

Box Tree Moth & Caterpillar

An EBTS Guide



What to do?

- From mid-March to October inspect your plants every few days and at least once a week for signs of caterpillar damage such as eaten leaves, cob-webbing or frass balls.
- Spray your plants as soon as you see any damage or caterpillars (preferably with a safe biological insecticide or use nematodes). If you don't like using sprays pick off the remaining caterpillars by hand and put them in water with few drops of washing up liquid.
- Carefully comb through the plants with a small hand claw/rake to remove the cob-webbing and green balls of frass and clear away the debris under the plants.
- Water the plants at their base, avoiding wetting the leaves as this can cause the conditions that allow blight to take hold.
- Setup up a pheromone trap to catch the male moths thus reducing the number of fertilised eggs that get laid by the females.
- Register your trap, caterpillars or moths sightings at www.ebts.org/bmctracker

It's not recommended to use a jet wash to remove caterpillars. This is likely to cause damage to the plants & promote blight (damp and humid at the centre of the plant).

Catch the male moths with a Pheromone Trap

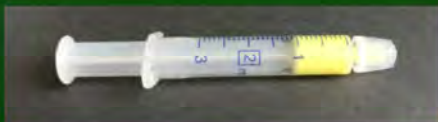
Funnel traps use a lure containing a synthetic pheromone that smells like a female moth. This attracts the male moths who flutter near the lure which is above a funnel that leads to a container. When they get tired they drop lower into the funnel and can't fully open their wings causing them to drop into the container below.

Originally used to monitor the presence of moths, they can also be used to disrupt the breeding cycle by reducing the numbers of male moths. This decreases the number of fertilised eggs laid by the females and thus reduces the number of caterpillars.

'How to' videos are available at www.ebts.org



Rubber bung lure lasts 4-6 weeks



Sticky gel lure lasts 12 weeks



Full season lure last 35 weeks

The consensus is that the wide scale spread is not caused by the flight of the moths, but by commercial movement of infected plants where leaves are carrying undetected eggs. A good example of this was the 2012 Sochi Winter Olympic Games. During the build-up, Italian box was imported for planting in the Olympic village where Russian experts then found *Cydalima perspectalis* in the site. Control measures using Aktelik, a non-systemic organophosphorus insectoacaricide product with enteric-contact action, failed, resulting in a rapid spread into the natural boxwood in the territory of yew-box grove in the Caucasian Biosphere Reserve. It has since spread further across Georgia. Damage has also been observed on *Rubus* spp., *Ruscus colchicus*, *Ruscus fruticosus* and *Smilax excelsa*.

Box Moth were first categorised as *Cydalima perspectalis* in 1859 by Francis Walker (1809-1874) when he was working for the British Museum collating their specimens. They were recorded in the *List of the specimens of lepidopterous insects in the collection of the British Museum*. Without the aid of modern technology to cross-reference specimens, Walker gave it more than one name, so box moth was also called *Phakellura perspectalis*, *Diaphania perspectalis* and *Glyphodes perspectalis*.



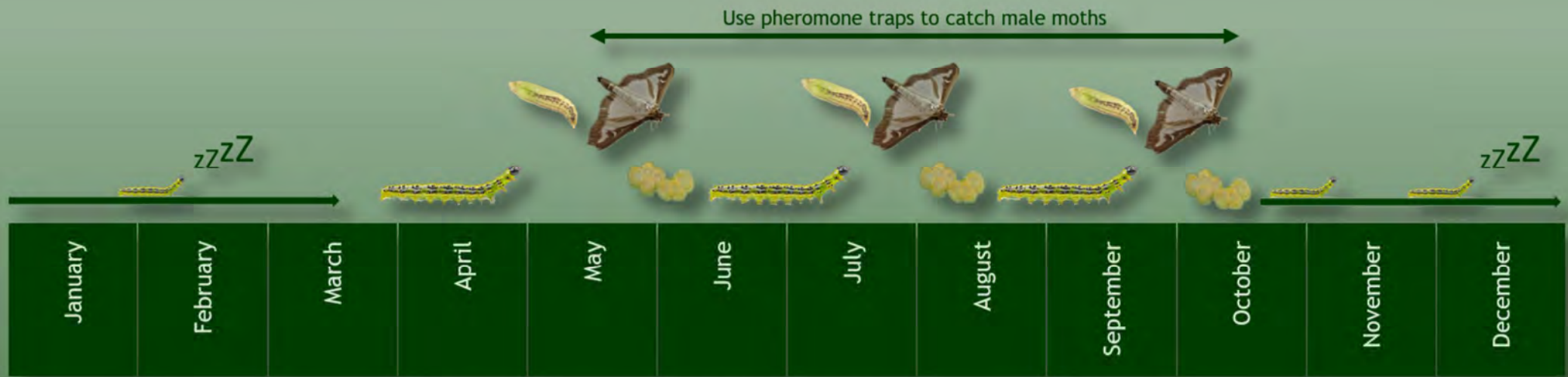
Wikipedia

Prospects for the future?

Essential Oils & Plant Extracts – In her dissertation, Stefanie Gabriele Göttig of the Technische Universität Darmstadt, looked at the repellent effect of different concentration of the extracts and oils & toxicity. The plant that was most effective was Elder *Sambucus nigra* followed by *Thymus vulgaris* which reduced egg laying significantly. However, when also looking at the toxicity of the treatment, with the *T. vulgaris* at 5% concentration only 7% survived.

