).

**Remarks** This species occurs in almost the whole of Europe but is sparsely recorded although normally present in dense colonies. Mound (1966) recorded it as widespread but infrequent throughout Southern England. There is one generation and adults are present from the beginning of June to the first half of July. After the birth of the crawlers there is a diapause period of 60 days from the second half of August till the first half of October (Bink 1980). The species hibernates in the second stage. The adult females seldomly



Figure 26. Puparium of *Pealius quercus* op *Fagus sylvatica*.  
Figuur 26. Pop van *Pealius quercus* on *Fagus sylvatica*.

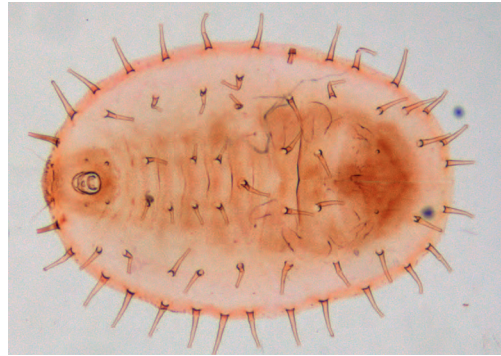


Figure 27. Microscopic view of the puparium of *Siphoninus immaculatus* on *Hedera helix*, Vlodrop-Station, Nationaal Park De Meinweg, 17.vi.2004.

Figuur 27. Microscopisch beeld van de pop van *Siphoninus immaculatus* op *Hedera helix*, Vlodrop-Station, Nationaal Park De Meinweg, 17.vi.2004.

fly. They live about 2-3 weeks and stay very long on the same leaf. They lay about 80 eggs. Rearing is easy, provided that the culture is kept in the shadow (Bink 1980).

### *Siphoninus phillyreae* (Haliday, 1835) (fig. 28-29)

**Published observations** Wageningen (Jansen 1994c, Jansen & Stigter 1995).

**New observations** Bennekom, on *Chaenomeles speciosus*, 1.xi.1998, F. Bink; Blokker (prov. Noord-





Figure 28. Puparia of *Siphoninus phillyreae* on *Crataegus monogyna*, Zoelen, Zoelense bos, 4.x.2009.

Figuur 28. Poppen van *Siphoninus phillyreae* op *Crataegus monogyna*, Zoelen, Zoelense bos, 4.x.2009.



Figure 29. Microscopic view of a puparium of *Siphoninus phillyreae*.

Figuur 29. Microscopisch beeld van de pop van *Siphoninus phillyreae*.



Figure 30. Microscopic view of a puparium of *Tetralticia ericae*.

Figuur 30. Microscopisch beeld van een pop van *Tetralticia ericae*.



Figure 31. Puparium of *Tetralticia ericae* on *Erica tetralix*, Vlodrop-Station, Meinweg, 17.VI.2010.

Figuur 31. Pop van *Tetralticia ericae* op *Erica tetralix*, Vlodrop-Station, Meinweg, 17.VI.2010.

Holland), on *Pyrus*, 20.IX.2000, M. Jansen; Beusichem, De Meent, on *Crataegus monogyna*, 12.x.2008, M. Jansen; Zoelen, Zoelense bos, on *Crataegus monogyna*, 4.x.2009, M. Jansen; Heveadorp, on *Crataegus monogyna*, 22.IX.2011, M. Cioffi & M. Jansen.

**Hosts** The species refers woody hosts in the Oleaceae, Lythraceae and Rosaceae, particularly *Crataegus*, *Fraxinus*, *Olea*, *Phillyrea* and *Pyrus* (Martin et al. 2000). Other hosts: *Citrus*, *Phillyrea latifolia*, *Pyrus communis*, *Crataegus monogyna* and *Punica granatum* (in Albania).

### *Tetralticia ericae* Harrison, 1917 (fig. 30-31)

**Published observations** Mantinge, Havelte, Zwartemeer, Weerribben, Haaksbergen, Raalte, Ermelo, Wekeromse zand, Arnhem, Velp, Korenburgerveen, Winterswijk, Leersum, Amerongen, Zundert, Ulicoten, Loon op Zand, Schinveld (Bink et al. 1980).

**New observations** Veenendaal, 4.VI.1975, F. Bink & R. Bink-Moenen; IJsselham, 29.VII.1977, F. Bink & R. Bink-Moenen; Vlodrop-Station,





Figure 32. Dorsal view on puparium of *Trialeurodes ericae* on *Erica tetralix*, Meinweg, 17.VI.2010.

Figuur 32. Rugzijde van de pop van *Trialeurodes ericae* op *Erica tetralix*, Meinweg, 17.VI.2010. Foto Maurice Jansen.



Figure 32. Dorsal view on puparium of *Trialeurodes ericae* on *Erica tetralix*, Meinweg, 17.VI.2010.

Figuur 32. Rugzijde van de pop van *Trialeurodes ericae* op *Erica tetralix*, Meinweg, 17.VI.2010. Foto Maurice Jansen.

Meinweg, 17.VI.2004, M. Jansen; Vlodrop-Station, Meinweg, 17.VI.2010, leg. M. Jansen.  
**Hosts** Monophagous on *Erica tetralix*.

***Trialeurodes ericae* Bink-Moenen, 1976 (fig. 32-34)**

**Published observations** Terschelling, Beetsterszwaag, Fochtelooëerveen, Norg, Assen, Diever, Mantinge, Dwingelo, Javelte, Zwartemeer, Weerribben, Giethoorn, Staphorst, Haaksbergen, Ermelo, Harskamp, Beekbergen, Loenermark, Wekeromse zand, Ede, Arnhem, Velp, Rheden, Winterswijk, Korenburgerveen, Lievelede, Leersum, Amerongen, Veenendaal, Calantsoog, Zundert, Chaam, Ulicoten, Loon op Zand and Schin op Geul (Bink et al. 1980). According to Woets (2002, pers. comm.) the species is as common as its host.

**New observations** Nieuw-Milligen, 27.V.2003, M. Jansen; Veenendaal, 27.VII.1997, M. Jansen; Vlodrop-Station, Meinweg, 17.VI.2004, M. Jansen; Vlodrop-Station, Meinweg, 17.VI.2010, M. Jansen.

**Hosts** Monophagous on *Erica tetralix*.



Figure 34. Microscopic view of a puparium of *Trialeurodes ericae*.

Figuur 34. Microscopisch beeld van een pop van *Trialeurodes ericae*.

***Trialeurodes vaporariorum* (Westwood, 1856) (fig. 35-39)**

**Published observations** Bennekom, Amerongen, Rhenen, Amsterdam

**New observations** Berkel en Rodenrijs, on *Polygonum*, 8.IX.1971, J. Woets; Zundert, on *Tilia cordata* and *Fraxinus excelsior*, 16.XI.2001, A. Loomans; Zundert, on *Catalpa bignonioides* and *Viburnum opulus*, 14.X.2004, M. Jansen & A. Loomans; Naaldwijk, on *Ageratum*, 7.IX.1971, J. Woets; Bleiswijk, on *Epilobium parviflorum*, *Sonchus asper*, *S. oleraceus*, 30.IX.2008, W. den



Figure 35. Adult of *Trialeurodes vaporariorum* on *Gerbera*, Klazienaveen, 13.III.2009.

