The first population of the small brown planthopper *Laodelphax striatellus* (Homoptera: Delphacidae) in the Netherlands

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The small brown planthopper *Laodelphax striatellus* has always been considered a migrant species in the Netherlands, since no established populations were known. However, the first reproducing Dutch population was discovered in 2016. Climate change might have caused an area extension of *L. striatellus*. Future research has to show whether the area extension is permanent. Unfortunately, the habitat of the discovered population is destroyed. The small brown planthopper is of economic importance in southern Europe, mainly due to transmission of the maize rough dwarf virus (MRDV). In this respect, attention should be given to possible area extensions of this species.

Introduction

The small brown planthopper *Laodelphax striatellus* (Fallén, 1826) has a wide distribution in the Palearctic region, mainly in southern areas (Jach & Hoch 2013, Nast 1972). In eastern Asia (including Japan) it is one of the most serious pest insects of rice (Heinrichs 1994, Sanada-Morimura et al. 2011). *Laodelphax striatellus* damages rice plants directly by feeding on phloem sap, and indirectly by the transfer of viruses (rice stripe virus and rice black-streaked dwarf virus; Nault 1994). This planthopper is also known as a vector of various other diseases of cereal crops, mostly in warmer climates. Examples in Europe include maize rough dwarf virus (MRDV) in Central Europe and the Mediterranean area, barley yellow striate mosaic virus (BYSMV) in Sweden, Italy and France, and wheat chlorotic streak virus in France (Adams & Antoniw 2016, Lindsten 1974, Nault 1994). This planthopper is of economic importance in southern Europe, mainly due to transmission of the maize rough dwarf virus (MRDV). In this respect, attention should be given to possible area extensions of this species.

Observations

**Material**

Noord-Holland: Amsterdam, 27.vii.1956, 1♂ Ma leg. W.H. Gravestein, former collection Zoological Museum Amsterdam (ZMAN), now Naturalis collection, Leiden (RMNH). Groningen: Lauwersmeer (AC 213-596), no date, one specimen. Limburg: Slavante near St Pietersberg (AC 176-315), 17.viii.1950, 1♂ Ma, RMNH. Noord-Brabant: Oisterwijk: nature reserve Kammina (AC 145-398) heath land, 7.ix.2003, 1♂ Ma; Bergen op Zoom: nature reserve De Duinjes in a ditch (AC 79.1-385.3), 1♂ Ma; Breda: rural estate Wolfslaar (AC 114.7-396.8) damp road side, 2.vi.2007, 1♂ Ma and 6.vi.2008, 1♂ Ma. Oosterhout, industrial area De Vijf Eiken (AC 120.7-404.1) (figure 1), 17.vii.2016 (4♂♂ Br, 9♀♀ Ma, 4♀♀ Br, 3♀♀ Ma, also first larval instars), 18.vii.2016 (1♂ Br, 12♀♀ Ma, 4♀♀ Br, 1♀ Ma), and 23.vii.2016 (1♂ Br, 8♀♀ Ma, 9♀♀ Br, 2♀♀ Ma) all collected on the grass species Cynodon dactylon. Some individuals of the last two catches have been used for acoustical recordings. Other planthopper species at the Oosterhout site included *Javesella pellucida* (Fabricius, 1794), *J. dubia* (Boheman, 1868), *Ribautodelphax collina* (Boheman, 1847), *R. vinealis* Den Bieman, 1987 and *Xanthodelphax stramineus* (Vilbaste, 1858).
Identification and biology

*Laodelphax striatellus* is characterized by its dark frons with white keels and its light pronotum in combination with a dark streak along the claval commissure just proximally of the clavus apex, both in macropterous and brachypterous specimens (figure 2). The male genitalia are very characteristic (Biedermann & Niedringhaus 2004, Ossiannilsson 1978).

This species lives in a broad variety of habitats, from dry to moist, and often in anthropogenic sites: fallow land, fertilized meadows, damp grassland, vineyards, swamps and road verges (Kirby 1992, Nickel 2003, personal observations in France and the Iberian Peninsula). The species obviously adapts well to disturbed habitats and is a pioneer inhabiting open and poorly vegetated sites (Söderman 2007). It is a polyphagous species feeding on a variety of grass species (Gramineae) including the cereal crops: barley, maize, rice and wheat. In Europe, *Agropyron* sp. (Drosopoulos 1982), *Agrostis capillaris* (Söderman 2007) and *Cynodon dactylon* (Drosopoulos 1982 and personal observations), were mentioned as hostplants. In Japan, 36 other grass species were mentioned as hostplants. In Japan, 36 other grass species (Mochida & Okada 1971).

