

# Fall Webworm, *Hyphantria cunea* (Drury) (Insecta: Lepidoptera: Arctiidae: Arctiinae)<sup>1</sup>

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*The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.*

## Introduction

The fall webworm, *Hyphantria cunea* (Drury), is a pest of a number of ornamental trees and shrubs as well as of several agricultural crops. The larvae feed in huge nests and are able to completely defoliate trees and shrubs. Native to North America, this species has become an invasive pest throughout Europe and Asia, and therefore is well studied.

## Synonymy

*Hyphantria*

*liturata* (Goeze, 1781)

*punctatissima* (Smith, 1797)

*budea* (Hübner, 1823)

*textor* (Harris, 1828)

*mutans* (Walker, 1856)



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Figure 1. Adult male fall webworm, *Hyphantria cunea* (Drury). This adult is all white, which is typical for members of this species from the northern part of its range. Photograph taken at Gainesville, Florida, from a reared larva.

*punctata* (Fitch, 1857)

*pallida* (Packard, 1864)

*candida* (Walker, 1865)

*suffusa* (Strecker, 1900)

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## Distribution

The fall webworm originally occurred throughout North America to its northernmost limit in southern Canada. The northern range limit for *Hyphantria cunea* occurs at the latitude of 50–55° (Morris 1963).

The fall webworm was introduced into Yugoslavia in the 1940s, and since then has invaded most of Europe. It now also inhabits parts of China and North Korea, again due to accidental introduction, and it is found in Japan.

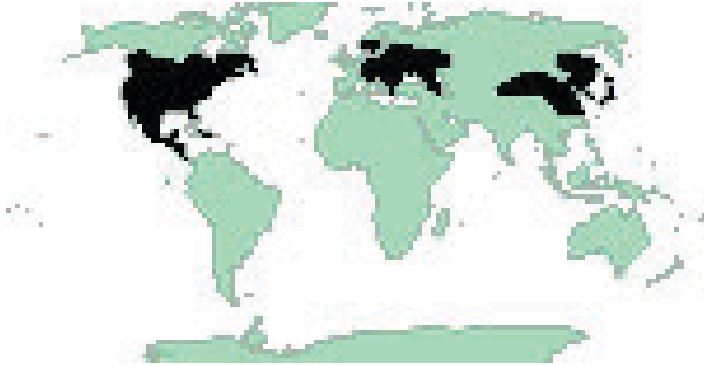


Figure 2. Worldwide distribution as of 2010.

## Description and Life Cycle



Figure 3. Adult male fall webworm, *Hyphantria cunea* (Drury). This adult is all white, which is typical for members of this species from the northern part of its range. Photograph taken at Gainesville, Florida from a reared larva.

Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida

The adult fall webworm moth is bright white, with a hairy body. In the southern part of its range, the moth is white with dark wing spots while in the northern part of its range it is nearly always pure white (MPG 2010) and was once thought to be a separate species from the southern populations. The gregarious larvae form large tents around the host plant. Currently, the taxonomic status of *Hyphantria*

*cunea* as a single species remains intact. The variations in phenotypes of both adults and larvae (presence of dark markings on the wings in some populations and presence of populations with red-headed vs. dark-headed larvae) have caused speculation that more than one species might be involved. For example, in Japan, DNA barcoding studies have shown that two species might be occurring there sympatrically (Takeda 2005).



Figure 4. Adult fall webworm, *Hyphantria cunea* (Drury), with spots on white, which is typical for members of this species from the southern part of its range.

Credits: Lyle J. Buss, University of Florida



Figure 5. Adult fall webworm, *Hyphantria cunea* (Drury), with spots on white, which is typical for members of this species from the southern part of its range.



Like most moths, the fall webworm moths are nocturnal and are attracted to light. Adult moths have a wingspan of between 1.4–1.7 inches (35–42 mm). The bases of the front legs are orange or bright yellow.

The number of generations per year depends greatly on latitude. Southern populations may complete four generations in one year, while in the north the fall webworm completes only one life cycle. The univoltine chiefly black-headed and dark-bodied larvae tend to occur above 40° latitude, while the multivoltine cycles with green-bodied, red or black-headed larvae tend to be found in the southern part of the distribution area.

Adults emerge as early as March in the south, but do not fly until late spring or early summer in northern areas. Mostly, the adults appear from May to August and deposit their eggs.



Figure 6. A mating pair of fall webworms, *Hyphantria cunea* (Drury). These individuals were reared from the same nest of black-headed larvae, collected on bold cypress in Gainesville, Florida.

