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The pear leaf blister moth (PLBM), *Leucoptera malifoliella* (Costa), is a pest of rosaceous fruit trees across much of Europe and western Asia. Larvae create solitary, circular, blisterlike mines in leaves (Fig. 2), causing early leaf drop and potentially reducing fruit quality and yields. Apple (*Malus*) is the preferred host, and this species is often referred to as the ribbed apple leaf miner. Other primary hosts include pear (*Pyrus communis*), sweet cherry (*Prunus avium*), and quince (*Cydonia oblonga*). Secondary hosts include a wide variety of other fruit trees in the genera *Pyrus*, *Prunus*, and *Malus*, along with hawthorn (*Crataegus*), pistachio (*Pistacia*), and birch (*Betula*). In Europe, one to five overlapping generations per year are possible, and adults are present from the end of March until the end of September, depending on location.



Fig. 1: Unspread *L. malifoliella* (Photo by Agriculture and Agri-Food Canada Archive, Agriculture and Agri-Food Canada, Bugwood.org).

Leucoptera malifoliella is a member of the leaf-miner family Lyonetiidae, which contains approximately 250 species. Adults are small (forewing length 3-4 mm) and have white forewings and distal metallic and orange or yellow markings. Seven species of *Leucoptera* (including closely related *Paraleucoptera* and *Proleucoptera*) are present in the U.S., including minor pests such as the cottonwood leafminer (*L. albella*) and the erythrina leafminer (*L. erythrinella*). *Lyonetia prunifoliella* is another European apple-feeding lyonetiid that is also present in the U.S. Identification of any of these species is difficult and requires genitalic dissection by a specialist.

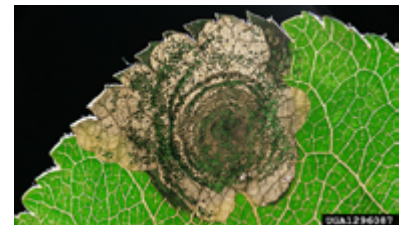


Fig. 2: *Leucoptera malifoliella* leaf mine (Photo by Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org).

Pheromone traps have been used to successfully survey for *L. malifoliella* adults in Europe. PLBM traps deployed in the northeastern U.S. (CT, MA, RI) in 1991 and 2013 attracted mainly Tortricidae, Noctuidae, and Geometridae, and only a few non-target Lyonetiidae, including *Proleucoptera*. Delta pheromone traps with “hard tack” adhesive are preferred because the moths are not covered in sticky glue and wing characters are easier to examine. This aid is designed to assist in the sorting and screening of *L. malifoliella* suspect adults captured in CAPS sticky traps in the continental U.S. Basic knowledge of Lepidoptera morphology is necessary to screen for *L. malifoliella* suspects.



Fig. 3: *Leucoptera malifoliella* wing pattern.

CAPS Approved Survey Method: Delta pheromone trap (hard tack)

Sorting

Pear Leaf Blister Moth

Leucoptera malifoliella (Costa)

Leucoptera malifoliella pheromone traps should be sorted initially for the presence of moths of the appropriate size, color, and shape. Traps that contain moths meeting all of the following requirements should be moved to Level 1 Screening (Page 3):

- 1) Moths are approximately 4-7 mm (0.15-0.28 inches) long (Fig. 4).
- 2) Moths have an overall shape that is similar to the outline depicted in Fig. 4. Note that moths caught on their side or back may have a different outline.
- 3) Moth forewings are bright white to pale silvery gray basally with distal metallic, orange/yellow, black, and brown markings (Fig. 5).

Note that the appearance of moths caught in sticky traps can vary substantially depending on the amount of sticky glue on the moth (this should be less of a problem if hard tack traps were used). Any very small white moth meeting the above criteria should be sent forward for screening.

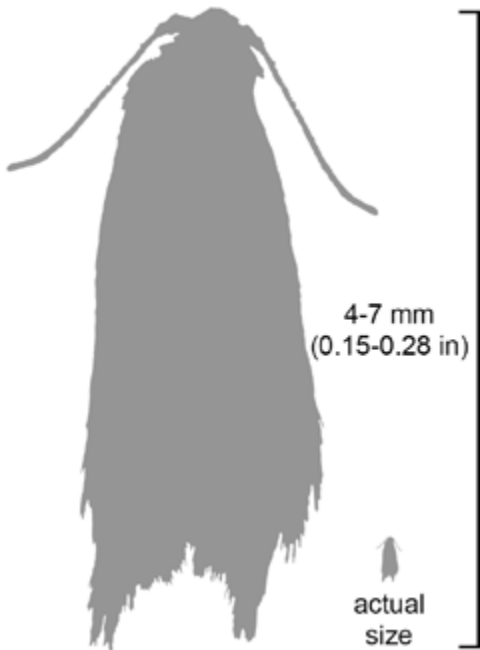


Fig. 4: Outline and size of a *Leucoptera* male caught in a sticky trap. *Leucoptera* are very small (4-7 mm long, including head and wing fringe). Forewings are white basally with distal metallic and orange/yellow markings.



Fig. 5: *Leucoptera malifoliella* adults. Note that the forewings in *L. malifoliella* are not bright white, but instead pale silvery gray and the distal markings consist of a central metallic-purple field separating two black "dots." Many other species of *Leucoptera* have bright white forewings and the black markings are reduced.

