BRANCHING OUT
IPM NEWSLETTER FOR TREES & SHRUBS

Gypsy Moth—Still Making Headlines

Dawn Dailey O'Brien, Plant Pathology & Plant-Microbe Biology Section, Cornell University

The purpose of this article is to alert readers to predictions of high gypsy moth populations in parts of the Northeast and to watch for Asian gypsy moths, which were found in traps in 2015 in Washington State, Oregon, Georgia and South Carolina. The Asian strain presents additional trouble; regulatory officials continue monitoring to ensure it doesn't become established.

High populations of gypsy moth are being predicted throughout the Northeast, including New York, this year. Dan Gilrein, Extension Entomologist from Suffolk County CCE received reports of high numbers of gypsy moth egg masses around Long Island from arborists and parks staff. High numbers are present in parts of eastern and central PA and the lower Hudson Valley. CT saw high levels last year with evidence of continued infestations this year.

European gypsy moth (EGM), the strain established in the US, feeds on over 300 types of trees including oak, maple, birch, beech, willow, and hickory. Though not preferred, some conifers such as pine, spruce, hemlock are also hosts, especially for the larger caterpillars and in outbreak years. Some trees including tulip poplar, ash, dogwood, rhododendron and cedar tend to be avoided. The females are flightless.

Asian gypsy moths

Asian gypsy moths (AGM) form a group of related moths and possibly subspecies of EGM (*Lymantria dispar dispar*), many so similar in appearance that DNA analysis is necessary to distinguish them. AGM also includes three visually distinct species (*Lymantria monacha, L. mathura* and *L. xylina*).

AGM poses a bigger threat to our landscapes and natural areas due to its broader host range (over 500 hardwood and softwood species) and ability to fly long distances—suggesting it could spread even more easily and quickly throughout the US. Their faster egg hatch in spring, reduced sensitivity to biopesticides like Bt, and fondness for conifers are added cause for concern.

AGM have been repeatedly intercepted on ships and cargo entering the US over the years. Fortunately, diligent monitoring and eradication efforts have kept it from successfully establishing in the US. However, AGM detections in four states in 2015 show the need for vigilance at all levels and the role arborists and growers can play. Gypsy moth defoliation on less preferred hosts (particularly conifer species like larch) is not uncommon during an outbreak year, but should it persist further investigation is suggested. Females able to fly are clearly an indication of something more serious.

AGM larvae have five different color forms (bright yellow, yellow, yellow-gray, gray, and black) that vary somewhat from EGM. However, only a taxonomist with expertise in the family should make an official identification. Whenever there is any question, best to collect a sample and obtain a diagnosis.

Historically, once gypsy moth became established, populations fluctuated from undetectable levels to large-scale causing catastrophic defoliations, peaking every six to eight years in the Northeast. These outbreaks were regulated by natural controls such as the gypsy moth nuclear polyhedrosis virus (NPV) and in the last several decades by the fungus *Entomophaga maimaiga*. Last year's relatively warm, dry spring may have been unfavorable for the fungus allowing the building population to increase further.

Nuclear polyhedrosis virus

Nuclear polyhedrosis virus (NPV) is a naturally occurring virus causing "wilt disease" in gypsy moth caterpillars, recognized in the early 1900s. The common name describes the symptom observed in infected larvae. Though always present, it seldom affects caterpillars until under stress from overcrowding or food scarcity. NPV infections typically follow a long period of rain or very humid conditions when caterpillars are actively feeding. NPV only infects gypsy moth.

Wilt disease is density-dependent, taking its greatest toll as gypsy moth populations increase. As each infected cadaver spreads virus particles to foliage, more caterpillars become infected by consuming contaminated leaves. The accelerating transmission rates result in a fairly dramatic population crash. In dense gypsy moth populations, the virus can kill more than 90% of larvae, reducing populations to levels where they cause only minimal defoliation

Infected larvae usually die within 9 to 11 days, characteristically hanging by their prolegs from leaves or bark in an inverted "V" position. The symptom, however, is not sufficiently reliable for diagnosis; larvae need to be dissected to confirm the cause.

Asian gypsy moth larval forms © USDA APHIS PPQ–Oxford, North Carolina, USDA APHIS PPQ, Bugwood.org

Typical inverted "V" shape of gypsy moth larvae infected with nucleopolyhedrosis virus (NPV) © John H. Ghent, USDA Forest Service, Bugwood.org