## Eggs



Figure 7. Adult female fall webworm, *Hyphantria cunea* (Drury), laying eggs. Usually there are 400–1000 eggs in a batch. Female died following oviposition, never moving from the leaf. Photograph taken at Gainesville, Florida.

The egg mass of *Hyphantria cunea* is almost iridescent green in color. The egg batch contains 400–1000 eggs. The eggs are usually deposited on the undersides of leaves in the spring, in a single (black-headed larva race) or double (red-headed larvae race) layer of several hundred eggs. The egg mass is lightly covered with scales from the female's abdomen.



Figure 8. Eggs and neonate larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida

## Larvae

In one to two weeks, the larvae hatch and immediately begin spinning their silk tent. The neonate caterpillars place the web over single leaves and feed by skeletonizing.



Figure 9. Second instar larvae of the fall webworm, *Hyphantria cunea* (Drury), making the nest. Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida





Figure 10. Close-up of second instar larva of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 11. Second instar larvae of the fall webworm, *Hyphantria cunea* (Drury), feeding. Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 12. Second instar larvae of the fall webworm, *Hyphantria cunea* (Drury), before molting. Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida

Mature larvae are hairy and either have a lime green body with black spots or can have darker color, especially in the later instars. The head capsules in some populations can be either red or black. In other populations, they are entirely black. The black-headed larvae are thought to be more prevalent in the northern climes, while the red-headed larvae are thought to be dominant in the southern climes. Some behavioral differences have been noted between different larval morphs. For instance, larvae of the red-headed morph stay inside the tent throughout the larval stage, while the black-headed morph leaves the tent in its fifth instar.



Figure 13. Late instar, red-headed morph larvae of the fall webworm, *Hyphantria cunea* (Drury). Credits: Lyle J. Buss, University of Florida



Figure 14. Late instar, black-headed morph larvae of the fall webworm, *Hyphantria cunea* (Drury). Credits: Lyle J. Buss, University of Florida





Figure 15. Third instar larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 18. Close-up of fifth instar larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 16. Third instar larvae of the fall webworm, *Hyphantria cunea* (Drury), feeding. Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 19. Fifth instar larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 17. Fourth (middle) and fifth (bottom) instar larvae of the fall webworm, *Hyphantria cunea* (Drury). The top image is the skin left behind by a molted fourth instar caterpillar. Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 20. Freshly molted fifth instar larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida.  
Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida





Figure 21. Dorsal view of a fifth instar larva of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 22. Lateral view of a fifth instar larva of the fall webworm, *Hyphantria cunea* (Drury). Credits: Lyle J. Buss, University of Florida

## Pupae

Full-grown larvae leave the web to pupate in leaf litter or bark crevices. Fall webworms overwinter in the pupal stage. Pupation occurs in thin cocoons. The pupae are brown.



Figure 23. Fifth instar larva of the fall webworm, *Hyphantria cunea* (Drury), inside a cocoon. Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 24. Cocoon of the fall webworm, *Hyphantria cunea* (Drury). Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida



Figure 25. Pupae of the fall webworm, *Hyphantria cunea* (Drury), removed from a cocoon. Photograph taken at Gainesville, Florida. Credits: Andrei Sourakov, Florida Museum of Natural History, University of Florida

## Hosts

Part of *Hyphanea cunea*'s success as a species can be attributed to the fact that its larvae are consummate generalists, capable of developing on a wide range of host plants. Preferred host plants include hickory, pecan, walnut, elm, alder, willow, mulberry, oak, sweetgum, and poplar.

## Host Plants Recorded in Florida (Heppner 2007, and personal observation)

**Aceraceae:** *Acer* spp.—*A. negundo*, *A. rubrum*, *A. saccharinum*, *A. saccharophorum*

**Anacardiaceae:** *Cotinus coggygia*

**Anacardiaceae:** *Schinus terebinthifolius*

**Annonaceae:** *Asimina triloba*

**Aquifoliaceae:** *Ilex* spp.—*I. decidua*, *I. opaca*

**Berberidaceae:** *Berberis canadensis*

**Betulaceae:** *Alnus* spp.; *Betula* spp.—*B. alba*, *B. nigra*, *B. papyrifera*; *Carpinus caroliniana*; *Corylus americana*; *Ostrya virginiana*