Figuur 35. Adult van *Trialeurodes vaporariorum* op *Gerbera*, Klazienaveen, 13.III.2009.



Figure 36. Pupal case of *Trialeurodes vaporariorum* on tomato, Wageningen, 20.VII.2010.

Figuur 36. Lege pop van *Trialeurodes vaporariorum* op tomato, Wageningen, 20.VII.2010.



Figure 37. Puparium of *Trialeurodes vaporariorum* on *Gerbera*, Klazienaveen, 13.III.2009. The spotty appearance occurs in a small part of the populations.

Figuur 37. Pop van *Trialeurodes vaporariorum* op *Gerbera*, Klazienaveen, 13.III.2009. Het vlekkenpatroon komt voor in een klein deel van de populaties.

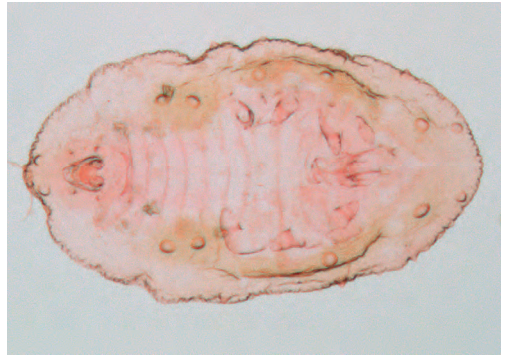


Figure 38. Microscopic view of a spotty coloured puparium of *Trialeurodes vaporariorum* on *Conyza sumatrensis*, Maasland, 17.X.2008.

Figuur 38. Microscopisch beeld van een gevlekte pop van *Trialeurodes vaporariorum* op *Conyza sumatrensis*, Maasland, 17.X.2008.



Figure 39. Microscopic view of a puparium of *Trialeurodes vaporariorum* on *Solidago*, Honselersdijk, import Kenya, 30.XI.2010.

Figuur 39. Microscopisch beeld van een pop van *Trialeurodes vaporariorum* op *Solidago*, Honselersdijk, import Kenia, 30.XI.2010.



Figure 40. Puparium of *Aleurocanthus spiniferus* on *Camellia sinensis*, Bergsenhoek, import China, 9.XII.2005.  
 Figuur 40. Pop van *Aleurocanthus spiniferus* op *Camellia sinensis*, Bergsenhoek, import China, 9.XII.2005.



Figure 41. Puparia of *Aleurocanthus spiniferus* on *Citrus*, Italy, Gallipoli, 2009. Photo Francesco Porcelli.  
 Figuur 41. Poppen van *Aleurocanthus spiniferus* op *Citrus*, Italy, Gallipoli, 2009. Foto Francesco Porcelli.

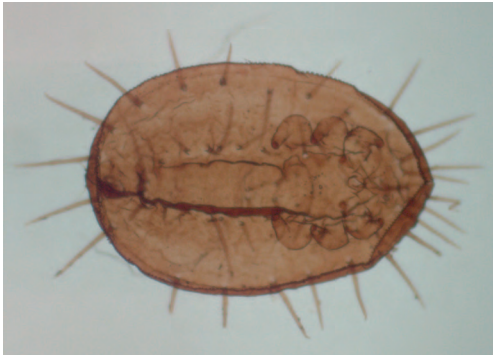


Figure 42. Microscopic view of a puparium of *Aleurocanthus spiniferus* on *Citrus*, Italy, Gallipoli, 2009. Photo Francesco Porcelli.  
 Figuur 42. Microscopisch beeld van een pop van *Aleurocanthus spiniferus* op *Citrus*, Italy, Gallipoli, 2009. Foto Francesco Porcelli.



Figure 43. Adults of *Aleurocanthus spiniferus* on *Citrus*, Italy, Gallipoli, 2009. Photo Francesco Porcelli.  
 Figuur 43. Adulten van *Aleurocanthus spiniferus* op *Citrus*, Italy, Gallipoli, 2009. Foto Francesco Porcelli.

Hartog; Amerongen, on *Chelidonium majus*, 12.III.1975, F. Bink & R. Bink-Moenen; Maas-dijk, on *Sonchus oleraceus*, 17.X.2008, W. den Hartog; Zaltbommel, on *Pawlonia tomentosa*, *Humulus lupulus* and *Helianthus annuus*, 23.X.2008, M. Jansen & W. den Hartog; Zevenhuizen, Plasweg, on *Brassica* culture 26.VIII.2003, M. Jansen, A. Loomans & M. Vlaswinkel.  
**Hosts** *Fraxinus excelsior* (Ripka et al. 1996), *Bryonia dioica*, *Viburnum opulus*, *Lapsana communis*, *Mentha aquatica*, *Chelidonium majus*, *Solanum lycopersicum*, *Angelica archangelica* (Bink et al.

1980). These are the hosts in the open.  
**Remarks** In 1982 the species was present in the potato growing season in the experimental garden at the Plant Protection Service in Wageningen. The population density was so high that the species was difficult to control with pesticides (pers. comm. G. Willems). Maybe the species overwinters in the field, but up to now there are no observations of overwintering specimens in the field. Overwintering specimens of other species e.g. the common *Aleyrodes proletella* are hard to find in the field as well. A second possibility is



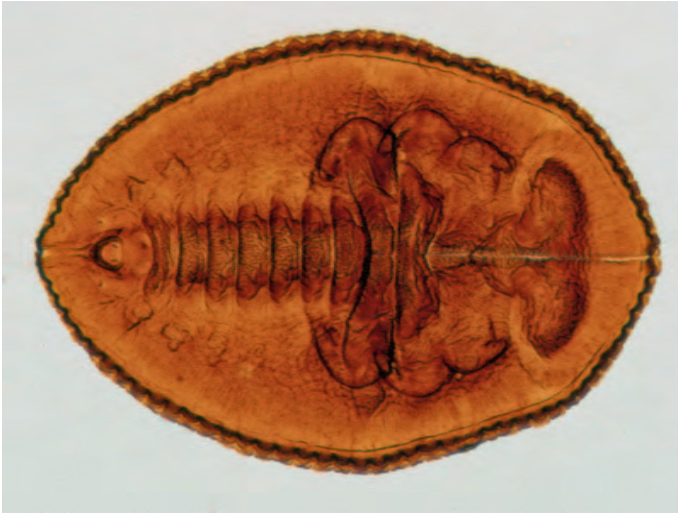


Figure 44. Microscopic view of *Aleurolobus marlatti* on *Pyracantha*, Bleiswijk, 11.II.1999.  
 Figuur 44. Microscopisch beeld van *Aleurolobus marlatti* op *Pyracantha*, Bleiswijk, 11.II.1999.

that these high numbers on potato in the field originate from specimens escaped from greenhouses during spring. Additional observations and experiments are needed to test these hypotheses. Although the species does not overwinter near Kursk (Russia) near the northern border with Ukraine (Kulik & Timoshin 1990) the species was reported to cause seasonal damage to vegetables among other plants and these serve as a source of re-infestation of greenhouses during the summer. Possibilities for outdoor overwintering appear very limited in the temperate climate and Hussey (1981) stated that the pest can survive the winter on outdoor weeds in the United Kingdom at least until such plants are killed off by a succession of severe frosts. After mild winters, infestations in glasshouses may originate from these overwintering sources depending on the phytosanitary hygiene in the greenhouse by removing weeds from which new infestations may start.

