

Lymantria umbrosa*

*For regulatory purposes, the two subspecies, *L. d. asiatica* and *L. d. japonica*, and the three revised species in Pogue and Schaefer (2007), *L. albescens*, *L. postalba*, and *L. umbrosa*, are all considered Asian gypsy moths.

Specific information for this species is limited. When information specific to *L. umbrosa* is unavailable, information on Asian gypsy moths (AGM) as a group has been used.

Scientific Name

Lymantria umbrosa (Butler)

Synonyms:

Porthetria umbrosa Butler

Lymantria dispar praeterea von Kardakoff

Lymantria dispar umbrosa Matsumura

Lymantria dispar hokkaidoensis Goldschmidt

Lymantria dispar nesiobia Bryk

Common Name

Hokkaido gypsy moth (HGM)

Type of Pest

Moth

Taxonomic Position

Class: Lymantria, **Order:** Lepidoptera, **Family:** Lymantriidae*

*Recent classifications lower Lymantriidae to the subfamily Lymantriinae under the family Erebididae. See Pogue and Schaefer (2007).

Reason for Inclusion in Manual

PPQ Pest of Concern

Pest Description

Eggs: Egg mass color is more variable than in *L. d. dispar*. Egg masses are covered thickly with abdominal hairs from the female moth (Pogue and Schaefer, 2007).



Figure 1. Adult male (top) and female (bottom) of *Lymantria umbrosa* (Image courtesy of Michael Pogue, USDA-ARS).

Larvae: A full description of the larvae can be found in Pogue and Schaefer (2007). The length of the larvae ranges from 18 to 20 mm (approx. $11/16$ to $13/16$ in) (Pogue and Schaefer, 2007).

Pupae: No description available.

Adults: A full description of the adults can be found in Pogue and Schaefer (2007).

Male genitalia: “Essentially the same as *L. d. dispar*, aedeagus 0.75 - 0.78 x height of genital capsule” (Pogue and Schaefer, 2007).



Figure 2. Head of *L. umbrosa* larva (Image courtesy of Michael Pogue, USDA-ARS).

Biology and Ecology

Gravid females usually fly in the afternoons and prefer to oviposit on *Betula platyphylla* (white birch). Eggs are usually oviposited on boles of various trees at heights below 2 m (6.6 ft) (Pogue and Schaefer, 2007). In areas with heavy snow, snow cover provides insulation and protection from predatory birds (Higashiura, 1980; 1989).

After hatching in the spring, larvae will balloon to more favorable plants for food, such as *Larix leptolepis* (Japanese larch). Once adult females emerge, they will again fly to *Betula platyphylla* to oviposit. During high populations, *Larix* is preferred over *Betula*, which is often spared defoliation (Pogue and Schaefer, 2007).

Adult males fly during mid to late morning until late afternoon (Pogue and Schaefer, 2007).

Damage

There is limited information available on damage caused by *L. umbrosa*. In general, the main damage by Asian gypsy moth (AGM) is caused by larvae defoliating host trees. Infestations can lead to defoliation of trees. If defoliation is repeated, trees can become weakened and susceptible to disease. Tree mortality may also occur with repeated defoliations.

Pest Importance

In general, AGM can cause weakening of host plants through repeated defoliation. This can lead to tree mortality or an increase in tree susceptibility to diseases and other pests. The byproducts of an infestation (silk strands from caterpillars, frass, destroyed leaves, and dead moths) would be a nuisance to homes, yards, and parks (USDA, 2003).

Known Hosts

This species is polyphagous, but it generally prefers *Larix leptolepis* (Japanese larch) in monoculture plantations (Pogue and Schaefer, 2007).

Abies (fir), *Acer* (maple), *Betula* (birch), *Carpinus* (hornbeam), *Celtis* (hackberry), *Larix* spp. (larch), *L. leptolepis* (Japanese larch), *Morus* (mulberry), *Populus* (cottonwood), *Prunus* (plum), *Quercus* (oak), *Rosa* (rose), *Rubus* (blackberry), *Salix* (willow), and *Ulmus* (elm) (reviewed in Pogue and Schaefer, 2007).

Pathogen or Associated Organisms Vectored

AGM are not known to vector any human or animal pathogens. Defoliation caused by the larvae can lead to weakening of host trees making them more vulnerable to diseases.