**Bignoniaceae:** *Campsis radicans*, *Catalpa bignonioides*, *Catalpa speciosa*

**Buxaceae:** *Buxus* spp.—*B. sempervirens*

**Cannaceae:** *Canna* spp.

**Caprifoliaceae:** *Lonicera* spp., *Sambucus canadensis*, *Symphoricarpos albus*, *Virburnum* spp.

**Celastraceae:** *Euonymus atropurpureus*

**Chenopodiaceae:** *Chenopodium album*, *Spinacia oleracea*

**Comaceae:** *Cornus* spp.—*C. alternifolia*, *C. drummondii*, *C. florida*

**Compositae:** *Helianthus* spp., *Parthenium argentatum*

**Cupressaceae:** *Chamaecyperis thyoides*, *Cupressus* spp., *Juniperus virginiana*, *Taxodium distichum*

**Ebenaceae:** *Diospyros kaki*, *Diospyros virginiana*

**Ericaceae:** *Kalmia* spp.

**Ericaceae:** *Oxydendrum arboretum*, *Rhododendron* spp.

**Euphorbiaceae:** *Ricinus communis*

**Fagaceae:** *Castanea* spp.—*C. dentata*, *C. pumila*; *Fagus grandifolia*; *Quercus* spp.—*Q. alba*, *Q. coccinea*, *Q. phellos*, *Q. prinus*, *Q. rubra*

**Geraniaceae:** *Pelargonium* spp., *Geranium* spp.

**Gramineae:** *Zea mays*

**Hamamelidaceae:** *Hamamelis virginiana*, *Liquidambar styraciflua*

**Hippocastanaceae:** *Aesculus* spp.—*A. glabra*, *A. hippocastanum*, *A. octandra*

**Juglandaceae:** *Juglans* spp.—*J. californica*, *J. nigra*, *J. regia*; *Carya* spp.—*C. glabra*, *C. illinoensis*, *C. laciniata*

**Lauraceae:** *Sassafras albidum*

**Leguminosae:**

**Leguminosae:** *Cercis canadensis*; *Gleditsia triacanthos*; *Gymnocladus dioica*; *Robinia pseudo-acacia*; *Trifolium* spp.; *Wisteria* spp.—*W. frutescens*, *W. sinensis*

**Malvaceae:** *Althaea rosea*, *Gossypium herbaceum*, *Hibiscus syriacus*

**Magnoliaceae:** *Liriodendron tulipifera*, *Magnolia* spp.

**Moraceae:** *Ficus carica*, *Maclura pomifera*, *Morus* spp.—*M. rubra*

**Naucleaceae:** *Cephalanthus occidentalis*

**Nyssaceae:** *Nyssa sylvatica*

**Oleaceae:** *Chionanthus virginicus*; *Fraxinus* spp.—*F. americana*, *F. excelsior*; *Jasminum* spp., *Ligustrum vulgare*, *Syringa* spp.

**Platanaceae:** *Platanus occidentalis*

**Pinaceae:** *Larix deciduas*, *Pinus* spp.

**Portulacaceae:** *Portulaca oleracea*

**Ranunculaceae:** *Clematis* spp.

**Rhamnaceae:** *Rhamnus alnifolia*

**Rosaceae:** *Amelanchier canadensis*; *Crataegus* spp.; *Cydonia oblonga*; *Malus* spp.—*M. angustifolia*, *M. coronaria*, *M. diversifolia*, *M. pumila*; *Prunus* spp. - *P. americana*, *P. avium*, *P. cerasus*, *P. domestica*, *P. ilicifolia*, *P. persica*, *P. serotina*, *P. communis*; *Pyrus communis*; *Rosa* spp.; *Rubus* spp.—*R. allegheniensis*, *R. idaeus* var. *strigosus*; *Spiraea* spp.

**Rutaceae:** *Citrus* spp.—*C. aurantiifolia*, *C. lemon*, *C. paradisi*, *C. sinensis*; *Zanthoxylum americanum*

**Salicaceae:** *Populus* spp.—*P. alba*, *P. balsamifera*, *P. deltoides*, *P. fremonti*, *P. nigra* var. *Italica*, *P. tremuloides*; *Salix* spp.

**Saxifragaceae:** *Ribes* spp.—*R. lacustre*, *R. sativum*

**Scrophulariaceae:** *Paulownia tomentosa*

**Simaroubaceae:** *Ailanthus altissima*



**Staphyleaceae:** *Staphylea trifolia*

**Taxaceae:** *Taxus* spp.

**Tiliaceae:** *Tilia* spp.—*T. americana*, *T. europaea*

**Ulmaceae:** *Celtis* spp.—*C. laevigata*, *C. occidentalis*; *Ulmus* spp.—*U. americana*, *U. rubra*

**Vitaceae:** *Parthenocissus quinquefolia*, *Vitis vulpina*

## Economic Importance

In the wild, within its native range, fall webworm does not usually damage the trees, since the defoliation occurs just before leaf drop. However, *Hyphantria cunea* is known to cause damage to ornamental trees and is also known as a pest of sericulture because of its preference for mulberry leaves (Franz 1961, Yang & Zhang 2007).