Fungal Pathogen

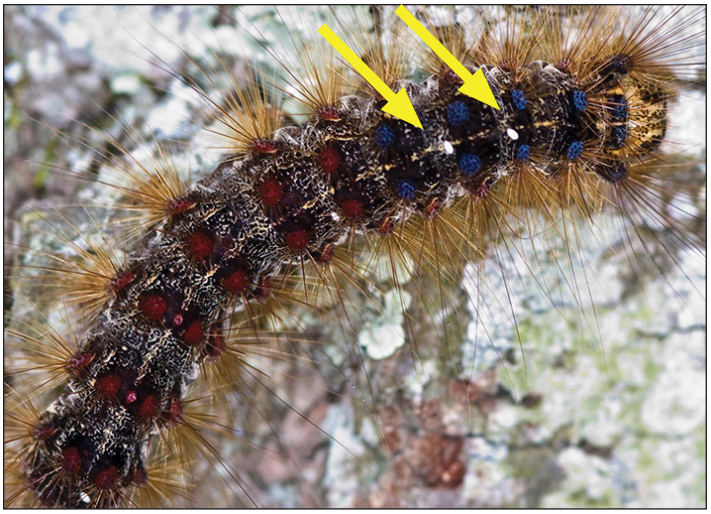
Entomophaga maimaiga, a fungal insect pathogen native to Japan, was identified in the US in 1989. Caterpillars killed by *E. maimaiga* look similar to those killed by NPV to untrained observers. Late-stage gypsy moth larvae die from *E. maimaiga* infection hanging vertically from tree trunks with prolegs extended laterally at 90 degrees away from the body. Larvae recently killed by the fungus are soft-bodied, and older cadavers appear dry. During humid or wet conditions the hairs can be noticeably covered with a dust of fungal spores. (see video from the Cornell Plant Pathology Photo Lab www.youtube.com/watch?v=erRkHbgK7eQ)

E. maimaiga is effective in both high and low density gypsy moth populations, in contrast to NPV which primarily operates under high density populations. The fungus can play a significant role in natural control of gypsy moth, especially in years with wet springs. This fungal pathogen is considered specific to gypsy moth.

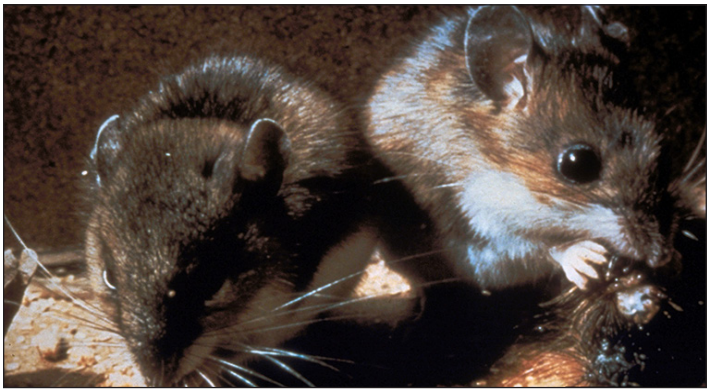
Dead gypsy moth caterpillar killed by Entomophaga maimaiga (fungal pathogen). © Steven Katovich, USDA Forest Service, Bugwood.org

Other Natural Controls

There are several other less prominent biological controls including parasitic wasps and flies which lay eggs in the caterpillars. The parasites feed in and eventually kill their host. Other natural enemies include ants, spiders, birds, shrews, mice, and squirrels. In addition, many species of predaceous ground beetles feed on gypsy moth larvae and pupae. Both the larvae and adults of these large (about one inch), often iridescent, beetles are predators of gypsy moth. White-footed mice are key predators of gypsy moth caterpillars and pupae. Interesting research suggests high populations of mice are directly correlated with low gypsy moth numbers. Environmental conditions, aside from wet springs, may have some direct impact. Temperatures of -20°F or colder kill exposed overwintering egg masses — under such conditions only those in protected sites, such as under snow, survive.

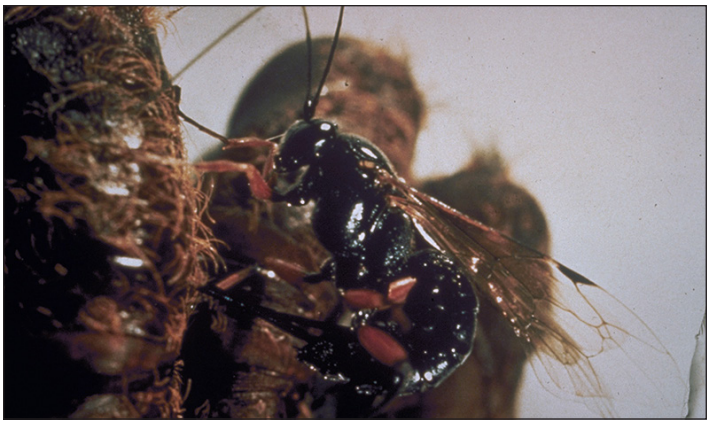


Late instar gypsy moth larvae with tacinid fly eggs on back (at yellow arrows) © John H. Ghent, USDA Forest Service, Bugwood.org



Mice feeding on gypsy moth larvae © Bill Antrobius, USDA Forest Service, Bugwood.org

A ground beetle adult (Calosoma spp.) © A. Steven Munson, USDA Forest Service, Bugwood.org



Parastic wasp laying eggs on gyspy moth pupal case. Eggs will hatch into wasp larvae which will feed and kill host. © USDA APHIS PPQ, Bugwood.org