Level 1 & 2 Screening

Pear Leaf Blister Moth *Leucoptera malifoliella* (Costa)

Moths that meet the sorting requirements should be screened for suspect *Leucoptera*. Level 1 and 2 screening uses the same characters. Screeners should proceed through the characters listed here as far as their expertise allows and forward remaining suspect Lyonetiids for further screening or identification. Many of the characters listed here are only visible on a cleaned specimen viewed under a quality microscope. If traps are to be forwarded to another facility for further screening, follow the steps at the bottom of this page to ensure they are packed correctly. Only proceed to screening if expertise is available – screening small moths is difficult and may need to be performed by a trained Lepidopterist.

Level 1 & 2 Screening

1) **Suspect Lyonetiidae have an enlarged and flattened antennal scape (segment at the base of the antenna) that forms an eye cap (Fig. 6).** All Lyonetiidae have an eye cap, although this structure is also present in other families of small moths that are gray to white, including Opostegidae (see <http://www.microleps.org/Guide/Opostegidae/index.html>).

Suspect Lyonetiids should be cleaned before proceeding further to identify suspect *L. malifoliella* individuals. Instructions on cleaning specimens caught in sticky traps can be found here: <http://idtools.org/id/leps/tortai/dissections.html>. Only clean specimens if expertise is available.

2) **Ocelli are absent.** Ocelli are present in many other families and are usually located above the compound eye behind the antenna. This character may be difficult to see in Lyonetiidae because of their small size.

3) **Forewings are pale silvery gray basally.** Forewings in many other species of *Leucoptera* are bright white. Compare the basal forewing color in the adult images in Fig. 9 with those of the non-targets in Figs. 10-13.

4) **The apical markings on the *L. malifoliella* forewing consists of two black “dots” that are widely separated by purple-metallic scales.** The black markings on the forewings of many other *Leucoptera* are reduced. Compare the markings in Fig. 9 with those of the non-targets in Figs. 10-13.

Traps to be forwarded to another facility for Level 2 Screening should be carefully packed following the steps outlined in Fig. 8. Traps should be folded, with glue on the inside, making sure the two halves are not touching, secured loosely with a rubber band or a few small pieces of tape. Plastic bags can be used unless the traps have been in the field a long time or contain large numbers of possibly rotten insects. Insert 2-3 styrofoam packing peanuts on trap surfaces without moths to cushion and prevent the two sticky surfaces from sticking during shipment to taxonomists. DO NOT simply fold traps flat or cover traps with transparent plastic wrap (or other material), as this will guarantee specimens will be damaged or pulled apart – making identification difficult or impossible.



Fig. 6: Detail of *L. malifoliella* head. Arrows denote the enlarged flattened antennal scape that forms an eye cap.

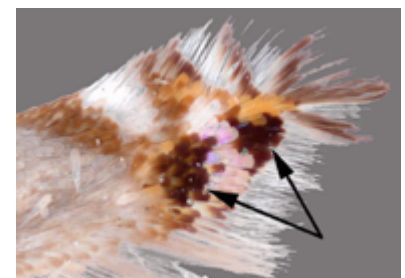


Fig. 7: Detail of *L. malifoliella* apical forewing markings. Note the two black “dots” are widely separated by purple-metallic scales.

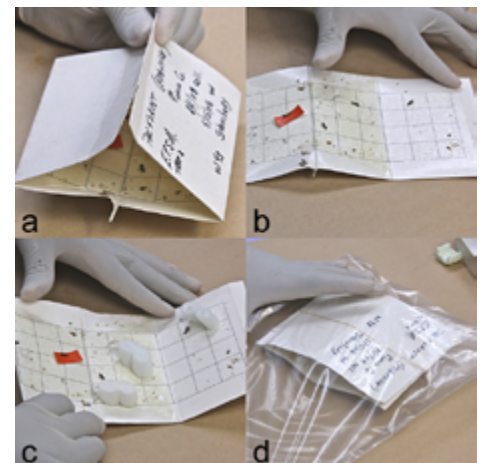


Fig. 8: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag (Photos by E. LaGasa, WSDA).



Fig. 9: *Leucoptera malifoliella*.



Fig. 10: *Leucoptera albella*.



Fig. 11: *Leucoptera laburnella*.



Fig. 12: *Leucoptera sinuella* (not present in the U.S.).



Fig. 13: *Leucoptera spartifoliella*.

It is expected that other species of *Leucoptera* (including *Paraleucoptera* and *Proleucoptera*), and possibly other lyonetiids, will be attracted to *L. malifoliella* pheromone traps, although traps placed in the northeastern U.S. attracted primarily moths in other families. A sampling of other *Leucoptera* is shown on this page. Note that these species have not been verified to be attracted to *L. malifoliella* pheromone traps and that non-targets encountered during CAPS surveys will vary by region.

Key to Sort and Screen *Leucoptera malifoliella* Suspects in the United States

1. Moths approximately 4-7 mm long; overall shape is typical for a Lyonetiid (Fig. 4); and forewings are bright white to pale silvery gray basally with distal metallic, orange/yellow, black, and brown markings (Fig. 5)..... 2
- 1'. Moths larger or smaller than 4-7 mm long; overall shape not typically Lyonetiid; or forewings not bright white to pale silvery gray basally with distal markings..... Not *L. malifoliella*
2. Antennal scape enlarged and flattened, forming an eye cap; and ocelli absent (Fig. 6) 3
- 2'. Antennal scape not forming an eye cap; or ocelli present..... Not *L. malifoliella*
3. Forewings pale silvery gray basally; and forewing markings consists of two black “dots” that are widely separated by purple-metallic scales (Fig. 7)..... ***L. malifoliella* suspect**
- 3'. Forewings not pale silvery gray basally; or forewing markings does not consist of two black “dots” that are widely separated by purple-metallic scales..... Not *L. malifoliella*

Citation

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References for more information on *L. malifoliella* and non-targets

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Acknowledgments

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