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The false codling moth (FCM), *Thaumatotibia leucotreta* (Meyrick), is a serious agricultural pest that has been reported from approximately 40 countries on the African continent. Larvae are highly polyphagous and have been recorded feeding on more than 50 species of plants in over 30 families, although most economic loss occurs with citrus, cotton, and avocado. It has also been reported causing serious damage to corn, guava, macadamia, mango, peach, and other horticultural crops. Although mostly restricted to Africa, *T. leucotreta* is occasionally reported from Europe and it is considered locally present in Israel. A single male was captured in a CAPS trap in California in 2008; extensive trapping has not detected any other individuals in the U.S. Locations near ports that import citrus from the Old World likely represent the highest risk for introduction of FCM into the U.S.

Thaumatotibia leucotreta 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. Male *T. leucotreta* have a consistent wing pattern (Figs. 4-5), and most individuals will appear as solid black if covered in glue on a sticky trap. Although other similar species are present in the U.S., *T. leucotreta* is the only tortricid with the hindwing scale pocket shown in Figs. 5-7, and this character can be used to separate FCM males from all other Nearctic tortricids and non-targets.

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

Gilligan, T. M. & 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 or wing pheromone trap



Fig. 1: Resting FCM adult (Photo by Marja van der Straten, NPPO, the Netherlands).



Fig. 2: FCM male in sticky trap.

Sorting

False Codling Moth *Thaumatotibia leucotreta* (Meyrick)

Thaumatotibia leucotreta 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 8-12 mm (0.3-0.5 inches) long (Figs. 3, 8).
- 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 appear solid black if covered in sticky glue. Moths not covered in glue may exhibit the wing patterns shown 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, tortricidlike moth meeting the above criteria should be sent forward to Level 1 Screening.

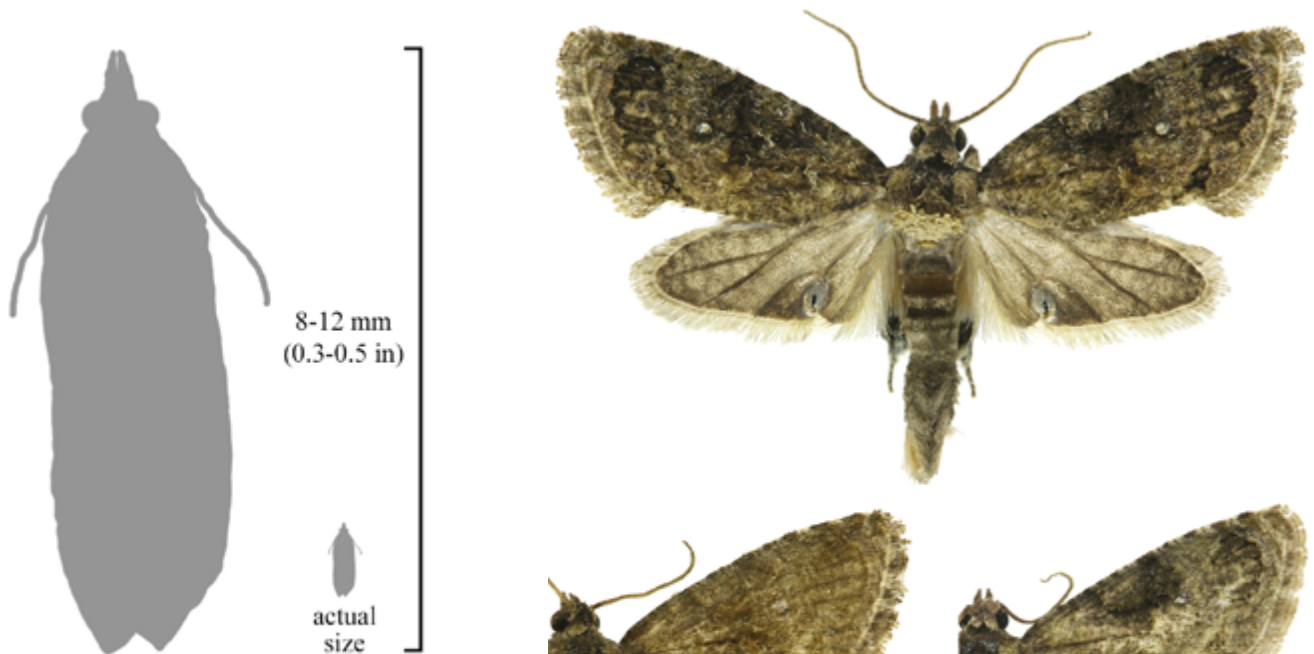


Fig. 3: Outline and size of a resting *T. leucotreta* male. Many tortricids that are easily confused with *T. leucotreta* have a similar appearance: black, triangular forewings that are folded over the body in resting position.



Fig. 4: Variation in wing pattern and coloration of *T. leucotreta* adults. Wing pattern is consistent in most individuals, although pattern expression and wing color can vary. Pattern elements are highlighted in Fig. 5.

Moths that meet the sorting requirements should be screened for suspect *T. leucotreta*. Level 1 Screening for this species is not difficult because of the easily-observed hindwing character (Figs. 5-7), but the screener should be comfortable working with small moths. 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.

