PennState Extension

# Box Tree Moth

Box tree moth is an invasive pest that has decimated wild and ornamental boxwoods in Europe, where it was introduced from Asia. In the fall of 2018, it was discovered in Toronto, Canada and may invade the United States.

Box tree moth adults. Photograph by Cosmi O. Manci, used with permission.

## Summary

Box tree moths are invasive moths that feed on boxwood (*Buxus* sp.) as caterpillars. They were detected in Toronto, Canada in 2018 and have since spread to multiple US states.

## Classification

Common name: Box tree moth
Scientific name: *Cydalima perspectalis* (Walker, 1859)
Order: Lepidoptera (moths and butterflies)
Family: Crambidae (crambid snout moths)

Figure 2. Box tree moth adult. Photograph by Didier Descouens via Wikimedia, used under a CC BY-SA 3.0 license.

## Distribution and spread

Box tree moths (Figures 1, 2) are native to eastern Asia, including Japan, China, the Russian Far East, Korea, and India. They were introduced into Germany in 2006 and have subsequently spread throughout most of Europe (Figure 3). Box tree moths were first detected in North America in Toronto, Canada in November 2018 and in the United States in 2021 in New York state. As of this writing (December 2023), their presence has been confirmed in New York (2021), Michigan (2022), Ohio (2023), and Massachusetts (2023).

Figure 1. Box tree moth caterpillar. Photograph by Christophe Quintin via Flickr, used under a CC BY-NC 2.0 license. Cropped from original.

Box tree moths were able to spread quickly through Europe due to a couple of factors. First, two species of boxwood are native to Europe. Once the moths got onto wild, non-ornamental European boxwoods, they were able to spread relatively unchecked in natural areas. Second, based on DNA evidence, box tree moths were introduced into Europe from Asia multiple times and moved within Europe via nursery trade after they were introduced.

There are no native boxwood species in continental North America and they are not present in wild areas as invasives, so the only boxwoods that can be infested are those that have been planted as ornamentals. While boxwoods are one of the most commonly planted ornamentals in North America, the largest plantings occur in urban areas. The absence of wild boxwoods in natural areas and relative lack of ornamental boxwoods in more rural areas may help slow the spread of the moths from urban to suburban areas and between different large urban centers.

## Damage

Box tree moth caterpillars feed exclusively on boxwoods. The young caterpillars feed on the undersides of leaves, which give them a "peeled" appearance from the top. Older caterpillars consume the entire leaf except for the midrib. In addition to feeding damage, caterpillars web together leaves and construct silken retreats. Because they lack natural enemies in Europe, box tree moths decimate boxwood plantings. Extensive feeding kills individual plants and entire plantings.

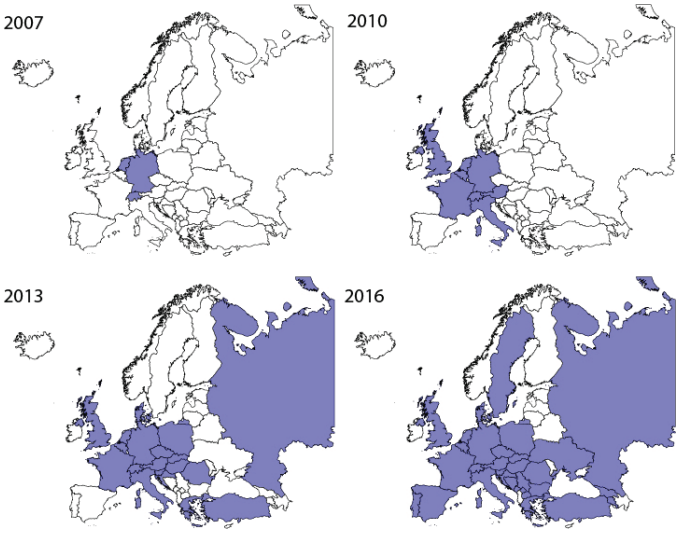


Figure 3. Box tree moth invasion of Europe. Modified from Bras et al. (2019) and EBTS (2020).

