

TORTRICIDAE

Screening and Identification Aid

European Grapevine Moth *Lobesia botrana* (Denis & Schiff.)

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The European grapevine moth (EGVM), *Lobesia botrana* (Denis & Schiffermüller), is one of the most destructive grape pests in the Palearctic. *L. botrana* larvae cause damage to grapes by feeding on fruit, resulting in direct damage and secondary infection of feeding sites by botrytis bunch rot (gray mold; Fungi). *L. botrana* was discovered infesting grapes in Napa Valley, California in 2009; it has not been reported from North America outside of California.

L. botrana is a member of the Tortricidae, a large family of moths (Lepidoptera) that includes many pest species. In North America there are approximately 1200 species of tortricids, which are often referred to as “leafrollers” because the larvae of some species feed inside a rolled leaf. Most tortricid moths are small and brown with a wingspan of approximately 10-30 mm. *L. botrana* can be distinguished from many other tortricids by its wing pattern and small size; however some species are superficially similar to *L. botrana*. Other species of *Lobesia* and related *Paralobesia* (both subfamily Olethreutinae) are present in North America, and a genitalic dissection is necessary to separate these species from *L. botrana* in most cases.

This aid is designed to assist in the screening and identification of *L. botrana* adults collected from sticky traps in the United States. It covers basic sorting of traps, first and second level screening, and identification based on morphological characters. Basic knowledge of Lepidoptera morphology is necessary to screen for *L. botrana*. Basic knowledge of Tortricidae and dissection techniques are necessary to identify suspect *L. botrana* specimens.



Figure 1: Adult *L. botrana*. Wing pattern is very consistent with no obvious difference between males and females.



Figure 2: Adult *L. botrana* showing color variation.



Figure 3: *L. botrana* larva feeding on grapes.

Sorting

European Grapevine Moth

Lobesia botrana (Denis & Schiff.)

Lobesia botrana 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:

- 1) Moths are approximately 4-7 mm ($\frac{1}{4}$ inch) long (forewing length) (Figs. 5 & 6)
- 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 (Fig. 6).
- 3) Moths appear superficially similar to those depicted in Figs. 1-2 & 6-7.

The appearance of moths caught in sticky traps can vary substantially depending on the amount of sticky glue on the moth. For this reason, any small, tortricid-like moth should be sent forward to level 1 screening.

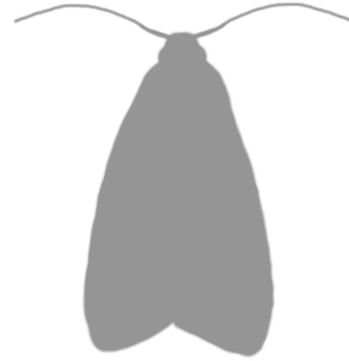


Figure 4: Outline of *L. botrana* in resting position.



Figure 5: Actual size (4-7 mm forewing length) of a *L. botrana* adult.

