

Calosoma sycophanta: A Natural Enemy of Gypsy Moth Larvae and Pupae

Michigan State University Extension

Molly Mott
M.S. Research assistant
Dept. of Entomology
Michigan State University

Deborah G. McCullough
Assistant professor
Dept. of Entomology and Dept. of Forestry
Michigan State University

The gypsy moth (*Lymantria dispar* L.) is an exotic pest of urban and forest trees. It was accidentally introduced from Europe into Massachusetts in 1869. Since then, gypsy moth populations have gradually spread across the northeastern United States. Gypsy moth caterpillars feed on the leaves of oak, aspen and 300 other species of trees and woody shrubs. Although feeding usually does not kill trees, stress from defoliation can make trees more vulnerable to damage from drought, disease, or other insect and disease pests. During outbreaks, an abundance of large, hairy caterpillars and defoliation of shade trees may be quite annoying. Frass (fecal pellets) may litter picnic tables, driveways and porches, and hairs from caterpillars may cause skin irritation.

Natural enemies - our allies in gypsy moth control

Chemical and biological insecticides have been developed for gypsy moth management in urban areas. However, we should also be familiar with the natural enemies such as birds, mice and predatory insects that work daily to lower gypsy moth populations. Natural enemies help reduce gypsy moth numbers during outbreaks and between outbreaks in both forest and urban forest environments.

Calosoma sycophanta, a predatory beetle

One natural enemy of gypsy moth is a predaceous ground beetle, *Calosoma sycophanta* L. This beetle was imported from Europe and was first released in 1906 in New England to help control gypsy moth. In recent years, *C. sycophanta* has been released in several states, including Connecticut, Delaware, Pennsylvania and Michigan.

"Spoilator," may be the oldest name for ground beetles. It was used specifically by medieval authors to refer to *Calosoma sycophanta*, a beetle in the family Carabidae. Members of the genus *Calosoma* are often known as "caterpillar hunters" because of their fairly exclusive diet

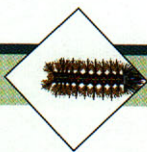
and active predation. *C. sycophanta* is one of the largest and most brilliantly colored carabids. Adults are metallic green and dark blue and may reach sizes of 25 mm or more (Fig. 1). Immature beetles are strikingly different. Dark brown larvae attain lengths of 35 mm and have long, slender abdomens (Fig. 2).



Figure 1. Adult *C. sycophanta*.



Figure 2. Immature *C. sycophanta*.



Life history

Adult beetles spend the winter in the soil. When they emerge in June, they actively hunt for gypsy moth caterpillars, often climbing trees to capture their prey (Fig. 3). In July, female beetles lay eggs in the soil that hatch in about a week.

Immature beetles also climb trees but search mainly for gypsy moth pupae instead of caterpillars. When the immature beetles find a pupa, they chew on it voraciously, leaving serrated edges that resemble an attack by pinkish shears. Immature beetles return to the soil to pupate and will emerge as adults within 4 weeks. Adult beetles live 3 to 4 years, returning to the soil each July to overwinter.

Though *C. sycophanta* is a good predator of gypsy moth, it is not likely to harm populations of native moth or butterfly species. Beetles are active only during the weeks when large gypsy moth caterpillars are likely to be present. Also, female beetles must feed extensively within a week after they emerge from the soil or their eggs will not mature. This means that high numbers of *C. sycophanta* are produced only when gypsy moth caterpillars are abundant.



Figure 3. Predation on gypsy moth larva.

An effective predator?

Though its life history is closely synchronized with that of the gypsy moth, the impact of predation by *C. sycophanta* on gypsy moth populations varies. One study was conducted in Connecticut, where a gypsy moth population was building toward outbreak levels. Researchers found that *C. sycophanta* destroyed over 70 percent of the gypsy moth larvae on the lower trunks of trees and 40 percent of all pupae.¹ However, a second study showed that survival of gypsy moth pupae during an outbreak was high even when *C. sycophanta* beetles

were abundant.² This situation would not occur if *C. sycophanta* was indeed controlling the gypsy moth outbreak. Also, there is a lag time of 1 to 2 years between increases in gypsy moth density and an increase in beetle numbers. Thus, the beetle can help control building and declining gypsy moth populations but appears to become overwhelmed during outbreaks.

Experience with *C. sycophanta* in several states indicates that this beetle is likely to become established when released in sites where gypsy moth populations are high. The focus of biological control programs that involve *C. sycophanta*, therefore, is to establish a breeding population. Releasing large numbers of *C. sycophanta* in hopes of immediate gypsy moth control is not likely to be effective.

Though *C. sycophanta* is not a "silver bullet," it can play an important role in long-term management of gypsy moth populations. A specialized predator such as *C. sycophanta* is a welcome addition to the complex of natural enemies that attack gypsy moth.

For more information on gypsy moth natural enemies, see the following Michigan State University bulletins available from your county MSU Extension office:

- E-2604 *Entomophaga maimaiga*: A Natural Enemy of Gypsy Moth
- E-2302 Gypsy Moth in Michigan: A Homeowner's Guide
- E-2421 Using Bt to Control Gypsy Moth
- E-1983 Gypsy Moth in Michigan: Guide for Home & Small Woodlot Owners

¹Weseloh, R.M. 1985. Predation by *Calosoma sycophanta* L. (Coleoptera: Carabidae): evidence for a large impact on gypsy moth, *Lymantria dispar* L. (Lepidoptera: Lymantriidae) pupae. *Can. Entomol.*, 117:1117-1126.

²Weseloh, R., G. Bernon, L. Butler, R. Fuester, D. McCullough and F. Stehr. 1995. Release of *Calosoma sycophanta* (Coleoptera: Carabidae) near the edge of gypsy moth (Lepidoptera: Lymantriidae) distribution. *Environ. Entomol.*, 24:1713-1717.