Screening Aid

Variegated Golden Tortrix

Archips xylosteana (Linnaeus)

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Version 2.0
2 Jul 2014

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USDA-APHIS-PPQ National Identification Services (NIS)
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The variegated golden tortrix, *Archips xylosteana* (Linnaeus), is a pest of trees in several different families, although the majority of recorded hosts are in the Fagaceae and Rosaceae. Larvae feed primarily on new foliage and buds, and larvae may also feed on fruitlets causing superficial damage to mature fruit. *Archips xylosteana* is widely distributed throughout Europe, Asia (China, Iran, Japan, Kazakhstan, North Korea, South Korea, Siberia, Turkey), and northern Africa (Algeria). It was first discovered in North America (St. John's, Newfoundland, Canada) in 2005. As of early 2014, *A. xylosteana* has not been recorded from the U.S.

Fig. 1: *Archips xylosteana* resting (Photo by Hectonichus, Val Noci, Genova, Italy).

Fig. 2: *Archips xylosteana* resting (Photo by Sander van der Molen).

Archips xylosteana 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 *A. xylosteana* (Figs. 1-2, 4-5) is similar to that of many other *Archips*, including, but not limited to: *A. crataegana*, *A. grisea*, *A. magnoliana*, *A. podana*, and *A. rosana*. Identification is moderately difficult (especially of specimens from sticky traps), and a genitalic dissection is necessary to confirm the identity of *A. xylosteana* and to separate it from the native North American *Archips*.

This aid is designed to assist in the sorting and screening *A. xylosteana* 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 *A. xylosteana* suspects. For more information on this and other pest tortricids, please consult the following resource:

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: Wing pheromone trap

Sorting

Archips xylosteana 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 7-13 mm (0.25-0.55 inches) long (Fig. 3)

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 mix of brown, orange, purple, or gray - see the comparison of forewing colors in Fig. 4 and Figs. 1-2.

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.

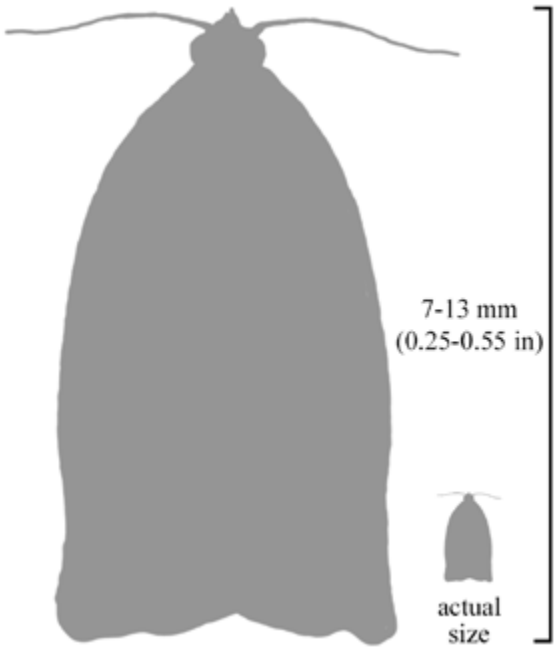

Fig. 3: Outline and size of a resting *A. xylosteana* male. Many tortricids that are easily confused with *A. xylosteana* have a similar appearance: rectangular forewings that form the outline of a “bell” when folded in the resting position.

Fig. 4: Variation in wing pattern and coloration of *A. xylosteana* adults (top = male; bottom left = male; bottom right = female). Females typically have darker markings than males, although fresh males can appear similar to the specimen in the bottom right.

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.

Fig. 5: Live adult in resting position (Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org - 5371375).

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. 6). 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. 6). Note that chaetosemata may be difficult to see without a high-quality microscope.

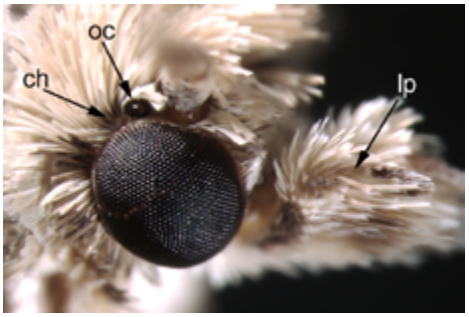

Fig. 6: Tortricid head; ch = chaetosema; oc = ocellus; lp = labial palpi. Note that the chaetosema is above the compound eye behind the ocellus (Photo from Gilligan et al. 2008).