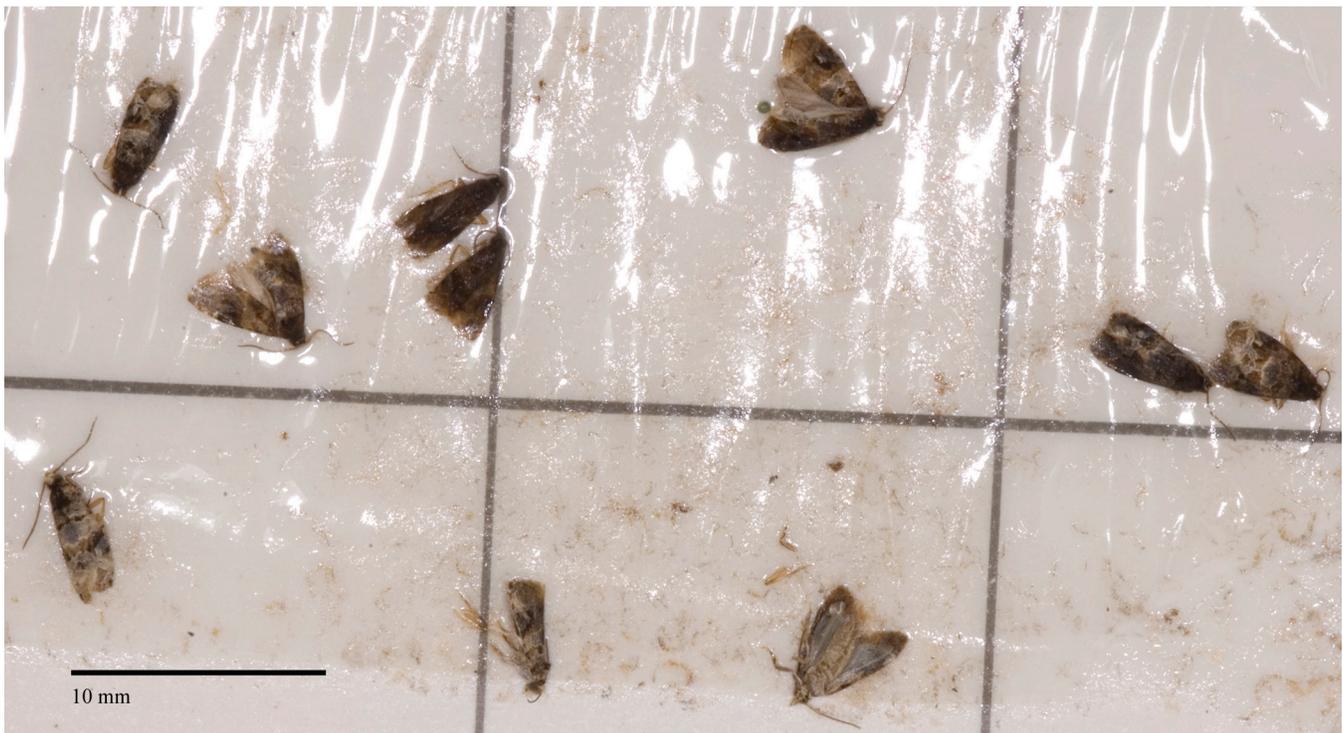


Figure 6: Examples of *L. botrana* adults caught in a sticky trap.

Level 1 Screening

European Grapevine Moth

Lobesia botrana (Denis & Schiff.)

Moths that meet the sorting requirements should be screened for suspect tortricids. Level 1 screening is difficult for small moths and may need to be performed by a trained Lepidopterist. **When in doubt distinguishing first level screening characters, forward traps that have passed the sorting requirements to a trained taxonomist.** Suspect tortricids in traps should not be manipulated or removed for screening unless expertise is available.

Tortricid moths can be identified by the following combination of characters:

- 1) Antennae simple, thread-like, and never pectinate (feathery).
- 2) Tympanum absent. Members of the Pyraloidea may appear similar but have a tympanum at the base of the abdomen.
- 3) Labial palpi pointed and project forward. Some families have labial palpi that curve upwards.
- 4) Maxillary palpi are very reduced and not visible in tortricids. Maxillary palpi may be visible under magnification in some commonly intercepted pyralid species.
- 4) Proboscis (tongue) unscaled. Members of the Gelechioidea and Pyraloidea have a scaled proboscis.
- 5) Chaetosema (patch of bristle-like setae) present above the compound eye. (Chaetosema may be difficult to see without a high-quality microscope.)

Moths meeting the above criteria should be sent to level 2 screening. Traps to be forwarded to level 2 should be carefully packed following the steps outlined in Fig. 8. Traps can be folded, with stickum-glue on the inside, making sure the two halves are not touching, secured loosely with a rubber band, and placed in a plastic bag for shipment. 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 wrap (or other material), as this will guarantee specimens will be seriously damaged or pulled apart – making identification difficult or impossible.



Figure 7: Male *L. botrana* in a sticky trap.

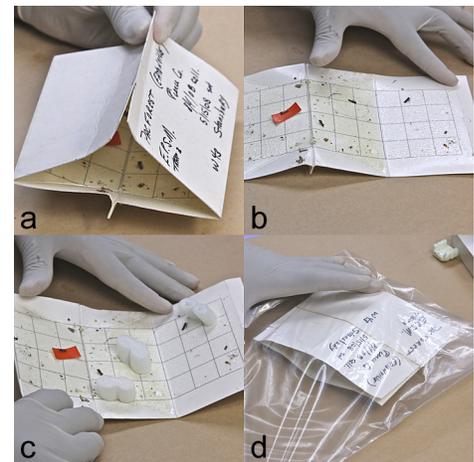


Figure 8: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag.