## Description

Box tree moth eggs are pale yellow (Figure 4); they are laid in groups of 5–20 and overlap like shingles. Eggs take three days to develop and when the young caterpillars are close to hatching, the head capsule becomes visible through the egg. Box tree moth caterpillars (Figures 1, 5) are green and yellow with white, yellow, and black stripes and black spots; they are only caterpillars in the region that feed on boxwood, so finding them on the host plant is distinctive. Box tree moth caterpillars take about 14 days to mature. Pupae are found amongst webbing and damaged leaves (Figure 6). Young pupae are green with brown stripes; when pupae are ready to turn into moths, the pattern of the wings becomes visible through the pupal skin. Pupae take about 14 days to develop. Most adult box tree moths are white with a brown border (Figure 2). Some adult moths may have an additional brown border on the edge of the forewing. A minority of specimens (5–10%) are entirely brown except for the white commas on the forewings (Figure 7). White box tree moths look superficially similar to melon worm moths ( Diaphania hyalinata ), which are common in the southeastern United States and sometimes migrate into Pennsylvania in the fall, but can be distinguished by the presence of white commas on the forewings (orange arrow) and white prothorax which interrupts the brown border (red arrow) (Figure 8). Adult box tree moths can survive for about a month. They are strong fliers and can disperse 4–6 miles.

Figure 4. Box tree moth eggs. Photograph by Cosmi O. Manci, used with permission.

Figure 5. Box tree moth caterpillar. Photograph by Cosmi O. Manci, used with permission.

Figure 6. Box tree moth pupae. Photographs by Cosmi O. Manci, used with permission.

Figure. 7. Dark (melanic) phase box tree moth. Photograph by George Partsinevelos (Benaki Phytopathological Institute Dept. of Entomology and Agricultural Zoology), in Strachinis et al. (2015). Used with permission.

Figure 8. Comparison of adult box tree moth and melonworm moth. Photograph of box tree moth by Didier Descouens via Wikimedia, used under a CC BY-SA 3.0 license. Photograph of melonworm moth by Mark Dreiling via Bugguide, used under a CC BY-ND-NC 1.0 license.

## Life history and behavior

Box tree moths have 1–5 generations per year depending on the latitude and local climate. Based on information from Europe and Canada, they will likely have two generations across most of Pennsylvania but may have three generations in Philadelphia and the surrounding area. Box tree moths overwinter as 2nd to 5th instar larvae and can survive temperatures to at least -22°F (-30°C). Overwintering caterpillars have a development threshold of 46–53°F, so will begin feeding in early to mid-spring. They have an obligatory diapause (when the caterpillars stop eating and rest) of 6–8 weeks when day lengths reach 13.5 hours; this occurs between 15–20 April in Pennsylvania, so feeding in our area will begin again in late May to early June.

## Control

Because it is not established in the United States at this time, there are no official recommendations for controlling box tree moth. When infestations are small, hand-picking caterpillars and disposing of them in soapy water is likely going to be an effective solution. When caterpillars are small, it is possible to knock them off plants with a strong jet of water, which kills many of them as they are unable to climb back up the plant before starving.

A sex pheromone is commercially available and pheromone traps are used to monitor plantings for box tree moth. While it doesn't seem to have been done in Europe, there may be an opportunity to use the pheromones for mating disruption.

There are a number of natural enemies of box tree moth that have been recorded from their native range, including a variety of parasitoid wasps and flies. However, all of the species have broad host ranges and also attack other caterpillars and are not suitable for release in invaded areas. A handful of studies in Europe found low levels of parasitism by native parasitoid wasps and flies, but never enough to exert control over the moths.

Horticultural oil and insecticidal soaps will likely be able to control young caterpillars and biopesticides that work on other caterpillars, such as *Bt* and Spinosad, have been used to kill box tree moths in Europe. Broad spectrum pesticides that are labeled for caterpillar control on ornamental plants will also likely provide acceptable control. However, it should be noted that adequate coverage can be difficult to achieve as the young caterpillars feed only on the undersides of leaves and older caterpillars are protected by silken retreats.

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