#### Species from greenhouses and living rooms

#### *Aleurocanthus spiniferus* (Quaintance, 1903) (fig. 40-43)

Specimens were found once in a commercial greenhouse on a *Fortunella* bonsai at Vleuten in 1989. The species has a quarantine status on the

II/AI European quarantine list which means that after discovery eradication measures are mandatory. In 2008 the species was reported as introduced, acclimatized and spreading in southern Italy (Porcelli 2008) where it causes severe damage to citrus orchards and is a nuisance to several other host plant species such as *Vitis*, *Parthenocissus tricuspidata*, *Hedera helix*, *Fatsia*, *Diospyros kaki*, *Laurus nobilis*, *Malva*, *Ficus carica*, *Morus alba*, *Punica granatum*, *Hybiscus rosa-sinensis*, *Prunus armeniaca*, *Cydonia*, *Malus*, *Pyrus*, *Rosa*, *Pyracantha coccinea*, *Prunus domestica* and *Eryobotrya japonica* (pers. comm. F. Porcelli & M. Cioffi). The species is very polyphagous and known from 22 plant families. The species originates from Southern Asia and Oceania and has spread to several African countries and Hawaii (Jeffers 2009).

#### *Aleurolobus marlatti* (Quaintance, 1903) (fig. 44)

= *niloticus* Priesner & Hosny, 1934

This polyphagous species is known from a wide variety of mostly woody hosts, representatives of at least 24 plant families (Mound & Halsey 1978). It causes the drying up and die back of the leaves. Once it was found in a greenhouse on a





Figure 45. Microscopic view of detail of posterior abdominal part of *Aleurotrachelus trachoides* on leaves of an unidentified plant, Schiphol, import Suriname, 24.IX.2009.  
 Figuur 45. Microscopisch beeld van een detail van het achterlijf van *Aleurotrachelus trachoides* op bladeren van een ongeïdentificeerde plant, Schiphol, import Suriname, 24.IX.2009.



Figure 46. Microscopic view of a puparium of *Aleurotrachelus trachoides*.  
 Figuur 46. Microscopisch beeld van een pop van *Aleurotrachelus trachoides*.

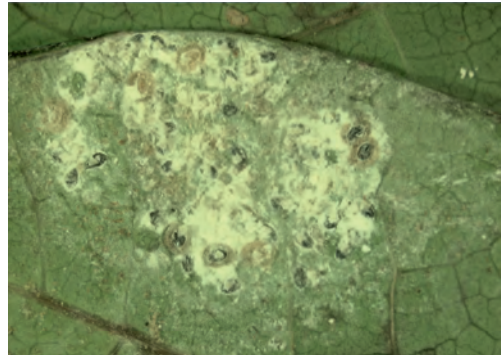


Figure 47. Puparia and wax of *Aleurotrachelus trachoides* on leaves of an unidentified plant, Schiphol, import Suriname, 24.IX.2009.  
 Figuur 47. Poppen en wasafscheiding van *Aleurotrachelus trachoides* op bladeren van een onbekende plant, Schiphol, import Suriname, 24.IX.2009.

*Pyracantha* bonsai at Bleiswijk in 1999. The species is very regularly transported by trade from many countries to all parts of the world (Evans 2007). The present distribution includes Australia, the Middle East, northern Africa, the Oriental and Austro-Oriental regions (Martin 1999).

***Aleurotrachelus trachoides* (Back, 1912)  
 (fig. 45-47)**

In 1987 orchids originating from Venezuela and growing in the greenhouse of the Hortus Botanicus of Leiden (Burger 1988) were infested by this whitefly that originates from Central and South America. It is a very polyphagous species, listed from 28 plant families (Evans 2007). The population vanished after some time without any measures taken.

***Aleurothrixus floccosus* (Maskell, 1895)  
 (fig. 48-49)**

**Observations** Emmen, Noorder Dierenpark, 27.I.1988 leg. R. Schreuder, on *Citrus*; Malden, 16.VII.1993, leg. A. Tonk, *Citrus sinensis*; De Kwakel, 9.XI.1994, leg. A. Klaver, on *Citrus*; Malden, 19.I.1995, leg. PD Tiel, on *Citrus*; Malden, 2.XI.1995 on *Eugenia uniflora*; Naaldwijk, 9.XII.1996, leg. H. Oord, on *Citrus*; Rijsenhout, 5.IX.2001, leg. R. Verhoog & J. Starre, on *Citrus*;

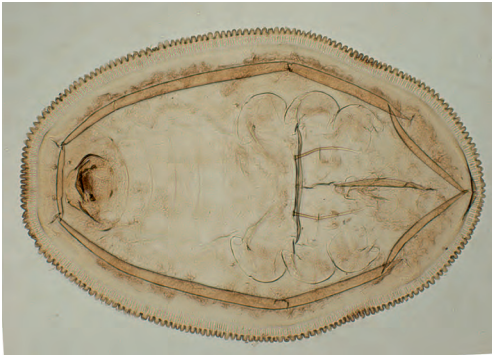


Figure 48. Microscopic view of a puparium of *Aleurothrix floccosus* on *Citrus*, import Portugal, Algarve, VIII.1984.

Figuur 48. Microscopisch beeld van een pop van *Aleurothrix floccosus* op *Citrus*, import Portugal, Algarve, VIII.1984.

Rijssenhout, 21.VIII.2002, leg. A. van Wijk, on *Citrus*.

Burger & Vierbergen (1991) recorded this species from specimens found on *Citrus*, *Eugenia* and *Olea* in commercial greenhouses and zoological gardens. Since its first observation it has been occasionally found on imported products from Mediterranean countries. The species is native in Central and South America and has an almost worldwide distribution at the moment. In Europe it is introduced and common in most Mediterranean countries. Populations of the species survived in commercial greenhouses with organic production where only a limited amount of pesticides is permitted.

### *Aleurotulus nephrolepidis* (Quaintance, 1900) (fig. 50)

In 1989 specimens were discovered on several *Nephrolepis* pot plants in the greenhouse of the Botanical Garden of the University of Utrecht (Burger & Vierbergen 1991) where the population survived for at least fifteen years. It is a polygamous species, feeding on the representatives of seven families of ferns. It was found in the open



Figure 49. Puparia of *Aleurothrix floccosus* on a leaf of *Citrus*, Bari, v.2010. Photo Francesco Porcelli.

Figuur 49. Poppen van *Aleurothrix floccosus* op een blad van *Citrus*, Bari, v.2010. Foto Francesco Porcelli.

on Madagascar and in Brasil and it was known from greenhouses in het USA at the end of the 19<sup>th</sup> century. Isolated populations were found in several European countries, not seldom in botanical or zoological gardens (Anonymous 2006).