Level 2 Screening

European Grapevine Moth

Lobesia botrana (Denis & Schiff.)

Suspect tortricids should be cleaned to identify suspect *L. botrana* specimens. Details on cleaning specimens caught in sticky traps can be found on the following website:

<http://keys.lucidcentral.org/keys/v3/LBAM/dissections.html>

Cleaned specimens should be pinned and labeled. Initial screening is based on wing pattern, which varies little between individuals. *L. botrana* and close relatives can be separated from most other Nearctic tortricids by a combination of the following wing characters (depicted in red in Figs. 9 & 10); note that male *L. botrana* lack a forewing costal fold:

Wing Pattern

- 1) All *L. botrana* individuals have a prominent leaden-gray bar that runs across the middle of the forewing (Fig. 9). Often this bar is outlined in white. In a resting individual these markings form a complete, transverse, gray bar across the middle of the specimen (Fig. 10).
- 2) Many *L. botrana* individuals have a prominent inverted “Y” in the outer half of the forewing. This “Y” is formed from leaden-gray scales outlined in white (Figs. 9 & 10). This feature may not be evident in some specimens, especially those that are worn; however close examination should reveal some remnants of this pattern element.

Specimens that pass initial wing pattern screening most likely belong to the genera *Lobesia* or *Paralobesia*. These specimens should be dissected for further determination. Standard dissection procedures for Lepidoptera are outlined in Clarke (1951) and Robinson (1976). Separated abdomens and genitalia preparations should be carefully labeled to remain associated with pinned specimens. Specimens may need to be sent to a tortricid specialist for positive identification.

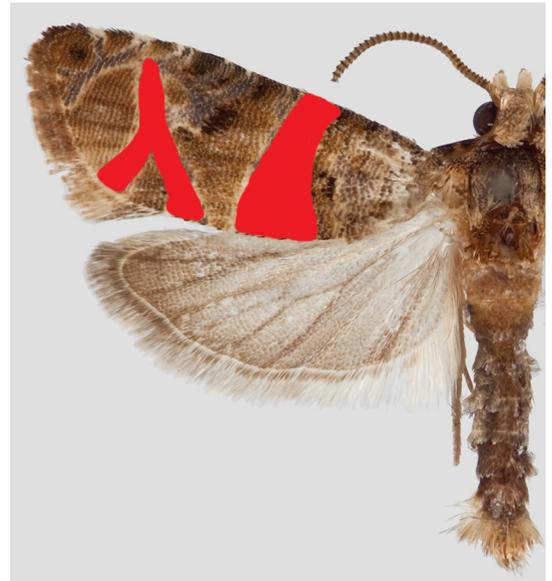


Figure 9: Diagnostic *L. botrana* forewing pattern elements (highlighted in red): prominent leaden-gray bar across the middle of the forewing and an inverted “Y” on the outer half of the forewing. Closely related *Paralobesia* share these same markings and cannot be separated by wing pattern alone.

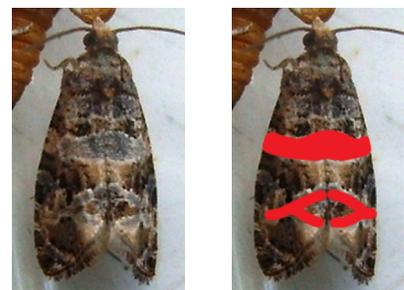


Figure 10: Diagnostic *L. botrana* wing pattern markings (highlighted in red) in a resting individual.

Identification

European Grapevine Moth

Lobesia botrana (Denis & Schiff.)

Dissected *L. botrana* can be separated from Nearctic *Paralobesia* based on the following genitalic characters:

Males

- 1) Valvae long and narrow with a row of spines on the ventral margin (Fig. 11). Cucullus separated from the sacculus by a distinct notch where spines are absent.

Females

- 1) Ductus bursae long, slender, and undifferentiated from the corpus bursae which is gradually enlarged anteriorly (Fig. 12).
- 2) A long, feather-shaped signum is present (Fig. 12).