Figure 26. Damage to persimmon tree caused by larval feeding of the fall webworm, *Hyphantria cunea* (Drury).  
Credits: Lyle J. Buss, University of Florida

A fall webworm tent normally encloses the foliage at the end of a branch. The caterpillars can build large silk tents that sometimes spread over several branches. At maturity, the larvae may reach one inch in length. Throughout their development, the caterpillars are able to make distinct jerking movements in unison if the nest is disturbed.



Figure 27. Leaf damage caused by larval feeding of the fall webworm, *Hyphantria cunea* (Drury).  
Credits: James Castner, University of Florida



Figure 28. Silken tent created by larvae of the fall webworm, *Hyphantria cunea* (Drury).  
Credits: Lyle J. Buss, University of Florida



Figure 29. Numerous tents created by larvae from separate egg clusters of the fall webworm, *Hyphantria cunea* (Drury).  
Credits: James Castner, University of Florida



## Management

### Biological Control

Parasitoids attacking *Hyphantria cunea* include

#### DIPTERA

**Tachinidae:** *Exorista japonica* Townsend, *Lespesia frenchii* (Williston), *Mericiaampelus* (Walker), *Pales pavidus* Meigen, *Zanillia libatrix* Panz

#### HYMENOPTERA

**Braconidae:** *Aleiodes malacosomatos* Mason, *Aleiodes sanctihyacinthi* (Provancher), *Apanteles diacrisiae* Gahan, *Apanteles hyphantriae* Riley, *Microplitis hyphantriae*, *Meteorus bakeri* Cook and Davis, *Meteorus hyphantriae* Riley

**Chalcididae:** *Brachymeria obscurata* (Walker)

**Eulophidae:** *Baryscapus esurus* (Riley), *Chouioia cunea* Yang, *Elachertus hyphantriae* Crawford

**Ichneumonidae:** *Campoplex validus* Cress, *Casinaria genuina* (Norton), *Casinaria limenitidis* Howard, *Coccygomimus disparis* (Viereck), *Coelichneumon navus* (Say), *Enicospilus glabratus* Say, *Hyposoter fugitivus* (Say), *Hyposoter rivalis* (Cresson), *Hyposoter pilosulus* Provancher, *Itopectis inquisitor* Say, *Pimpla turionellae* Linnaeus, *Sinophorus validus* (Cresson), *Therion morio* (Fabricius), *Therion sassacus* Vier, *Vulgichneumon brevicinctus* (Say)

**Pteromalidae:** *Dibrachys cavus* (Walker)

**Torymidae:** *Monodontomerus minor* (Ratzeburg)

**Trichogrammatidae:** *Trichogramma dendrolimi* Matsumura

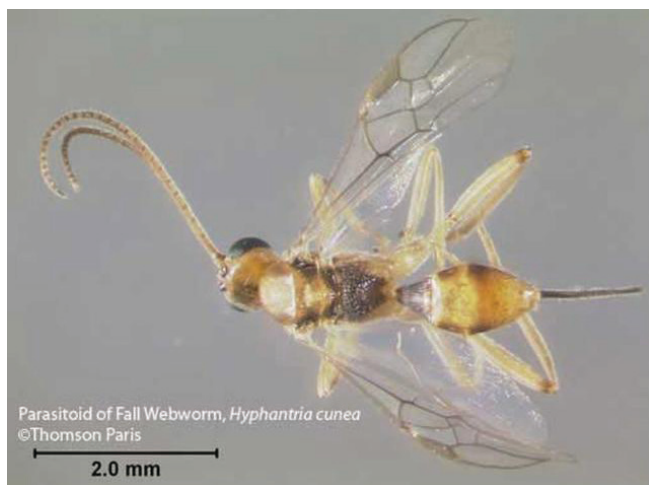


Figure 30. An adult parasitoid (unidentified species) of the fall webworm, *Hyphantria cunea* (Drury).

Credits: Thomson Paris, University of Florida



Figure 31. An adult parasitoid (unidentified species) of the fall webworm, *Hyphantria cunea* (Drury).

Credits: Thomson Paris, University of Florida



Figure 32. An adult parasitoid (unidentified species) of the fall webworm, *Hyphantria cunea* (Drury).

Credits: Thomson Paris, University of Florida

## Chemical Control

Florida Insect Management Guide for Pecans

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