Hindwing Scale Pocket

Male *T. leucotreta* are the only tortricids with a semicircular pocket of scales on the hindwings as shown in Figs. 5-7. Other members of the genus *Thaumatotibia* have similar structures on the hindwing, but none are the same that found in *T. leucotreta*. No North American tortricids have a similar structure on the hindwing. This is the most important diagnostic character for this species – if the hindwing scale pocket is not present in a male specimen, it is not *T. leucotreta*. The hindwing scale pocket can be observed on specimens still in sticky traps by carefully moving the forewings with forceps or an insect pin (Fig. 7, red arrows).

Other Diagnostic Characters

In addition to the hindwing scale pocket, most male *T. leucotreta* have a distinctive forewing pattern consisting of a dark “question-mark-shaped” marking on the end of the wing, a dark crescent on the costa, and a distinct white spot (Fig. 5, outlined in red). Males also have tufts of modified scales on the hind tibia, and an enlargement of the inner apical spur on the hind tibia – these both appear as tufts of long black scales on the hind legs. These characters are shared by some North American tortricids and should only be used to confirm specimens with the hindwing scale pocket present, or to diagnose specimens with the hindwings damaged or missing.



Fig. 5: Important diagnostic characters for male *T. leucotreta*: wing pattern (red outline), and hindwing scale pocket (red arrow).

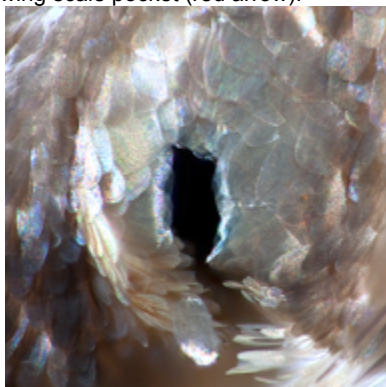


Fig. 6: Close-up photo of the scale pocket on the hindwing in male *T. leucotreta*.



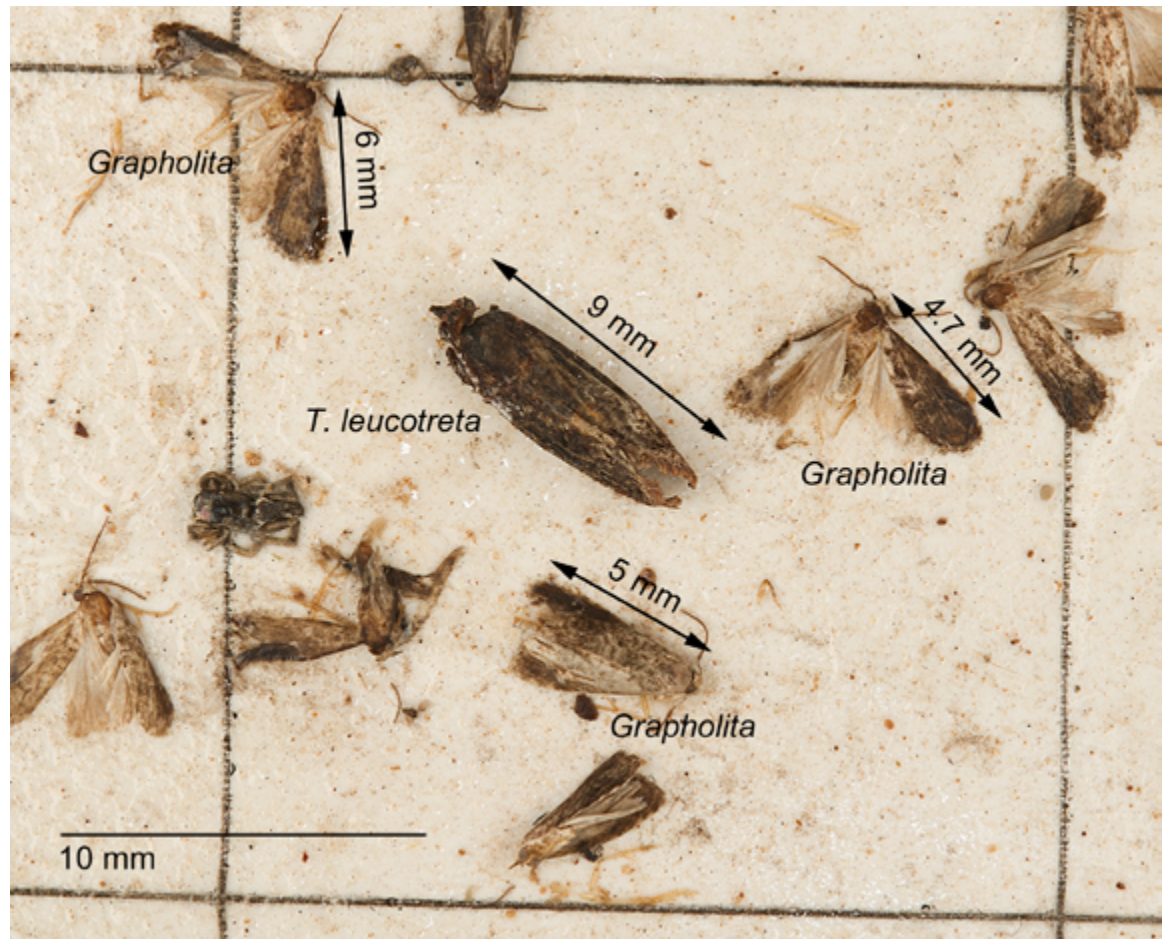
Fig. 7: Male *T. leucotreta* in a sticky trap showing hindwing scale pockets (red arrows). This character can be observed on specimens still in a sticky trap by simply moving the forewings with forceps or an insect pin until the hindwings are visible. No North American tortricid has this same structure on the hindwing.

