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Version 3.0
12 Aug 2014

This CAPS (Cooperative Agricultural Pest Survey) screening aid produced for and distributed by:
USDA-APHIS-PPQ National Identification Services (NIS)
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The light brown apple moth, *Epiphyas postvittana* (Walker), is a pest of pome and stone fruits and other horticultural crops. Larvae are highly polyphagous and been recorded from more than 500 plant species in 121 families and 363 genera, although they prefer herbaceous plants over woody ones. A native of Australia, *E. postvittana* occurs in all apple-growing areas of that country. It has been introduced into Tasmania, New Zealand, Hawaii, the United Kingdom, and it is intermittently recorded from continental Europe. *Epiphyas postvittana* was first discovered in California in 2006. It is currently well-established and has been recorded from 23 California counties. In early 2011, a single adult was captured in Oregon, but, as of 2014, an established population has not been found in the U.S. outside of California.

Light brown apple moth (LBAM) is a member of the Tortricidae, a large family of moths (Lepidoptera) that includes many pest species. In North America, there are approximately 1,200 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. The wing pattern of *E. postvittana* is quite variable (Figs. 1-2, 4-5, 8-10), and adults appear similar to many species of tortricids in other genera such as *Choristoneura*, *Argyrotaenia*, *Clepsis*, and *Pandemis*. A genitalic dissection is usually necessary to confirm the identity of *E. postvittana* adults.

This aid is designed to assist in the sorting and screening *E. postvittana* suspect adults collected from CAPS sticky traps in the continental United States. It covers basic sorting of traps, first level and second level screening, all based on morphological characters. Basic knowledge of Lepidoptera morphology is necessary to screen for LBAM suspects. See the following for more information on this and other pest tortricids:

Gilligan, T. M. and M. E. Epstein. 2012. TortAI, Tortricids of Agricultural Importance to the United States (Lepidoptera: Tortricidae). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. (<http://idtools.org/id/leps/tortai>).

CAPS Approved Trapping Method: Delta pheromone trap



Fig. 1: Cleaned LBAM male from a sticky trap (Photo by J. Brambila).



Fig. 2: Unusually marked LBAM male in a sticky trap.

Epiphyas postvittana 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 7-12 mm (0.25-0.5 inches) long (Fig. 4).
- 2) Moths have an overall shape that is similar to the outline depicted in Fig. 3. Note that moths caught on their side or back may have a different outline.
- 3) Moth forewings are a shade of brown (light brown, dark brown, tan, orangish brown, yellowish brown, etc. - see the comparison of forewing colors in Figs. 4-5).

Note that the appearance of moths caught in sticky traps can vary substantially depending on the amount of sticky glue on the moth (most individuals usually appear darker when covered in glue). For this reason, any small, tortricid-like moth meeting the above criteria should be sent forward to Level 1 Screening.

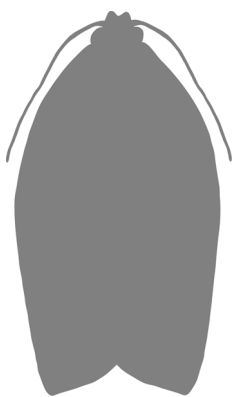


Fig. 3: Outline and size of a resting LBAM male. Many tortricids that are easily confused with LBAM have a similar appearance.



Fig. 4: Actual size and appearance of LBAM adults caught in a sticky trap. Note that the sticky glue can obscure the wing pattern (Photo by J. Brambila).