### *Aleyrodes loniceræ* Walker, 1852 (fig. 13)

**Observations** Geldermalsen, 28.x.1993 leg. M. Jansen & K. van Zuijdam on *Rubus*; Barendrecht, 4.x.2006, leg. P. van der Meijden on *Fragaria*; Boven-Leeuwen, 1x.2002 leg. M. Jansen, on *Fragaria*; Randwijk PPO, 23.vi.2003, adults and nymphs leg. K. van Zuijdam on *Ribes rubrum*. As a common native species occurring out of doors *A. loniceræ* is also present, not seldomly in high numbers, in non heated greenhouses of research institutes and private persons on weeds and soft fruits.



Figure 50. Microscopic view of a puparium of *Aleurotulus nephrolepidis* on *Nephrolepis*, Utrecht, Botanical Garden, VIII.1989.

Figuur 50. Microscopisch beeld van een pop van *Aleurotulus nephrolepidis* op *Nephrolepis*, Utrecht, botanische tuin, VIII.1989.

***Aleyrodes proletella* (Linnaeus, 1758)  
(fig. 14-16)**

Since early 1999 *Aleyrodes proletella* has become a serious pest in greenhouse grown gerbera crops (*Gerbera jamesonii*) in some parts of 'De Kring', near Rotterdam (Loomans et al. 2002, Jansen 2001b). In 2000 it was common at Oudijk on *Brassica rapa* var. *alboglabra* (Chinese cabbage) and *Brassica rapa* subsp. *chinensis* (pak choi). Snels (2004) recorded the presence of *A. proletella* on *Cucumis sativus* (cucumber) in greenhouses in Belgium. Additional observations: Wageningen, greenhouse LUW, on *Brassica*, 13.v.2000, C. Quint; Pijnacker *Brassica rapa* var. *alboglabra* (Chinese cabbage), on *Gerbera* 23.v.2000, Van de Kooy.

***Aleyrodes* sp.  
(fig. 17-18)**

Adults and eggs were identified to the genus level. Poeldijk, on *Cyclamen*, 10.x.2006, A. v.d. Made. Specimens of puparia with intermediate characters were observed on several localities. In unheated greenhouse: Ridderkerk, high numbers on *Cucumis*, 2.xi.2006, P. van der Meijden; Randwijk

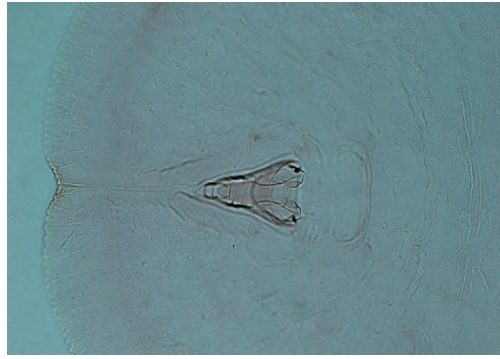


Figure 51. Microscopic view of a detail of the posterior part of the abdomen of a puparium of *Bemisia afer*. Characteristic are the very short caudal setae at the posterior margin. Croatia, 7.v.2009.

Figuur 51. Microscopisch beeld van een detail van het achterste deel van het achterlijf van een pop van *Bemisia afer*. Kenmerkend zijn de heel korte caudale setae bij de achterrand. Croatia, 7.v.2009.

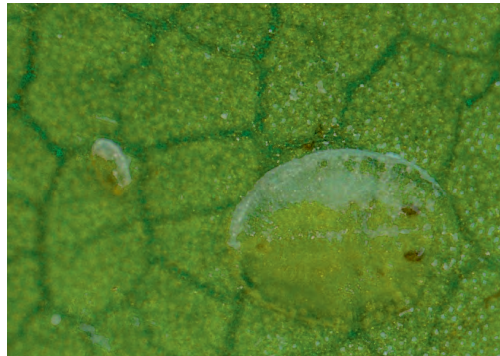


Figure 52. Puparium of *Bemisia afer* on *Laurus nobilis*.  
Figuur 52. Pop van *Bemisia afer* op *Laurus nobilis*.

PPO, adults on *Centaurea*, *Stellaria*, *Oreganum*, *Malva*, *Daucus carota*, 9.i.2008, Kanne; Strijen, adults on tomato seedlings and *Taraxacum*, 8.xi.2006, M. Jansen & P. van der Meijden.

***Bemisia afer* (Priesner & Hosny, 1934)  
(fig. 51-52)**

This whitefly is of Mediterranean origin but is widely distributed in warmer parts of the world



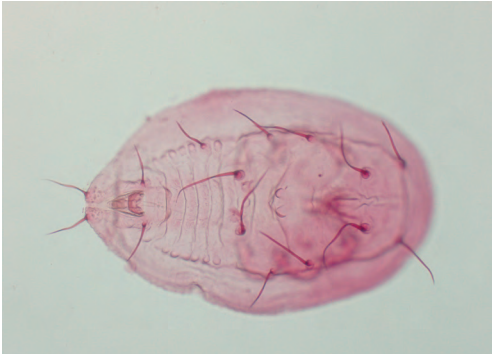


Figure 53. Microscopic view of *Bemisia tabaci* on *Cassia*, Kwintsheul, 16.XI.2001.

Figuur 53. Microscopisch beeld van *Bemisia tabaci* op *Cassia*, Kwintsheul, 16.XI.2001.

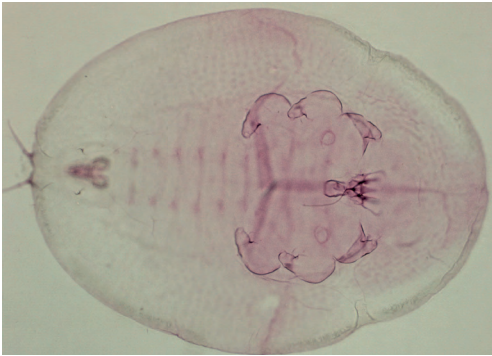


Figure 55. Microscopic view of the puparium of *Bemisia tabaci* on *Euphorbia pulcherrima*.

Figuur 55. Microscopisch beeld van de pop van *Bemisia tabaci* op *Euphorbia pulcherrima*.

(Martin et al. 2000). The species is very polyphagous and hosts belong to 23 plant families (Evans 2007). The first interception in the Netherlands was at St. Oedenrode on 4.X.2011, leg. Henk Lemmen on imported *Laurus nobilis* plants originating from South Europe. The species has never been found in the open. Although morphologically variable and fairly similar to *Bemisia tabaci*, the absence of long caudal setae which are replaced by very short ones which can only be discovered by using a binocular or a compound microscope, is an important discriminating character.



Figure 54. Adult of *Bemisia tabaci* on *Euphorbia pulcherrima*, Berkel en Rodenrijs, import Kenia, 12.XI.2009.

Figuur 54. Adult van *Bemisia tabaci* op *Euphorbia pulcherrima*, Berkel en Rodenrijs, import Kenia, 12.XI.2009.