The first Dutch population was found on the grass *C. dactylon* at a dry and sandy grassland in 2016 (figure 1). This grassland was mown once a year and it was heavily grazed by rabbits. Moreover, the grassland was occasionally used as a motor cycle circuit. *Cynodon dactylon* was the dominant grass in and along the motor cycle tracks. *Laodelphax striatellus* from this site was also reared on this hostplant in a greenhouse.

*Cynodon dactylon* originates from the tropics and was introduced into the Netherlands more than a century ago (Floron 2016). It appears in coastal and river dunes, sandy dikes, road verges, railroad yards, harbours and industrial areas. It has a preference for sunny areas on sandy soils. This broad variety of habitats matches the habitat preference of the small brown planthopper in Germany (Nickel 2003). In Europe, *C. dactylon* reaches its northern limit in the Netherlands. It mainly occurs in the central and southern parts of the Netherlands (Floron 2016).

Until 2016, the small brown planthopper was considered a rare migrant in the Netherlands and only a few macropterous specimens had been collected. The discovery of a population with both macropterous and brachypterous individuals as well as larvae was unexpected. Whether this population existed for some years already could not be determined, although it was not found at the same location in 2010. Unfortunately, in the winter of 2016 the location was destroyed, because a factory was build at this spot.

Recent observations on the distribution of the small brown planthopper in England suggest that it may never form permanent populations, and that individuals found in Britain have probably been blown there by air currents (Stewart 2015). Older data, mainly from the nineteenth century, suggest that it was formerly widespread in South-east England (Kirby 1992). It was suggested that climate change was the main cause of the population decline. It seems that thus far only macropterous migrant specimens have been collected in Belgium as well (Baugnée 2016, personal communication). In Germany, reproducing populations are largely confined to rather warm lowlands in the southern half of the country. Single individuals collected in the North German Plain were always macropterous (Nickel 2003). *Laodelphax striatellus* is not known from Denmark, was collected only once in Norway, is scarce in Sweden but, perhaps surprisingly, rather common in southern Finland (Ossiannilsson 1978, Söderman et al. 2009). The records north of the boreal region in Finland all concern macropterous individuals, possibly on dispersal flight. This species has apparently expanded its Finnish range northwards in this century (Söderman 2007).

German and Italian data indicate that this species hibernates in the larval state and has two generations each year (Häni et al. 1989, Nickel 2003). Acoustical communication is an important element in sexual behaviour of planthoppers. Sound records of males collected from the Dutch population are available at the website Insect Drummers (www.insectdrummers.com).

Economic importance

European reports on virus transfer by *L. striatellus* in oats and barley are known from Sweden (Lindsten 1974). However, its importance as a virus vector is limited by the rarity and low abundance in Sweden (Ossiannilsson 1978).

*Laodelphax striatellus* is the only known vector of maize rough dwarf virus (MRDV). In Europe this virus occurs in France, Switzerland, former Czechoslovakia, Italy, Spain, former Yugoslavia (Lovisolo 1971) and Greece (Dovas et al. 2003). In the Netherlands, MRDV has not yet been observed (M. Verbeek & R. van der Vlugt, personal communication).
Maize plants infected with MRDV exhibit small enations along the veins on the underside of the leaves, associated with mild to severe dwarfing of the plant and accompanied by drastic reductions in yield when plants are infected at early vegetative stages. Harvest loss was as high as 70% or more in Greece, while hardly any loss was observed the following year (Dovas et al. 2003). In Spain, MRDV was already reported in the 1960’s. From 1999 onwards, severe maize crop losses were reported in north-east Spain (Achon et al. 2014). In Tessin (Switzerland), more than 50% of the maize plants was infected (Häni et al. 1989).

The only known natural hosts of MRDV are maize, *Digitaria sanguinalis*, *Echinochloa cruz-galli*, *C. dactylon* (Achon et al. 2014, Lovisolo 1971) and *Lolium perenne* (Achon et al. 2015). The latter four are common in and along maize fields. Also cultivated wheat is a host of MRDV (Achon et al. 2015).

Many factors affect the level of infection of maize crops. One factor is that *L. striatellus* does not breed on maize, it only feeds on this plant occasionally (Häni et al. 1989, Lovisola 2016). The amount and vicinity of true hostplants of *L. striatellus* near a maize field probably will determine the moment of invasion and the number of invading *L. striatellus*.

**Conclusion**

The small brown planthopper reaches its northwestern limit in England, the Netherlands and Central-Germany. Small climatic changes may influence its distribution. Whether the first Dutch population of *L. striatellus* is an indication of a range extension needs to be investigated in the coming years. As the small brown planthopper is of economic importance in southern Europe, this could also become an issue in the Netherlands.
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Literature


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