

Box tree caterpillar

Cydalima perspectalis



Figure 1. Late instar *Cydalima perspectalis* larva on a box plant leaf. It grows to a maximum length of 4 cm.

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Background

The box tree caterpillar, *Cydalima perspectalis* (Walker, 1859) (Lepidoptera, Crambidae), has been found in England. This Plant Pest Factsheet provides information about identification and control.

Cydalima perspectalis has been placed in a number of genera since its arrival in Europe, with suggested names including *Glyphodes perspectalis* (Walker, 1859), *Neoglyphodes perspectalis* (Walker, 1859), *Palpita perspectalis* (Walker, 1859) and, most commonly in the UK, *Diaphania perspectalis* (Walker, 1859). *Cydalima perspectalis* is the name currently accepted for the species. It is native to Asia, and after an initial finding in Germany in 2007, it has been spreading through central Europe, larvae sometimes causing severe defoliation as they feed on box (*Buxus* spp.). It is thought that the species was originally introduced with imports from China. *Cydalima perspectalis* was added to the EPPO Alert List in 2007. By 2008, *C. perspectalis* had been reported from five countries in Western Europe. This includes England, where adult moths were caught in light traps in 2008, and in 2009 a nursery in Surrey found *C. perspectalis* larvae causing severe damage. A rapid pest risk assessment on *C. perspectalis* was published by Fera in September 2010, which concluded that the moth is now established in continental Europe, and given the rapid spread of the pest and the possibility that it may reach the UK naturally from Europe, no statutory action should be taken on future UK findings. Therefore, there is no longer a requirement to report new findings of this pest to Fera.

Geographical Distribution

Cydalima perspectalis originates from East Asia, and has been recorded in China, the Korean Republic and Japan.

Larvae were discovered defoliating box in the southeast of Germany in 2007, around the Baden-Württemberg area. It is thought that the infestation had gone undetected for around two years before that. Since then, *C. perspectalis* has been found in other, more northerly, locations in Germany, largely around the Rhine. By

2008, *C. perspectalis* larval infestations were also reported from the Netherlands, Switzerland and a small area in France, and from Austria in 2009. In the UK, three adult moths were found in East Sussex and Surrey in September 2008 and in 2009 damage to box was observed in a Surrey nursery. Further adult findings were reported from Essex and Kent in 2009, and from Kent, Hertfordshire and Bristol in 2010.



Figure 2. Underside of a box leaf showing a batch of eggs from *Cydalima perspectalis*; each egg is around 1 mm in diameter.

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Figure 3. Pupa of *Cydalima perspectalis*, which has been removed from the cocoon that it had spun in the box plant. The pupa is a maximum of 2 cm in length.

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Figure 4. Adult *Cydalima perspectalis* with the typical brown and semi-transparent white wing pattern. The moth has a wingspan of about 4 cm.

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Figure 5. A less common colour form of the adult *Cydalima perspectalis*, with almost totally brown wings.

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Figure 6. A box plant affected by *Cydalima perspectalis* larvae, showing skeletonised leaves and dieback.

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Figure 7. *Cydalima perspectalis* larvae feeding on box, surrounded by loose webbing.

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Host Plants

In Europe, *C. perspectalis* larvae have only been observed eating species of box (Fig. 1): *Buxus microphylla*, *B. microphylla* var. *insularis*, *B. sempervirens* and *B. sinica*. However, in Asia other reported hosts include *Ilex purpurea* (purple-leaved holly), *Euonymus japonicus* (Japanese spindle plant), and *Euonymus alata* (burning bush).

Description

The eggs are laid in a flat sheet, overlapping each other, on the underside of box leaves. When first laid, they are pale yellow and difficult to see, but as they mature, the eggs develop a black spot where each larval head capsule is forming (Fig. 2).

Newly hatched larvae are coloured greenish yellow, with black heads. As the larvae get older, the head stays black and the green body develops dark brown stripes. Mature larvae retain the green ground colour to their bodies, and develop a striking pattern of thick black and thin white stripes along the length of the body, with large black dots outlined in white on the dorsal side (Fig. 1). They are up to 4 cm long.

The pupae are between 1.5 and 2.0 cm long. They are initially green with dark stripes on the dorsal surface, while older pupae turn brown (Fig. 3). They are concealed in a cocoon of white webbing spun among the leaves and twigs.

