Western Corn Rootworm, *Diabrotica virgifera*

**Overview**

Short description of *Diabrotica virgifera*, Western Corn Rootworm

5-6mm. Head black. Pronotum yellowish (may have a red/brown tinge). Elytra yellow, usually with dark stripes along the sides and suture. GB specimens may have a more diffuse dark colour. Larvae are pale whitish/buff, elongate, with a brown head capsule. They may be found burrowing into maize roots.

**Description of *Diabrotica virgifera*, Western Corn Rootworm status in GB**


**Habitat summary: *Diabrotica virgifera*, Western Corn Rootworm**

Essentially a grassland species, but associated with maize, especially where continuously grown with little habitat diversity. Adults will feed on other plants in areas with maize, but larvae are strictly limited to maize.

**Overview table**

<table>
<thead>
<tr>
<th>Environment:</th>
<th>Terrestrial</th>
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</thead>
<tbody>
<tr>
<td>Species status:</td>
<td>Non-Native</td>
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<tr>
<td>Native range:</td>
<td>Northern America, Mexico, Central America</td>
</tr>
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<td>Functional type:</td>
<td>Herbivore</td>
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<tr>
<td>Status in England:</td>
<td>Non-Native</td>
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<td>Status in Scotland:</td>
<td>Non-Native</td>
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<tr>
<td>Status in Wales:</td>
<td>Non-Native</td>
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<tr>
<td>Location of first record:</td>
<td>Slough &amp; Datchet (Berkshire)</td>
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<tr>
<td>Date of first record:</td>
<td>2003</td>
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</tbody>
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**Invasion history: *Diabrotica virgifera*, Western Corn Rootworm**

**Origin**

Its native range is probably in the tropics and subtropics of Mesoamerica (Mexico, Central America). However, it was first described in 1868 from the western part of north-central USA (Colorado, Kansas, Nebraska) and is widely treated as a North American species. Since the end of the 1940s it has spread over north and east North America reaching Canada (Ontario) and the Atlantic coast. The western corn rootworm, was first found on the European mainland in (the former) Yugoslavia in 1992. In Europe, it arrived as follows: Austria (2002), Belgium (2003), Bosnia and Herzegovina (1997), Bulgaria (1998), Croatia (1995), Czech Republic (2002), France (2002), Hungary (1995), Italy (1998), Montenegro (1998), Netherlands (2003), Poland (2005), Romania (1996), Serbia (1992), Slovakia (2000), Slovenia (2003), Switzerland (2000), Ukraine (2001), United Kingdom (2003). In GB it has, so far, not spread from its original area and may have been exterminated. However, further introductions are possible. Genetic data indicates repeated introductions from North America (Miller et al 2005). It continues to spread through Europe and has the potential to colonise all maize-producing countries in Eurasia.

**First Record**

First found in Berkshire and Sussex on five farms in the vicinity of London Heathrow and
Pathway and Method
This is not known for certain, but it appears to be linked in some way with international air transport. It is possible that transport also occurs via other vehicles (rail, shipping) together with goods and materials including soil and plants. Adults can disperse locally by flying at a rate of 20-100 km/yr, although initiation of flight activity appears to be temperature dependent.

Species Status
As noted above, the 2003-2007 GB introduction appears to have been eradicated, although monitoring continues. It remains a major pest in North America with continued spread within Europe.

Ecology & Habitat: Diabrotica virgifera, Western Corn Rootworm

Dispersal Mechanisms
Adults can disperse locally by flying at a rate of 20-100 km/yr. Longer distances appear to involve international air transport, and possibly other transport sectors.

Reproduction
Larvae are restricted to feeding on maize plants. Eggs are laid after about a month of adult feeding, in spring, in soil at the base of the maize seedlings, usually in the top 20 cm, but sometimes deeper. When larvae hatch, they burrow into the developing roots and the base of maize stems. Mature larvae pupate in the soil, with adults emerging in late summer to feed primarily on the above-ground parts of flowering maize. Females can lay up to around 1000 eggs in their lifetime. There is one generation per year. Eggs may overwinter in diapause. As males are strongly attracted to female pheromones, even small numbers of introduced individuals have the potential to become established.

Known Predators/Herbivores
A number of natural enemies are known from USA (pathogens, nematodes, predators and parasitoids). In its introduced range these are absent and only polyphagous predators exist. Work in North America has shown that there is a range of invertebrate predators feeding on D. virgifera, notably ground beetles, small rove beetles, spiders, harvestmen and predatory mites (Lundgren et al. 2009).

Resistant Stages
Eggs may overwinter in diapause. In North America by the 1980s, eggs of the biologically similar species D. barberi (Northern Corn Rootworm) were found to have developed an extended diapause which may be an adaptation to selection pressure caused by crop rotation (Willson & Eisley 2001). This extended diapause appears to have developed in D. virgifera soon after in the late 1980s with similar development of a new strain (Levine et al. 1992, 2002).

Habitat Occupied in GB
Known only from a few sites near Gatwick and Heathrow Airports with commercial maize crops. No records from 2008-2011. Note that the species’ temperature threshold means that southern Britain is likely to be the northern extent of its range; even with warming due to climate change, some areas of GB are likely to remain outside its potential range.

Distribution: Diabrotica virgifera, Western Corn Rootworm
At the time of writing (March 2010), all GB records of D. virgifera were near Gatwick and Heathrow Airports during the period 2003-2007. Monitoring is ongoing due to the possibility of further introductions. Under current climate conditions, D. virgifera appears to be at the northern edge of its range in GB.

Impacts: Diabrotica virgifera, Western Corn Rootworm

Environmental Impact
Possible indirect impact on non-target species if insecticides are used for control. Adults can feed on plants other than maize but no clear ecological impacts are known.

Health and Social Impact
No health impacts. Social impacts via financial loss (see below).

Economic Impact
No direct crop losses in GB currently with the species likely to have been eradicated. Some relatively minor costs linked to monitoring and management: eradication measures have been lifted following zero counts in 2008-2011, though crops continue to be rotated in areas around key airports, as required by EC measures. In North America, costs due to lost yields ($800m) and control/chemicals ($200m) mean an annual financial impact of around $1bn. In Europe, impacts are lower and details are given in MacLeod et al (2007) who assume UK yield losses to be £475/ha/yr if the species is established with no action taken. D. virgifera can also transmit and spread Maize Chlorotic Mottle Virus (MCMV); however this has not yet been recorded in Europe.

References & Links: Diabrotica virgifera, Western Corn Rootworm

Identification
FERA (undated). Diabrotica species.

Biology, ecology, spread, vectors


Management and impact
FERA (2009) 2009 survey results for England and Wales - Western Corn Rootworm Diabrotica virgifera virgifera FERA.


General