Known Distribution

Asia: Japan and Russia (Pogue and Schaefer, 2007).

Pathway

AGM have the potential to spread rapidly due to the females' ability to fly and the extensive host range of the larvae. Larvae can move through wind dispersal by "ballooning." Ballooning is when larvae climb trees or other objects and drop on a silken thread resulting in their becoming wind-borne. Apart from natural spread, AGM are most likely to be moved through human assisted means, specifically through movement of material infested with eggs. AGM females are attracted to light; therefore, eggs are frequently laid near light sources (USDA, 2012).

These behaviors can potentially lead to females being attracted to and laying eggs around dock areas, shipping containers, and vessels (Pogue and Schaefer, 2007). Egg masses can thus move through international trade easily.

The egg stage lasts approximately 9 months (Wallner, 2000) and is very tolerant to temperature and moisture extremes (USDA-FS, 1991). Egg masses can remain viable for extended periods of time. In addition, AGM hatch can be induced when ships from infested areas with cold climates reach our much warmer southern ports, even during winter months (USDA, 2012).

Because of the significance of ships and cargo as a pathway, the United States works in conjunction with other governments (Russia, Japan, China, and South Korea) to minimize AGM introductions. This is achieved through inspections and certifications of ships entering U.S. ports.

The risk associated with AGM travelling through international trade has also led to the development of a NAPPO Regional Standards for Phytosanitary Measures (RSPM), "Guidelines for Regulating the Movement of Ships and Cargoes Aboard

those Ships from Areas Infested with the Asian Gypsy Moth.” Human-mediated spread can also occur across land through movement of firewood, timber, rail cars, automobiles, and other inanimate objects (USDA, 2011).

Species identified to the genus level (*Lymantria* sp.) have been intercepted 6 times at U.S. ports of entry. Only one of these instances was known to have originated from a country where AGM is known to occur. Species identified only as *Lymantria dispar* have been intercepted 16 times with 7 interceptions occurring on material originating from countries where AGM is known to occur. Almost all of these interceptions occurred on ships and their miscellaneous cargo (AQAS, 2012; queried January 25, 2012).

Potential Distribution within the United States

Pogue and Schaefer (2007) state that this species has an intermediate potential for invasion in the United States due to adult females’ ability to fly towards lights at night. Due to its polyphagous nature, this species will likely find suitable alternate hosts if introduced.

Survey

CAPS-Approved Method*:

The CAPS-approved method is a trap and lure combination. There are two trap options: the paper delta trap with two sticky sides or the milk carton trap. The lure is available in either a laminate or string dispenser. The laminate is effective for 84 days (12 weeks) and the string lure is effective for 180 days (6 months). Traps should be checked every two weeks. **It is critical that samples be collected regularly, stored properly, and submitted to the Otis Lab as soon as possible to maintain the integrity of the DNA (see Handling and Submission of Suspect AGM Specimens for Identification below).**

02/03/14: The length of effectiveness for the Gypsy Moth String Lure has been revised from 84 days (12 weeks) to 180 days (6 months). The Gypsy Moth Laminate Lure is still effective for 84 days (12 weeks).

For 2014 surveys, if it is appropriate for your climate/ planned survey season, please use the Gypsy Moth String Lures for the full 180 days. If you ordered the string lures based on the 84 day length of effectiveness and have excess lures, please store the excess lures in unopened packages in a freezer for the next season. The lures may be stored for two years if stored in a freezer below 0°F.

IPHIS Survey Supply Ordering System Product Names:

1) Traps:

Milk Carton Trap

Paper Delta Trap, 2 sticky sides, Brown

Paper Delta Trap, 2 sticky sides, Green

Paper Delta Trap, 2 sticky sides, Orange

- 2) Lures:
 - Gypsy Moth Laminate Lure
 - Gypsy Moth String Lure
- 3) Pesticide Strip – DDVP (for use in milk carton traps only)

Trap Options

Use the following guidance to determine which trap type to use:

Paper Delta Traps:

Delta traps are used outside of areas that are generally infested with European gypsy moth, where catch is expected to be less than 10 moths per trap. The lure should be stapled inside the trap, to one of the non-sticky panels. The ends of the trap should be folded in. Trap color is up to the State and does not affect trap efficacy.