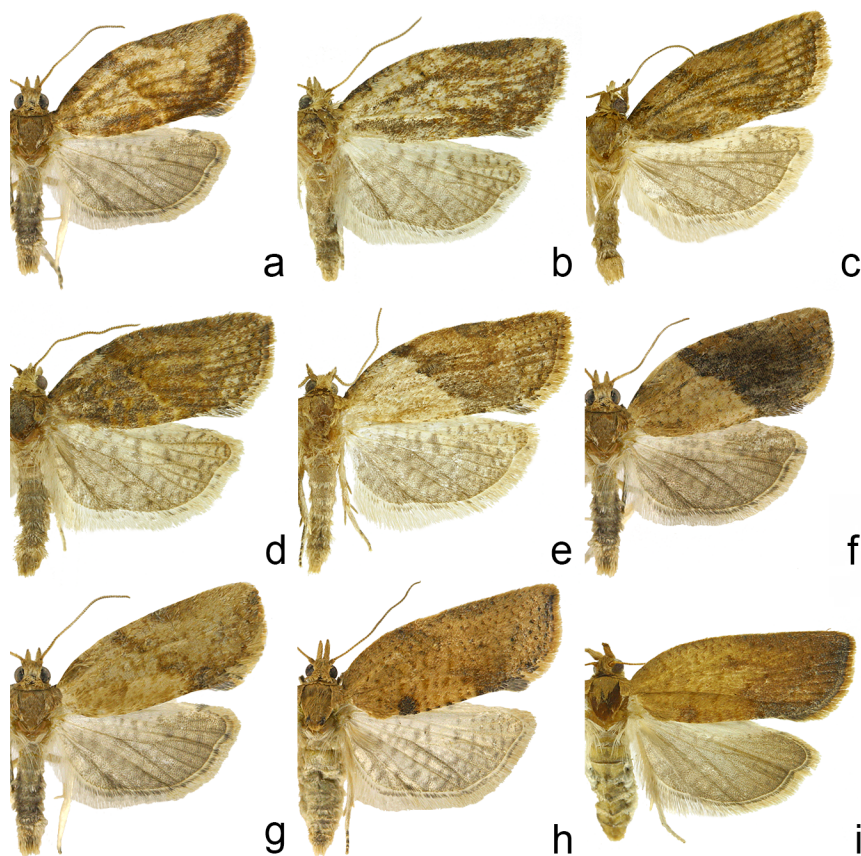


Fig. 5: Variation in wing pattern and coloration of *E. postvittana* adults (a-g: males; h-i: females). Males are more variable than females (Plate from Brown et al. 2010).

Level 1 Screening

Light Brown Apple Moth *Epiphyas postvittana* (Walker)

Moths that meet the sorting requirements should be screened for suspect tortricids. Level 1 Screening is difficult for small moths (like tortricids) and may need to be performed by a trained lepidopterist. When in doubt distinguishing or evaluating 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 (note that some characters may be difficult to see on specimens coated in sticky trap glue):

- 1) Antennae simple, threadlike, and never pectinate (feathery).
- 2) Tympanum absent. Pyraloidea and Geometridae have a tympanum at the base of the abdomen. Noctuoidea have a tympanum on the thorax near the junction with the abdomen. Tympanal organs may be difficult to see without manipulating the specimen.
- 3) Labial palpi pointed and projecting forwards (Fig. 7). Some families (especially in the Gelechioidea) have long labial palpi that curve upwards over the head - these are not tortricids.
- 4) Maxillary palpi are very reduced and not visible in tortricids. Maxillary palpi are conspicuous in some commonly captured pyraloid species.
- 5) Proboscis (tongue) unscaled. Members of the Gelechioidea and Pyraloidea have a scaled proboscis.
- 6) Chaetosema (patch of bristle-like setae) present above the compound eye behind the ocellus (Fig. 7). Note that chaetosemata may be difficult to see without a high-quality microscope.

Moths meeting the above criteria should be moved to Level 2 Screening (Page 4). 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 seriously damaged or pulled apart – making identification difficult or impossible.



Fig. 6: Spread LBAM male. Note mottled hindwing.



Fig. 7: Tortricid head; ch = chaetosema; oc = ocellus; lp = labial palpi. Note that the chaetosema is above the compound eye behind the ocellus (Photo from Gilligan et al. 2008).

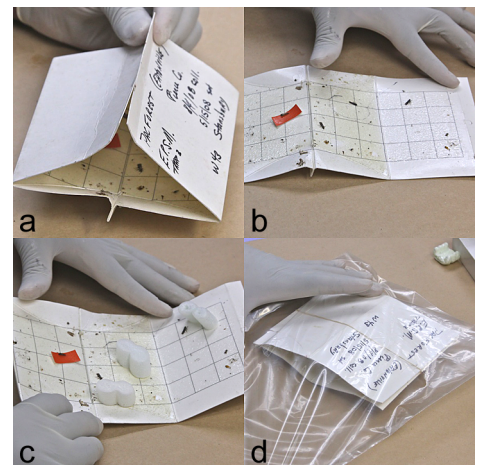


Fig. 8: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag (Photos by E. LaGasa, WSDA).

Level 2 Screening

Light Brown Apple Moth *Epiphyas postvittana* (Walker)

Suspect tortricids should be cleaned to identify suspect *E. postvittana* individuals. Instructions on cleaning specimens caught in sticky traps can be found here: <http://idtools.org/id/leps/tortai/dissections.html>.

Cleaned specimens should be pinned and labeled. Level 2 Screening is based on the presence of a forewing costal fold and wing pattern. Because the wing pattern of *E. postvittana* is variable and very similar to that of many other tortricids, a genitalic dissection by a specialist is usually necessary for species-level identification.

Forewing Costal Fold

A costal fold is present in all male *E. postvittana* individuals. The costal fold is a “flap” of scales that arises from the base of the costal margin (near the head) of the forewing and extends approximately 1/3 the length of the wing in *E. postvittana* (Fig. 9, outlined in blue on Figs. 10-12). Many other tortricids that are similar to *E. postvittana* also have a costal fold, but males lacking a costal fold cannot be *E. postvittana*. Note that the costal fold can be difficult to see in some specimens and examination under a quality microscope is often necessary. Specimens without a forewing costal fold should be eliminated as suspects before beginning careful examination of forewing pattern.