### *Bemisia tabaci* (Gennadius, 1889) (fig. 53-55)

The first interception in the Netherlands of this very noxious whitefly species was in 1987 on *Euphorbia pulcherrima*, followed after a couple of weeks by a population on *Begonia*. After that this species was observed on numerous imported plant species (Burger 1988).

When several literature records (e.g. Greathead 1986, Mound & Halsey 1978, Miyatake 1980) and unpublished data are put together about 1000 host plant species are known from at least 74 plant families. A lot of research has been carried out concerning the taxonomy, the biology, the damage and control of this economically very important and morphologically very plastic insect. Some dozens of biotypes have been described since the first problems started to arise in the field in the US during the 1980s (Costa & Brown 1991). *Bemisia argentifolii* was described by Bellows & Perring (in Bellows et al. 1994). Jansen & Oudman (1994) reported this so called B-biotype from the Netherlands based on esterase-patterns and in 2008 the Q-biotype was detected in a greenhouse sample. Interbreeding between B- and Q-biotypes is possible and was observed



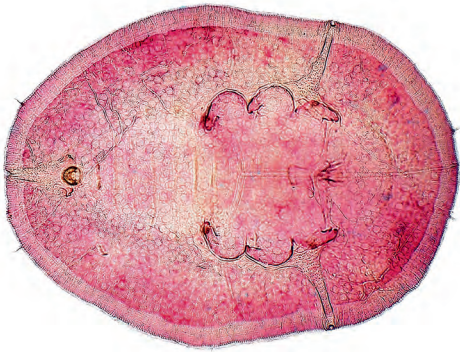


Figure 56. Microscopic view of the puparium of *Dialeurodes citri*. Photo Francesco Porcelli.  
 Figuur 56. Microscopisch beeld van de pop van *Dialeurodes citri*. Foto Francesco Porcelli.

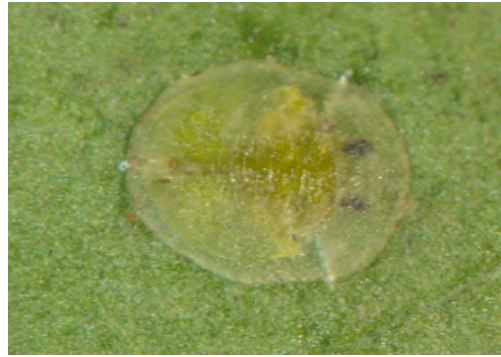


Figure 57. Puparium and adult of *Dialeurodes citri* on *Ligustrum*, Harmelen, 13.XI.2009.  
 Figuur 57. Pop van *Dialeurodes citri* op *Ligustrum*, Harmelen, 13.XI.2009.

under experimental circumstances in the lab (Ronda et al. 1999). The situation in relation to damage symptoms and biotypes a few years after the introduction in greenhouses in the Netherlands was discussed by Jansen (1994a). De Barro et al. (2011) however concluded that *B. tabaci* is not made up of biotypes and considered it is a complex of 11 well defined high-level groups containing at least 24 morphologically indistinguishable species. The species has the highest European quarantine status (A1) because of the risk of the introduction of plant virus diseases which are transmitted by the whitefly. It is obligatory to eradicate populations on plants originating from non-European countries. However, populations without any direct relationship with import are considered to be native.

### *Dialeurodes citri* (Ashmead, 1885) (fig. 56-58)

**Observations** Boskoop, 17.I.2005 leg. C. Koehler, on *Strebulus*; Harmelen, 23.III.2007, leg. Miedema, on *Ligustrum*; Honselersdijk, 12.I.1995, leg. PD Honselersdijk, on *Serissa*-bonsai; Malden, 14.III.1990, leg. C. Quint, on *Citrus*; Rijsenhout,



Figure 58. Adult of *Dialeurodes citri* on *Ligustrum*.  
 Figuur 58. Adult van *Dialeurodes citri* op *Ligustrum*.

3.X.2006, leg. F. van Holsteijn on *Ligustrum*; Tiel 24.II.2005, leg. K. Bakker, on *Serissa*-bonsai. This species is known to occur on representatives of at least 38 plant families (Evans 2007) and is native in the Oriental region. In 1965 the species was detected for the first time in northern Turkey and in 1976 in the Mediterranean region (Uygun et al. 1990). The species is regularly imported on products originating from Southern Europe or from Southeast Asia, especially on *Ligustrum* and populations survive in greenhouses with organic production. It sometimes survives a period in greenhouses.

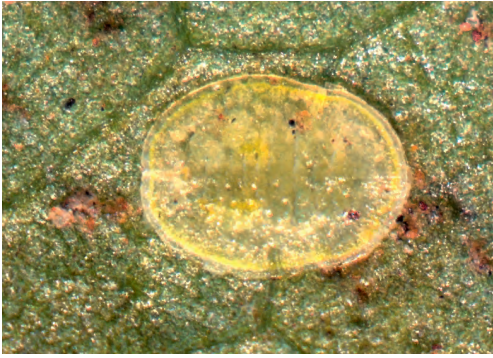


Figure 59. Puparium of *Parabemisia myricae* on *Sisygium jambos*, Haren, Botanical Garden, 9.XII.2009.  
 Figuur 59. Pop van *Parabemisia myricae* op *Sisygium jambos*, Haren, Botanical Garden, 9.XII.2009.



Figure 60. Microscopic view of a puparium of *Parabemisia myricae* on *Sisygium jambos*.  
 Figuur 60. Microscopisch beeld van een pop van *Parabemisia myricae* op *Sisygium jambos*.



Figure 61. Microscopic view of the posterior part of the abdomen of a puparium of *Parabemisia myricae*.  
 Figuur 61. Microscopisch beeld van het achterste deel van het achterlijf van de pop van *Parabemisia myricae*.

***Parabemisia myricae* (Kuwana, 1927)  
 (fig. 59-61)**

A population was found to occur on *Sisygium jambos* in the greenhouse of the Botanical Garden of Haren on 9.XII.2009 (M. Jansen). The species was first indicated in Turkey in 1982 (Uygun et al. 1990). The species is very polyphagous and recorded from at least 18 plant families (Evans 2007). Originally described and probably native to Japan, this species has become widely distributed across the Mediterranean basin favouring *Citrus* and *Persea americana* (Martin et al. 2000).

***Pealius azaleae* (Baker & Moles, 1920)**

This species has been collected in 1910 and 1920 on *Azalea*, was recorded by Mound & Halsey (1987) and has never been observed afterwards. The occurrence of this species in Europe is sporadic and records may reflect newly introduced populations on each occasion, with its azalea hosts usually being kept indoors, in greenhouses or in very sheltered yards (Martin et al. 2000). Presumably *P. azaleae* may originate from eastern Asia (Martin 1999). Bink et al. (1980) recorded it as a native species for the Netherlands but is removed from the species list because of its doubtful status elsewhere in Europe.