Frass Vials – Hungarian research has found that female moths don't tend to lay eggs near active caterpillars. The frass from the caterpillar acted as a beacon to say the leaves would be eaten if the eggs were laid on them so they were avoided. Using this knowledge they extracted and produced a synthetic version of the 3 compounds in the frass that triggered a reaction in the moths. When used in a vial with a wick it reduced egg laying by 75%.

Trichogramma – These are small wasps that lay their own eggs inside the egg sacks of the box moth eggs and when they hatch they eat the box moth eggs. The distribution method is often a biodegradable cardboard carrier that is hooked onto a branch inside a box plant. If applied as soon as eggs have been laid and a minimum of two consecutive treatments are applied to the first set of eggs in the year it is possible to achieve 90% efficiency.



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Caterpillars/Larvae

When they hatch are greenish yellow in colour, developing black heads and light & dark strips with spots along their length as they grow. Speed of growth is dependent on temperature, typically taking 3-4 weeks to become fully grown at 4cm long and living a further 2 weeks in the UK.

Temperature threshold for this state >8.4c



Pupae/Chrysalis

Are cocooned in white webbing spun around leaves and are between 1.5-2.0cm long.

The process of turning from caterpillar to moth takes about a week.

Temperature threshold for this state >11.5c

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Moths

Have a wing span of about 4cm and either have a thick dark brown border around a white coloured wing with distinctive dots halfway down the leading edge of the wings (common variant) or less commonly the wings are almost entirely brown with white dots (Melanic variant).

During their lives they can fly up to 10km & start laying eggs 2-3 days after they start flying.



Eggs

Each female can lay up to 700 eggs of 0.8-1.0mm diameter which are laid in groups of 5-30 on the underside of leaves and look like fried eggs. These are coloured greenish yellow at first with black dots appearing as the larval head capsule is formed.

Temperature threshold for egg development >10.9c

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When & how did it get here?

Since 2007 box moth caterpillars have been devastating our boxwood hedging and topiary in domestic, commercial and historic gardens across Europe. However, the impact is not just in gardens; the caterpillar is decimating large areas of Europe's natural box woodlands. The Northern Caucasus as well as Bulgaria, NW Italy, Romania and southern France have all been badly affected. In the UK wild box is now under threat with small infestations reported at Box Hill, though there are currently no reports at other large areas of natural box such as the Chilterns.

The severity of the infestations is demonstrated dramatically in Germany's Grenzarch-Whylen Nature Reserve which contains the country's largest box tree forest. Between 2009 and 2010, the caterpillars attacked all the box trees causing more than 90% defoliation and 27% lost all their leaves. Although the population of moths then decreased, having eaten most of its food source, by 2012 the trees that had been fully defoliated died as their bark had also been eaten and thus exposed the trees to fungal infection. Observations show the eco-system in the forest is beginning to change with new ground cover taking the place of the box which will likely now only remain in smaller clumps.

The origin of the moth is recorded as North China, but it has spread a long way since 1859 when it was first identified and now covers large areas of the continent of Europe.



Arrival across Europe

How to get rid of the caterpillars

Biological Insecticide

Most reports consider *Bacillus thuringiensis* (Bt) to be the best option for killing box tree caterpillars as they stop eating within an hour of ingesting a treated leaf and is harmless to humans, birds, fish, and other beneficial wildlife including bees.

XenTari & Dipel are both based on the Bt bacterium which contains protein endotoxin crystals and living spores. There are fifty subspecies, the most commonly used for caterpillars are subsp. *Kurstaki* (in Dipel) & *aizawai* (in XenTari). When the targeted insect eats a treated leaf, the toxins dissolve in the high pH of the pest's stomach, causing holes in the lining which allow the spores into the gut. These then germinate causing the death of the insect within a couple of days.

Spray plants as soon as caterpillars are spotted. Bt doesn't stay active on leaves for more than ten days as it breaks down under UV light and needs to be ingested to work.

Nematodes

These are small worms that are supplied as a powder that is mixed with water and applied with a watering can or hose attachment and repeated twice at 7 day intervals. As soon as an infestation is found, the nematodes need to be sprayed directly onto the caterpillars. They kill by entering through natural openings in the bodies of the larvae and producing bacteria that disrupts their digestive system. Next they reproduce in the dead caterpillars spreading to others until they have nothing left to eat, at which point they die. However they also die if the surroundings aren't moist or the temperature drops below 12c.

As nematodes are a live product they can only be stored for a maximum of 4 weeks and must be kept in a refrigerator during this time. They can be very effective if applied at the right time.

Chemical Insecticides

These generally work for longer than biological pesticides & can be sprayed by a professionals at higher doses but are not safe with bees & other garden beneficials.

Pyrethrum based products such as...

- Py Spray Garden Insect Killer
- Bug Clear Gun for Fruit and Veg
- Defenders Bug Killer
- Ecofective Bug Killer
- Growing Success Fruit & Veg Bug Killer
- Growing Success Shrub & Flower Bug killer

Deltamethrin based products such as...

- Bayer PROVADO Ultimate Bug Killer
- Bayer Sprayday Greenfly Killer

Lambda-cyhalothrin products such as...

- Westland Resolva Bug Killer



www.ebts.org

Devoted to encouraging the appreciation,
cultivation and knowledge of
Boxwood & Topiary.

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