Wing Pattern

Forewing pattern varies considerably in *E. postvittana*; however, the majority of specimens captured during surveys in California appear similar to those shown in Figs. 5 and 10-12. Most males have a defined median bar extending across the wing and dark mark on the costa distal to the median bar, while the rest of the wing is solid brown to light yellowish brown (Figs. 10-11). In some individuals, the distal half of the wing is solid brown to dark brown, obscuring the markings (Fig. 12). The hindwing of both sexes in *E. postvittana* is usually variably mottled with dark speckles, especially on the underside. This mottling is usually more evident in females, and can be nearly absent in some individuals.

A selection of non-targets similar to LBAM that are likely to be encountered in pheromone traps in California are illustrated on Page 5. Non-targets for other states will vary and some species, such as *C. rosaceana*, are found throughout the entire continental U.S. Although many non-targets have similar forewing patterns, not all have a costal fold; those species illustrated here without a costal fold are marked with an asterisk (*).

Suspect *E. postvittana* specimens (tortricids with a forewing costal fold, wing pattern or coloration similar to the specimens in Figs. 1-2, 4-6, and 10-12, and mottled hindwing) should be sent forward for identification. Specimens must be labeled and carefully packed to avoid damage during shipping. Final species-level identification must be performed by a specialist using genitalic characters. Ensure that all specimens forwarded for identification have intact abdomens; if the abdomen has been separated from the specimen, store it in a gelatin capsule on the same pin as the specimen.



Fig. 9: *Epiphyas postvittana* male forewing costal fold (arrow).



Figs. 10-12: *Epiphyas postvittana* male wing pattern variation. The forewing costal fold is outlined in blue.



Fig. 13: *Clepsis peritana*. *



Fig. 14: *Clepsis peritana*. *



Fig. 15: *Clepsis fucana*. *



Fig. 16: *Clepsis fucana*. *



Fig. 17: *Clepsis virescana*.



Fig. 18: *Clepsis virescana*.



Fig. 19: *Choristoneura rosaceana*.



Fig. 20: *Choristoneura rosaceana*.



Fig. 21: *Argyrotaenia franciscana*. *



Fig. 22: *Argyrotaenia franciscana*. *



Fig. 23: *Pandemis pyrusana*. *

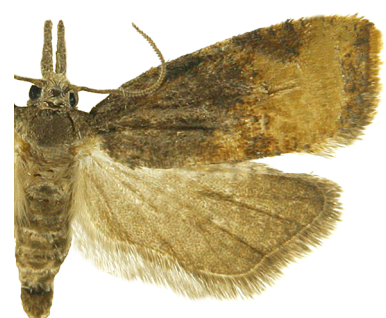


Fig. 24: *Platynota stultana*.

* species marked with an asterisk do NOT have a forewing costal fold and can be eliminated as LBAM suspects

Key to Sort and Screen *Epiphyas postvittana* Suspects in the United States

1. Moths approximately 7-12 mm long; overall shape is typical for a tortricid (Fig. 3); and forewings are a shade of brown as in Figs. 4-5 2
- 1'. Moths larger or smaller than 7-12 mm long; overall shape not typically tortricid; or forewing color not a shade of brown Not *E. postvittana*
2. Abdominal or thoracic tympana absent; antennae simple; labial palpi projecting forward; proboscis not scaled; and chaetosemata present 3
- 2'. Abdominal or thoracic tympana present; antennae pectinae; labial palpi upcurved; proboscis scaled; or chaetosemata absent..... Not *E. postvittana*
3. Forewing costal fold present; forewing pattern or coloration similar to those in Figs. 1-2, 4-6, and 10-12; and hindwing mottled..... ***E. postvittana suspect***
- 3'. Forewing costal fold absent; or forewing pattern drastically different than those in Figs. 1-2, 4-6, and 10-12 and hindwing not mottled Not *E. postvittana*

Citation

Gilligan, T. M., M. E. Epstein, S. C. Passoa and J. Brambila. 2014. Screening aid: Light brown apple moth, *Epiphyas postvittana* (Walker). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 6 pp.

References for more information on *E. postvittana* and non-targets

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Acknowledgments

We would like to thank Joel Floyd and USDA-APHIS-PPQ National Identification Services for support of this work. Funding for this project was provided to T. M. Gilligan through section 10201 of the 2008 Farm Bill. Terrence Walters (USDA-APHIS-PPQ-S&T ITP) provided grant supervision and access to imaging equipment.