***Trialeurodes vaporariorum* (Westwood, 1856) (fig. 35-39)**

This is an extremely polyphagous species, known to occur on plant species of at least 82 plant families (Mound & Halsey 1978) of herbs, shrubs and trees. Host plant species based on slide material present in the collection of the PPS are bold italic. Those which are italic are based on observations in the field: *Afzelia*, *Ageratum*, *Alcea rosea*, *Anigo-*

*zanthos*, *Annizonthea*, *Azalea*, *Bouvardia*, *Calceolaria*, *Chrysanthemum*, *Clematis*, *Cucumis sativus*, *Eucalyptus*, *Euphorbia Fuchsia*, *Gardenia*, *Hybiscus*, *Limonium*, *Malva*, *Nandina*, *Nerium*, *Nicotiana*, *Pelargonium*, *Polyscias*, *Polygala*, *Polygonum*, *Polyscias*, *Primula*, *Rhododendron*, *Rosa*, *Sageretia*, *Serissa*, *Solanum*, *Solanum melongena*, *Sparmannia africana*, *Strobilanthes*, *Ulmus*, *Vitis*, *Yucca* and *Zelkova*.

The first documented samples from specimens on imported plants from other continents were collected in 2000, but the species was already known to be common in greenhouses and living rooms during the 19th century.

## Intercepted species

Below species are listed from import inspections originating from other European countries or other parts of the world with the first year of introduction, the country of origin and the host on which it was found. Species transported by passengers travelling by plane on various plants are indicated with P. Not included are identifications from material which was not collected in the Netherlands as a result of transport of plant material but was collected in a particular country on plant material without the aim of transport.

<i>Acaudaleyrodes africanus</i> (Dozier, 1934)	1998: South-Africa ( <i>Acacia burkeii</i> )
<i>Aleurocanthus longispinus</i> Quaintance & Baker, 1917	1989: Thailand (bamboo)
<i>Aleurocanthus spiniferus</i> (Quaintance, 1903)	1989: Philippines ( <i>Streblus asper</i> ); China ( <i>Camellia sinensis</i> ); Thailand ( <i>Citrus</i> )
<i>Aleurocanthus woglumi</i> (Ashby, 1915)	2010: Thailand ( <i>Citrus</i> ) P
<i>Aleurocanthus</i> sp.	2010: Indonesia ( <i>Citrus hystrix</i> ) P
cf. <i>Aleurocanthus</i>	2000: Thailand ( <i>Phyllanthus</i> )
<i>Aleurocerus palmae</i> (Russell, 1986)	2000: Guatemala ( <i>Asparagus</i> , <i>Chamaedorea</i> )
<i>Aleuroclava aucubae</i> (Kuwana, 1911)	1984: China ( <i>Chaenomeles speciosa</i> , <i>Murraya</i> ), Japan ( <i>Pyracantha</i> )
<i>Aleuroclava</i> cf. <i>gordoniae</i> (Takahashi, 1932)	1989: China ( <i>Sageretia</i> )
<i>Aleuroclava guyavae</i> (Takahashi, 1932)	1990: China ( <i>Gardenia</i> , <i>Sageretia</i> )
<i>Aleuroclava hikosanensis</i> Takahashi, 1938	1988: Japan ( <i>Ilex crenata</i> )
<i>Aleuroclava jasmini</i> Takahashi, 1932	1985: China ( <i>Gardenia</i> ), Malaya ( <i>Ixora</i> ), Singapore ( <i>Ixora</i> ), Taiwan ( <i>Desmodium</i> , <i>Murraya</i> ), Thailand ( <i>Gardenia</i> )
<i>Aleuroclava</i> cf. <i>nigeriae</i> Mound, 1965	1997: Maleisia ( <i>Ixora</i> )
<i>Aleuroclava psidii</i> (Singh, 1931)	1988: China ( <i>Sageretia</i> )
<i>Aleurodicus dispersus</i> Russell, 1965	1995: Canary Islands (Palmae), Surinam ( <i>Solanum lycopersicum</i> ); Thailand ( <i>Citrus</i> ).
<i>Aleurolobus marlatti</i> Quaintance, 1903	1989: China ( <i>Murraya</i> )
<i>Aleurolobus wunni</i> (Ryberg, 1938)	2001: Lithuania ( <i>Asarum</i> )
<i>Aleuroplatus pectiniferus</i> Quaintance & Baker, 1917	1989: China ( <i>Ficus retusa</i> )
<i>Aleuroplatus</i> near <i>cadabae</i> Priesner & Hosny, 1934	1990: Madagascar ( <i>Didierea madagascariensis</i> )
<i>Aleurothrix</i> sp.	1983: Brazil ( <i>Tillandsia</i> )
<i>Aleurothrix floccosus</i> (Maskell, 1896)	1970: Italy ( <i>Citrus</i> ), Portugal ( <i>Citrus</i> ), Spain ( <i>Citrus</i> )
<i>Aleurotrachelus</i> cf. <i>caerulescens</i> Singh, 1931	1989: China ( <i>Sageretia</i> )
<i>Aleurotrachelus longispinus</i> Corbett, 1926	1992: Sri Lanka ( <i>Ixora</i> )
<i>Aleurotrachelus trachoides</i> (Back, 1912)	2009: Costa Rica ( <i>Phoenix</i> ) P; Suriname (unknown plant).