Milk Carton Traps:

The standard milk carton trap has a much higher capacity and should be used in areas where populations of European gypsy moth are established. The lure is typically stapled to a long garden tie that is, in turn, stapled to the inside of the trap at the top so that the lure hangs more or less in the center of the trap. A killing agent, a DDVP strip, is required for milk cartons traps. The DDVP strip should be stapled to the garden tie below the lure. The DDVP strip is effective for 8 weeks.

Trap Placement:

Traps should be hung in the immediate vicinity of preferred host trees. Milk carton traps should be hung using a string, tied to a branch of a host tree. Delta traps are most effective when attached directly to the bole of a host tree. If no host tree is available, another vertical surface such as a telephone pole can be used to hang the trap. Never hang the traps on branch tips.

Trap Spacing: When trapping for more than one species of moth (that require different lures), separate traps for different moth species by at least 20 meters (65 feet).

Survey Site Selection:

Traps should be placed in the immediate vicinity of preferred host plants.

Time of year to survey:

“Gypsy moths have one generation annually; timing of flight depends on local climate, and can vary from May or June in very warm areas to September in colder climates” (Lance, 2006).

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at <http://caps.ceris.purdue.edu/>.

Literature-Based Methods:

Trapping: Adults are diurnal but can be attracted to light traps at night (Pogue and Schaefer, 2007).

Key Diagnostics/Identification

CAPS-Approved Method*:

Molecular. Specimens that are suspected of being AGM should be submitted to the Center for Plant Health Science and Technology (CPHST) Otis Laboratory for testing. **It is critical that samples be collected regularly, stored properly, and submitted to the Otis Lab as soon as possible to maintain the integrity of the DNA.** See **Handling and Submission of Suspect AGM Specimens for Identification** below.

Keys to first instar larvae and last instar larvae of selected *Lymantria* species can be found in Pogue and Schaefer (2007).

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at <http://caps.ceris.purdue.edu/>.

Handling and Submission of Suspect AGM Specimens for Identification

Specimens that are suspected of being AGM should be submitted to the Center for Plant Health Science and Technology (CPHST) Otis Laboratory for testing. (see Asian Gypsy Moth Trapping Submission Guidelines below) All specimens collected outside of the EGM quarantine areas will be analyzed. Specimens collected within generally-infested areas will be analyzed based on sub-samples of total catch because of the large number of insects which can be caught in some areas. **It is critical that samples be collected regularly, stored properly, and submitted to the Otis Lab as soon as possible to maintain the integrity of the DNA.** If traps cannot be checked regularly, it may be considered to trap when flight is expected rather than spreading resources out across the whole season.

Sample Handling

As a general rule, traps should be checked and samples removed every two weeks in order to reduce the degradation of the specimen's DNA. High temperatures and high humidity speed degradation of specimens and trapping schedules should be adjusted accordingly. If stored unfrozen the specimens should be in containers (paper bags or boxes) which will promote drying. Plastic containers retain moisture that favors the growth of bacteria and fungi, which will quickly degrade the DNA. Specimens should be stored in a freezer if possible (if not, in a cool dry area) and shipped to the Otis Lab as soon as practical. Specimens should not be stored unfrozen for extended periods.

Sample Submission

Milk Carton Traps

- Layer moths loosely between wadded paper towels or tissue paper in a paper bag (brown lunch bag size) to prevent motion and specimen damage during shipment (one bag per trap; if more than one bag is required per trap, label appropriately). Label paper bag clearly with trap numbers matching paperwork.
- Staple or tape paper bag closed.
- Do not attach paperwork to individual bags.
- Do not use plastic bags or paper envelopes as these do not allow moisture release and thus promote fungal growth and decomposition of the moths.
- Do not send traps or paperwork for traps which contain no specimens.

Delta Traps

- Label each trap clearly with trap numbers matching paperwork.
- Package traps to avoid crushing during shipment.
- Do not attach paperwork to individual traps.
- Do not use Styrofoam peanuts or other small packaging materials that could potentially enter the traps.
- Do not disassemble the traps or remove moths from the trap.
- Do not ship traps with sharp staples exposed.