The adult moths are medium sized, with a wingspan of around 4 cm. The most common colour form has a thick dark brown border of uneven width around the edges of white-coloured wings. The forewings have a white extension to the central white portion of the wing, which extends into the brown border towards the front of the wing (Fig. 4). The moths are faintly iridescent, with the brown areas having a golden sheen, and the white parts with tinges of purple. The body is largely white, with a dark brown head and posterior end of the abdomen. There is another, less common, colour variant where the wings are completely brown except for a small white streak on the forewing, which is in the same position as the white marking described above (Fig. 5).

Pest Biology, Dispersal and Detection

The biology of *C. perspectalis* in Europe is not fully known yet, as it is a recent discovery here. In southwest Germany, there are two or three generations per year. At a temperature of 20°C, development time from egg hatching to adult emergence is around 40 days, though it can complete development at a temperature of 15°C. *Cydalima perspectalis* overwinters as a larva, spinning a cocoon between two box leaves in autumn, and completing its development the following spring.

As an adult, *Cydalima perspectalis* is capable of flight, though its natural dispersal capabilities are not known. It is thought that trade in Chinese commodities may have included *C. perspectalis* as a hitchhiker, this being the probable source of the initial introduction into Germany. Eggs, diapausing larvae and pupae are all associated with box foliage and are difficult to detect, hence trade in box plants is an obvious means of dispersal.

The box plants are disfigured by the loss of leaves and webbing spun by the larvae, and they may show patches of dieback (Fig. 6). This is especially apparent on trimmed plants (e.g., hedges), and at the sides and on the lower branches. Detecting this damage is the easiest method of finding *C. perspectalis*, though fungal attack can cause similar patches of dead leaves. Characteristic larval feeding damage may be seen on closer inspection. Younger larvae feed by 'windowing': eating the lower surfaces of the leaves only and leaving the upper epidermis intact. Older larvae feed inside webbing and skeletonise the leaves, leaving only the midribs, and occasionally the outer margin, intact (Fig. 7). Webbing, frass (excrement) and moulted black head capsules may also be apparent.

Economic Importance and Damage

In Germany, complete defoliation of ornamental box plants has occurred, while in the Netherlands the

damage has been less severe to date. Box is widely planted as an ornamental shrub in gardens and parks. The defoliation and dieback are unsightly, and reduce the amenity value of the plants.

In addition to being a threat to ornamental box plants, *C. perspectalis* is also a threat to native box trees in the UK. It has been reported to have caused significant damage to native box trees in Switzerland (Marc Kenis, pers. comm.). Though not commonly found in the wild in Britain, native box plants are present on isolated sites with chalky soils in southern England, notably Box Hill in Surrey.

Control Measures

There is little published information available on the control of *C. perspectalis*. The webbing that the older larvae form around them may make control more difficult. On commercial nurseries, pyrethroid insecticides that have contact and some residual toxicity, such as products containing deltamethrin (e.g. Decis) or cypermethrin (e.g. Toppel 100 EC), should be effective. An alternative to pyrethroid insecticides is diflubenzuron (Dimilin Flo). This is an insect growth regulator and is most effective if applied when caterpillars are very small, ideally just after egg hatch. One biological option is the entomopathogenic bacteria, *Bacillus thuringiensis* var. *kurstaki* (sold as Dipel DF). This pathogen is effective when ingested by caterpillars.

Steinernema carpocapsae are pathogenic nematodes that attack caterpillars. Laboratory studies have shown that they will kill *C. perspectalis*, therefore they have potential for control of this pest, but effective control is reliant on high humidity levels around the leaves. *S. carpocapsae* are available for gardeners (as Nemasys) and to professional growers (as Capsanem).

For box plants in gardens, insecticides containing pyrethrins should be effective against *C. perspectalis*. Physical control by cutting off infested material, picking off eggs or caterpillars, could also be considered depending on the situation.

Pesticide approvals are constantly changing and current approvals are listed on The Chemicals Regulation Directorate (CRD) website. The conditions listed on pesticide labels should be read and followed. If a plant protection product is being used on a crop for the first time, it is advisable to treat a limited number of plants initially to test for phytotoxic effects.

Authors

A. Korycinska and D. Eyre

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