Level 1 Screening

False Codling Moth *Thaumatotibia leucotreta* (Meyrick)

Commonly encountered non-targets are shown on Page 5. *Grapholita* are likely the most common non-targets found in *T. leucotreta* pheromone traps. Many *Grapholita* are easily separated from *T. leucotreta* based on size. Fig. 8 compares a male *T. leucotreta* (center) to several *Grapholita* caught in the same sticky trap. Common *Grapholita* species of similar size include: *G. packardi*, *G. libertina*, and *G. molesta*.

Fig. 8: *Thaumatotibia leucotreta* male (center) and *Grapholita* spp. in a sticky trap. Note that the *T. leucotreta* male is 2-4 mm larger than most of the *Grapholita*, which range in length from 4.5-7 mm. Other non-targets, such as *Gymnandrosoma* and *Ecdytolopha* are approximately the same size as *T. leucotreta*, but are usually less common than *Grapholita* in pheromone traps.



Suspect *T. leucotreta* may need to be cleaned to examine the hindwing and other diagnostic characters. Instructions on cleaning specimens caught in sticky traps can be found here: <http://idtools.org/id/leps/tortai/dissections.html>. Removal of specimens from traps and cleaning should only be attempted if expertise is available.

Suspect *T. leucotreta* should be forwarded for identification. Traps to be forwarded to another facility should be carefully packed following the steps outlined in Fig. 9. 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.

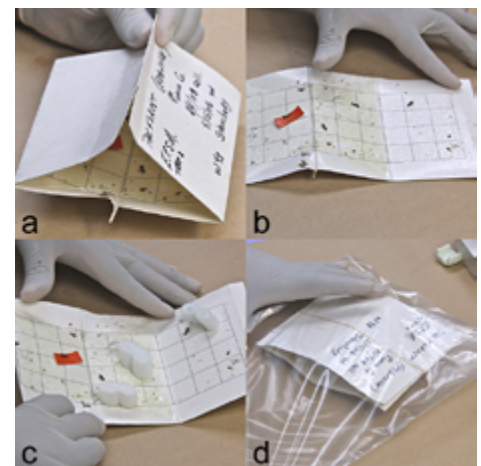


Fig. 9: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag (Photos by E. LaGasa, WSDA).

Level 1 Non-targets

False Codling Moth *Thaumatotibia leucotreta* (Meyrick)



Fig. 10: *Grapholita molesta*.



Fig. 11: *Grapholita molesta*.



Fig. 12: *Grapholita packardi*.



Fig. 13: *Grapholita packardi*.



Fig. 14: *Grapholita interstinctana*.



Fig. 15: *Gymnandrosoma punctidiscanum*.



Fig. 16: *Gymnandrosoma punctidiscanum*.



Fig. 17: *Ecdytolopha insiticiana*.



Fig. 18: *Cydia pomonella*.



Fig. 19: *Cydia caryana*.



Fig. 20: *Cydia toreuta*.

Many of the non-targets illustrated here are encountered in FCM traps, although not all species on this page have been verified to have been found in FCM traps. Non-targets encountered during CAPS surveys will vary by region.

Key to Sort and Screen *Thaumatotibia leucotreta* Suspects in the United States

1. Moths approximately 8-12 mm long; overall shape is typical for a tortricid (Fig. 3); and forewings generally dark brown or black (Figs. 1-2, 4-5) 2
- 1'. Moths larger or smaller than 8-12 mm long; overall shape not typically tortricid; or forewing color not generally dark brown or black..... Not *T. leucotreta*
2. Males with hindwing scale pocket present (Fig. 6-7); forewings with “?” markings or similar to those in Figs. 4-5; and hind legs with tufts of long black scales ***T. leucotreta suspect***
- 2'. Males with hindwing scale pocket absent (or if hindwings damaged, forewing pattern drastically different than those in Figs. 4-5) Not *T. leucotreta*

Citation

Gilligan, T. M. and M. E. Epstein. 2014. Screening aid: False codling moth, *Thaumatotibia leucotreta* (Meyrick). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 6 pp.

References for more information on *T. leucotreta* and 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.

Gilligan, T. M., M. E. Epstein and K. M. Hoffman. 2011. Discovery of false codling moth, *Thaumatotibia leucotreta* (Meyrick), in California (Lepidoptera: Tortricidae). Proceedings of the Entomological Society of Washington. 113: 426-435.

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>).

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