A PPQ Form 305 should be sent with each trap, stating the trap number, collection site, number of specimens (estimates okay), life stage, collection date, and date of last (previous) trap check (to determine maximum time that the moth may have been in the trap prior to the check). Specimens should be shipped via next day delivery for Tuesday through Friday arrival. They should be shipped to:

Molecular Diagnostics Unit
USDA, APHIS, PPQ
CPHST Otis Laboratory
1398 West Truck Road
Buzzards Bay, MA 02542-1329

For questions you can contact John Molongoski at:

Email: john.j.molongoski@aphis.usda.gov

Phone: 508-563-9303 ext. 218

Fax: 508-564-4398

Asian Gypsy Moth Trapping Submission Guidelines

Specimens trapped in the field can be analyzed for the presence of Asian genetic markers by submitting the specimens to the CPHST Otis Laboratory. All specimens submitted from outside the generally-infested area will be analyzed. Because of the quantity of specimens submitted from within the generally-infested area, only a small fraction can be analyzed. **Collect captured moths a minimum of every two weeks to minimize DNA degradation of the specimens, more frequently in warm climates.**

**Store specimens in a cool, dry location (frozen if possible).
Ship ASAP after collection**

MILK CARTON TRAPS

DO layer loose moths between wadded paper towels or tissue paper in paper bag (brown lunch bag size) to prevent motion and specimen damage during shipment.

DO label paper bag clearly with trap numbers matching paperwork.

DO staple or tape paper bag closed.

DO NOT attach paperwork to bags.

DO NOT use plastic bags or paper envelopes as these promote fungal growth and do not allow moisture release.

DO NOT send traps or paperwork for traps which contain no specimens.

DELTA TRAPS

DO label each trap clearly with trap numbers matching paperwork.

DO package traps to avoid crushing during shipment.

DO NOT attach paperwork to traps.

DO NOT use Styrofoam peanuts for packaging.

DO NOT disassemble the traps or remove moths from the trap.

SHIPPING

DO send a PPQ Form 305 for each trap sent.

Include: • Trap number • Collection Date
• Collection Site • Life Stage
• No. of specimens (estimates OK)

DO package moths / traps to prevent crushing or motion during shipping. Moths must be received whole with antennae and legs attached to body.

DO ship via next day delivery for Tuesday through Friday arrival.

DO ship ASAP after each collection.

DO keep moths frozen until shipment.

DO keep specimens dry.

DO NOT attach paperwork to traps or bags.

DO NOT use Styrofoam peanuts with delta traps.

DO NOT send traps or paperwork for traps with no specimens.

SHIP TO:

John Molongoski
USDA, APHIS, PPQ
CPHST Otis Laboratory
1398 West Truck Road
Buzzards Bay, MA 02542-1329

• Voice: (508) 563-9303 ext 218

• Fax: (508) 564-4398

• Email: john.j.molongoski@aphis.usda.gov

PPQ Form 305 can be obtained from the Otis Lab via phone or email requests. Please do not hesitate to contact us if you have any questions.

Easily Confused Pests

Pogue and Schaefer (2007) state that the genitalia of *L. umbrosa* and that of *L. d. dispar* and *L. d. japonica* are virtually indistinguishable in both the male and female. The hindwing in *L. umbrosa* contains more white than both *L. d. dispar* and *L. d. japonica*. “The female has a more rufous cast to the longer scales of the wings and body and has fewer forewing markings than either *L. d. dispar* or *L. d. japonica*” (Pogue and Schaefer, 2007).

Commonly Encountered Non-targets

The trap and lure for Asian gypsy moth can also trap *Lymantria monacha* (nun moth) (although there is a more optimal trap and lure for this species). It may also trap *L. concolor* (concolorous tussock moth), *L. mathura* (rosy moth), and *L. obfuscat*a (Indian gypsy moth) (Lance, 2006).

References

AQAS. 2012. Interception data on *Lymantria* sp. Accessed 25 January, 2012 from: <https://mokcs14.aphis.usda.gov/aqas/HomePageInit.do>.

Lance, D. 2006. Guidelines for Detection Trapping of Exotic Lymantriid and Lasiocampid Moths. USDA-APHIS-PPQ.

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USDA. 2003. Asian Gypsy Moth Factsheet. April 2003. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. 2 pp.

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USDA. In press. Asian Gypsy Moth Survey and Response Manual, draft form. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. 34 pp.

This datasheet was developed by USDA-APHIS-PPQ-CPHST staff. This pest is included as a target in the Asian Defoliator Survey. Additional information can be found in the [Asian Defoliator Pathway-based National Survey Guidelines](#).

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Revised February 4, 2014: Revised the length of effectiveness of the Gypsy Moth String Lure.