- Aleurotuba jelinekii* (Frauenfeld, 1867)  
*Aleyrodes asari* (Schränk, 1801)  
*Asterobemisia carpini* (Koch, 1857)  
*Bemisia giffardi* (Kotinsky, 1907)  
*Bemisia tabaci* (Gennadius, 1889)
- Bemisia* cf. *tuberculata* Bondar, 1923  
*Dialeurodes citri* (Ashmead, 1885)
- cf. *Dialeurodes* 1  
 cf. *Dialeurodes* 2  
*Dialeurodes kirkaldyi* (Kotinsky, 1907)  
*Dialeuronomada ixorae* (Singh, 1931)  
*Dialeurolonga pauliani/nigra* group  
*Dialeurolonga* sp.  
*Dialeuropora decempuncta* (Quaintance & Baker, 1917)  
*Massilaeurodes* cf. *sakaki* (Takahashi, 1958)  
*Minutaleyrodes minuta* (Singh, 1931)
- Orchamoplatus mammaeferus* (Quaintance & Baker, 1917)  
*Parabemisia myricae* (Kuwana, 1927)
- 2001: France (*Viburnum tinus*); Italy (*Viburnum tinus*)  
 1995: Lithuania (*Asarum europaea*)  
 1988: China (*Sageretia*)  
 2000: Thailand (*Phyllanthus*)  
 1987: Brazil (*Crossandra*, *Chrysanthemum*), Canary Islands (*Rosa*), Costa Rica (*Euphorbia*), Netherlands Antilles (*Rosa*), Cyprus (*Hibiscus*), Denmark (*Nicotiana*), Dominican Republic (*Cereus*), Egypt (*Hibiscus*, *Lantana*, *Solanum*), Germany (*Euphorbia*), India (*Gerbera*, *Rosa*), Israel (*Aster*, *Basilicum*, *Bougainvillea*, *Brachy-chiton*, *Chrysanthemum*, *Clematis*, *Eugenia*, *Euphorbia*, *Eustoma*, *Ficus*, *Fuchsia*, *Gardenia*, *Hardenbergia*, *Hibiscus*, *Hypericum*, *Ixora*, *Kennedia*, *Lantana*, *Lithospermum*, *Mandevilla*, *Melissa*, *Myrtus*, *Nerium*, *Ocimum*, *Petunia*, *Philodendron*, *Punica*, *Reinwardtia*, *Rosa*, *Solanum*, *Solidago*, *Trachelium*), Kenia (*Dendranthema*, *Eustoma*, *Lantana*), Sri Lanka (*Crossandra*), Malaya (*Lysimachia*), Mexico (*Lantana*), Norway (*Euphorbia pulcherrima*), Spain, (*Cucumis sativus*), South Africa (*Beauvardea*, *Crossandra*), USA (*Euphorbia pulcherrima*, *Gmelina*, *Hibiscus*, *Lilium*), Switzerland (*Jatropha*), Tanzania (*Lisianthus*), Thailand (*Anubias barteri*, *Euphorbia*, *Ocimum*, *Phyllanthus*), Zambia (*Rosa*), Zimbabwe (*Aster*, *Hypericum*, *Rosa*, *Solidago*)  
 2005: Chili (*Nothofagus*)  
 1987: China (*Gardenia*, *Ligustrum*, *Murraya*, *Sageretia*, *Serissa*, *Streblus*, *Zelkova*), Israel (*Citrus*). Italy (*Viburnum tinus*); Thailand (*Millettia brandisiana*).  
 1988: Indonesia (*Cudrania cochinchinensis*)  
 1988: Philippines (*Ficus*)  
 1994: China (*Murraya*)  
 1992: Sri Lanka (*Ixora*)  
 2004: Madagascar (*Malus*)  
 2007: Thailand (*Ficus*)  
 2007: Thailand (*Piper sarmentosum*)  
 1989: China (*Sageretia*)  
 1985: Sri Lanka (*Ixora*), Costa Rica (*Ixora*), Thailand (*Gardenia*, *Ixora*).  
 2001: unknown origin or destination (*Codiaeum*)  
 2005: Thailand (*Solanum*)

*Pealius mori* (Takahashi, 1932)

*Pealius rubi* Takahashi, 1936

*Rhachisphora styraci* (Takahashi, 1934)

*Singhiella* near *citrifolii* (Morgan, 1893)

*Singhius* cf. *hibisci* (Kotinsky, 1907)

*Trialeurodes vaporariorum* (Westwood, 1856)

1992: China (*Ficus* sp., *Zelkova*), Indonesia (*Morus*-bonsai)

2006: Thailand (*Persicaria odorata*)

2002: Japan (*Viburnum dilatatum*)

1968: USA (*Citrus*); China (*Sageretia*)

1988: China (*Gardenia*, *Sageretia*)

1986: Australia (*Rhododendron azaleae*), Brazil (*Solidago*), Burundi (*Rosa*), Canary Islands (*Rosa*), China (*Carmona*, *Sageretia*), Costa Rica (*Chrysanthemum*, *Rosa*), Equador (*Chrysanthemum*, *Solidago*), Greece (*Gardenia*), India (*Rosa*), Israel (*Solidago*), Kenya (*Aster*, *Chrysanthemum*, *Eustoma*, *Hypericum*, *Mentha*, *Rosa*, *Solidago*), New Zealand (*Strobilanthes*), Poland (*Gerbera*, *Limonium*), Ruanda (*Azalia*), South Africa (*Rosa*), Spain (*Gladiolus*), Sri Lanka (*Dizygotheca*), Uganda (*Rosa*), USA (*Gerbera*), Zambia (*Rosa*), Zimbabwe (*Aster*, *Hypericum*, *Solidago*)

## DISCUSSION

Figure 62 gives the presence of several species in a few habitats in the gradient from completely synanthropic to completely natural. Each habitat has a different species composition. The transition suggests that new introductions will run from the left to the right side in the diagram but actually the situation is much more complicated.

At first species may be introduced on infected plants which are directly traded from the Mediterranean region to the Netherlands or anywhere else in Europe. Inspectors are not obliged to carry out an inspection on *Viburnum tinus* which is the host plant of *Aleurotuba jelinekii* when plants originate from one of the European member states. This whitefly species is able to survive our winters but even in the case populations become extinct, regular import of new populations by traded products prevent the species from becoming extinct. The plant is not native, but it can survive in the manmade semi-natural or urban habitat and time will learn if the species is able to adapt to the Dutch environment. The natural

variant of this type of introduction is the regular transport of plant material by seeds of fluvial plant species along rivers such, as *Eryngium campestre*.

Besides, most if not all intercepted whitefly species originating from foreign countries and most whitefly species living in greenhouses don't have the ability to survive the Dutch climate for different reasons, which will not be discussed here further. Several species, including *Aleurolobus marlatti*, *Aleurothrixus floccosus* and *Dialeurodes citri*, have proved to be able to survive a short time in greenhouses when there is the condition of a minimized use of pesticides. However, they cannot survive our winter period. Therefore, in general, species of indoor urban ecosystems like greenhouses, living rooms, zoological and botanical gardens and found during import interceptions have to be considered incidental imports and do not form part of the Dutch fauna.

The gradient from completely synanthropic to natural environments can be divided in six habitats (fig. 62).

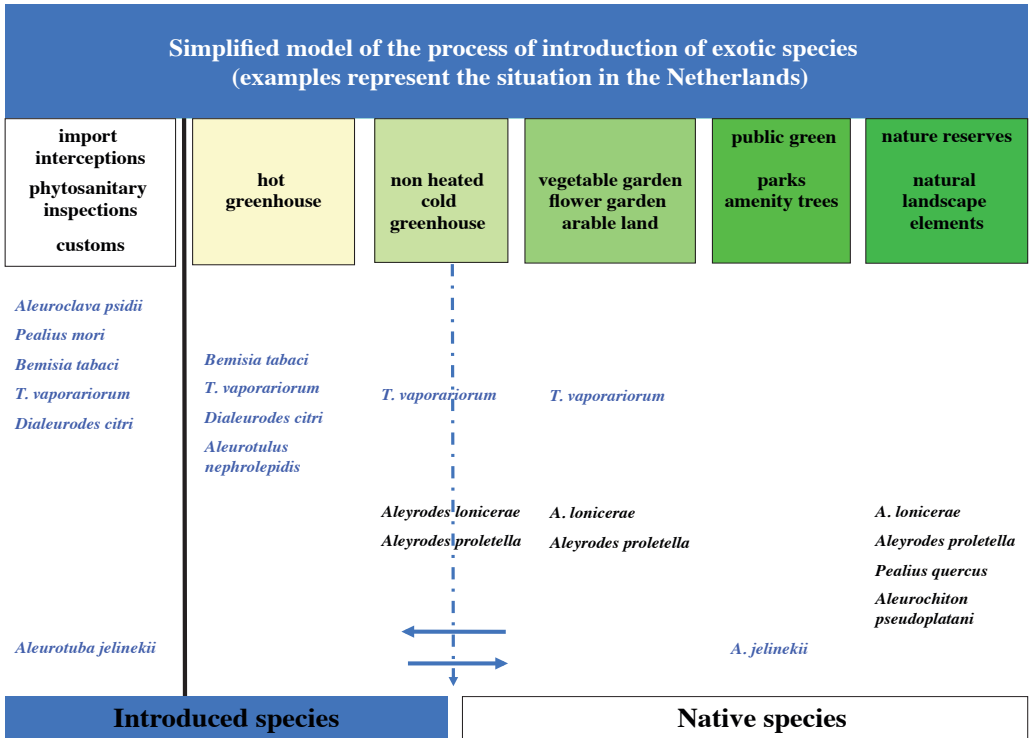


Figure 62. Aleyrodidae of different habitats.