Male Nearctic *Paralobesia* have a cluster of long setae (the saccular tuft) that extends from the ventral margin of the valva that is not present in *L. botrana*. Most female Nearctic *Paralobesia* lack a signum.

Paralobesia viteana is a native pest of grapes in eastern North America. This species is easily separated from *L. botrana* by genitalic characters: male *P. viteana* have a prominent lobe projecting from the valva that is absent in *L. botrana*, and female *P. viteana* lack a signum. The only common native *Lobesia* species in eastern North America, *L. carduana*, is not likely to be associated with grapes. Gilligan et al. (2008) should be consulted for identification of olethreutines in eastern North America. This volume contains detailed descriptions and illustrations of many species of *Paralobesia* that appear superficially similar to *L. botrana*.

In western North America, only two species of *Paralobesia* have been recorded. Neither are likely to be associated with grapes and both can be separated from *L. botrana* by genitalic characters. Powell and Opler (2009) should be consulted for identification of olethreutines in western North America.

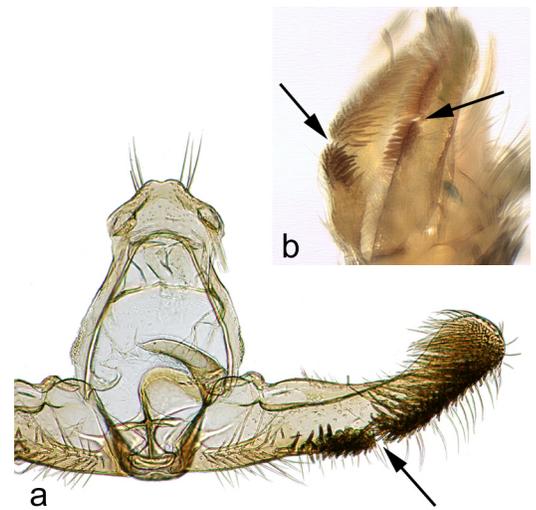


Figure 11: *L. botrana* male genitalia; a) slide mounted, b) unmounted. Arrows denote diagnostic notch in valvae.



Figure 12: *L. botrana* female genitalia. Arrow denotes female signum.

Key and References

European Grapevine Moth

Lobesia botrana (Denis & Schiff.)

Key to Screen and Identify *L. botrana* Suspects in the United States

The following key covers screening and identification of suspect *L. botrana*. Sticky traps normally capture only males moths, although female moths have been captured in California. Both sexes of moths are included; figures on previous pages should be consulted for specific characters.

- 1. Abdominal or thoracic tympanum present; antenna pectinate; labial palpi upturned; proboscis scaled or absent; moths not about 4-7 mm long..... **Not *L. botrana***
- 1'. Abdominal and thoracic tympanum absent; antenna simple; labial palpi projecting forward; proboscis not scaled; moths about 4-7 mm long **2**
- 2. Forewings with prominent median gray bar and outer inverted "Y," both outlined in white, or forewing pattern unknown..... **3**
- 2'. Forewings without prominent median gray bar and outer inverted "Y" **Not *L. botrana***
- 3. Males..... **4**
- 3'. Females **5**
- 4. Male valva with distinctive notch between cucullus and sacculus..... ***L. botrana suspect***
- 4'. Male valva without distinctive notch between cucullus and sacculus..... **Not *L. botrana***
- 5. Female with long narrow ductus bursae gradually expanding into corpus bursae, and a large, single signum ***L. botrana suspect***
- 5'. Female without a long narrow ductus bursae gradually expanding into corpus bursae, and signum absent or two signa present..... **Not *L. botrana***

References

Eastern & Midwestern North America non-targets:

Gilligan, T. M., D. J. Wright and L. D. Gibson. 2008. Olethreutine moths of the midwestern United States, an identification guide. Ohio Biological Survey, Columbus, Ohio. 334 pp.

Western North America non-targets:

Powell, J. A. and P. A. Opler. 2009. Moths of western North America. University of California Press, Berkeley. 369 pp.

Genitalia Dissections:

Clarke, J. F. G. 1941. The preparation of slides of the genitalia of Lepidoptera. Bulletin of the Brooklyn Entomological Society, 36:149-161.

Robinson, G. S. 1976. The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. Entomologist's Gazette. 27:127-132.

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