Figuur 62. Aleyrodidae van verschillende biotopen.

a. Rooms, buildings and cars during transport of regular traded products. Important places are auctions where import inspections are carried out. What will be found is dependent on the available inspection time, the experience, interest and knowledge of inspectors and the available host plants for whiteflies. A lot of products like vegetables and fruits enters Europe unseen and are not inspected. Species which have only been found on products which are not obliged to be inspected are *Parabemisia myricæ* and *Dialeuropora decempuncta*. *Bemisia tabaci* and *Trialeurodes vaporariorum* have been regularly found on the same kind of products as well. Therefore, the impression is that the actual number of introduced species is higher than what is presented here. However, only a small minority of the introduced species of this category will be invasive.

b. Heated greenhouses. Although there is a long list of introduced species only seven species have been observed in hot greenhouses *Aleurolobus marlatti* and *Aleurocanthus spiniferus* were found only once and *Aleurotulus nephrolepidis* sustains a small population in a botanical garden for several dozens of years. *Bemisia tabaci*, *Trialeurodes vaporariorum*, *Dialeurodes citri* and *Aleurothrixus floccosus* can survive on a regular base and from these only the first two species occur in greenhouses in which a small amount of pesticides is used as a consequence of biological cultivation. To survive the greenhouse conditions, species should be able to have more than one generation and be polyphagous. Whitefly infestations in greenhouses have decreased over the last decades due to better sanitary conditions e.g. by removing weeds from which whiteflies re-infect the new crop.



However, this account doesn't give any information about a possible decreasing number of infestations as a result of phytosanitary improvements during the last decades e.g. by a selection of propagation material. Insects regularly escape from greenhouses through the windows, they are passively and by accident transported by visitors on cloths, on plants and by implements used (Vierbergen 1995, 2002). The other way around specimens present in the open may enter greenhouses using the same pathways. The greenhouse environment is not completely closed and although all kind of measures are taken, one cannot completely avoid any interference of the two systems against high costs making these greenhouses less economic profitable.

- c. Non-heated greenhouse. This habitat has the lowest number of species but the biggest populations of *Aleyrodes lonicerae*. The low number of species may be a result of the relative small number of greenhouses of this type. Besides it is unusual to put imported tropical plants in this type of greenhouses. The temperature is too low for most introduced foreign species to survive.
- d. Vegetable gardens. The number of species in this habitat is limited. The most striking species is *Siphoninus phillyreae* which has its biggest populations on sheltered sites e.g. on *Pyrus* growing against walls. Since the 1990s *Aleyrodes proletella* has become a nuisance on most varieties of cabbage, at first in home gardens, later on also in commercial cabbage crops. Inquiries among private owners revealed that, although it was present in some regions in the Netherlands before the problems started around 1995, the populations became much bigger and the species became present on many sites where it was unknown for at least thirty years. In 1992 when there still were no problems in private gardens, the species was commonly found on *Chelidonium majus*. After 1995 almost all varieties of cabbage became infested, not only kale, Brussels sprouts, cauliflower and savoy cabbage but also the less

frequently infested red cabbage. The numbers of adults were so high that it caused respiration troubles for persons during the harvest.

- e. Public green, amenity trees and shrubs. Typical species in this urban habitat are the exotic *Aleurotuba jelinekii* which is regular found on *Viburnum tinus* and *Massiliewodes chittendeni* fairly common found on *Rhododendron*. Other species which can be regularly observed are *Aleurochiton pseudoplatani*, *A. aceris* and *Pealius quercus*.
- f. Nature reserves and (half) natural landscape. Several species were only found in a natural environment and were never found in urban habitats e.g. *Siphoninus immaculatus*, *Tetralicia ericae*, *Trialeurodes ericae*, *Aleuroclava similis* and *Asterobemisia carpini*. The main reason is that host plants such as *Erica tetralix*, *Vaccinium myrtillus* and *V. vitis-idaea* are rarely present in bigger populations in the public green. Some of them are reported from other hosts growing in the urban zone such as *Pieris japonica*, *Rhododendron* and *Rubus* but their presence should be confirmed by additional observations.

#### Species expected in the open

Although a limited number of Aleyrodidae species exists in West and Central Europe, the Dutch list is still incomplete. One of the species to be expected is *Aleurochiton acerinus* Haupt, 1934, a Central European species which lives monophagous on *Acer campestre*. This tree is probably not native in the Netherlands, but is now very commonly planted and also establishing in the wild. It is striking that recently at least two new Lepidoptera species for the Dutch fauna have been observed which may be a result of the eccentric position of the Netherlands in the distribution of the tree in Europe and the spread of the tree during the last century. This suggests that the fauna is now following the tree (Van Nieuwerkerken et al. 2006). A species which may be already locally present in the public green but probably has been overlooked is *Bemisia afer*. However, this species, now present in several British towns (pers. comm.

C. Malumphy), is difficult to find, as puparia are often almost completely translucent. Taking a sample of leaves and studying it under the stereomicroscope is the best way to find it. *Siphoninus phillyrea* has been found in the same way. Time will learn whether the climatic conditions in the Netherlands are suitable for species which are imported from eastern and southern Europe.

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## SAMENVATTING

### De wittevliegen van Nederland, inclusief twee nieuwe soorten voor de Nederlandse fauna (Hemiptera: Aleyrodidae)

Een lijst wordt gegeven van meer dan vijftig soorten wittevliegen in Nederland. Van de 14 soorten die buiten voorkomen wordt informatie gegeven van waardplanten, vindplaatsen, verzameldata en verzamelaars. Zeven soorten werden in kassen aangetroffen waarvan *Bemisia tabaci* en *Trialeurodes vaporariorum* getalsmatig de belangrijkste zijn. Bij importinspecties werden 42 soorten aangetroffen op allerlei waardplanten uit alle delen van de wereld. De meeste waarnemingen werden in de periode 1970-2010 gedaan. *Aleurotuba jelinekii* en *Siphoninus immaculatus* worden nieuw voor de fauna gemeld, de eerste als gevolg van toenemende importen van plantmateriaal uit Zuid-Europa, de tweede is waarschijnlijk al langere tijd in ons land aanwezig maar is tot nu toe over het hoofd gezien.

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