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. 7. 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.

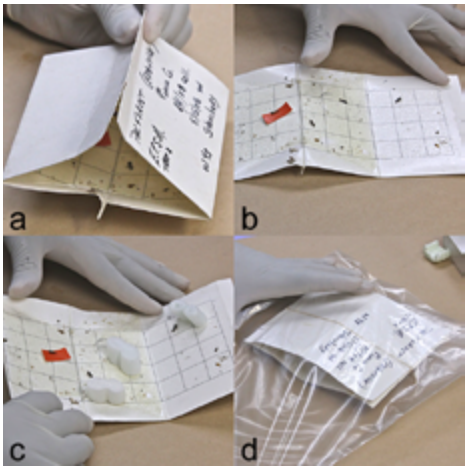

Fig. 7: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag (Photos by E. LaGasa, WSDA).

Suspect tortricids should be cleaned to identify suspect *A. xylosteana* individuals. Instructions on cleaning specimens caught in sticky traps are 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 *A. xylosteana* is very similar to that of many other *Archips*, a genitalic dissection by a specialist is necessary for species-level identification.

Forewing Costal Fold

A costal fold is present in all male *A. xylosteana*. 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 to nearly 1/2 the length of the wing in *A. xylosteana* (outlined in Figs. 8-10). Many other tortricids have a costal fold, but the length may be less than half the wing length. Males lacking a costal fold are not *A. xylosteana*. 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.

Fig. 8: Diagram of *A. xylosteana* wing pattern elements: a costal fold, three dark reddish-brown bands, and a dark brown spot between the outer two bands.

Forewing Pattern

The forewings of most *A. xylosteana* are brown to purplish gray with dark reddish brown to pale orangish brown markings. The following wing pattern elements are visible on most specimens (diagramed in Fig. 8 and outlined on specimens in Figs. 9-10): a thumb-shaped marking extending from the base of the wing towards the costal fold; a wide band extending from the dorsal margin towards the costal fold; a narrower band extending from the costal margin in the distal 1/3 of the wing; and a dark brown or black mark between these two outer bands. Other wing pattern elements are visible on fresh specimens, but these may be difficult to detect in worn specimens.

Fig. 9: *Archips xylosteana* male with forewing costal fold and primary markings outlined.

There are approximately 20-25 other species of *Archips* present in the Nearctic, and many exhibit wing patterns similar to *A. xylosteana*. The most similar species are illustrated on Page 5. Note that several non-target *Archips* have yellowish-orange apical shading on the hindwing that is absent (or greatly reduced) in male *A. xylosteana*. *Choristoneura rosaceana* (Fig. 22) is a very common non-target tortricid that also may appear similar to *A. xylosteana*. Note that not all of the non-target species illustrated on Page 5 have been found in *A. xylosteana* traps in the U.S., and specific non-targets will vary by region.

Suspect *A. xylosteana* specimens (tortricids with a forewing costal fold and wing pattern/coloration similar to the specimens in Figs. 1-2, 4-5, and 8-10) 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 geletin capsule on the same pin as the specimen.

Fig. 10: *Archips xylosteana* male with forewing costal fold and primary markings outlined.

Fig. 11: *Archips argyrospila*.

Fig. 12: *Archips crataegana*.

Fig. 13: *Archips crataegana*.

Fig. 14: *Archips fuscocupreanus*.

Fig. 15: *Archips grisea*.

Fig. 16: *Archips magnoliana*.

Fig. 17: *Archips podana*.

Fig. 18: *Archips podana*.

Fig. 19: *Archips podana*.

Fig. 20: *Archips rosana*.

Fig. 21: *Archips rosana*.

Fig. 22: *Choristoneura rosaceana*.

Key to Sort and Screen *Archips xylosteana* Suspects in the United States

1. Moths approximately 7-13 mm long; overall shape is typical for a tortricid (Fig. 3); and forewings are a mix of brown, orange, purple, or gray as in Fig. 4 2
1'. Moths larger or smaller than 7-13 mm long; overall shape not typically tortricid; or forewing color not a mix of brown, orange, purple, or gray ..... Not *A. xylosteana*

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 pectinate; labial palpi upcurved; proboscis scaled; or chaetosemata absent ..... Not *A. xylosteana*

3. Forewing costal fold present, extending to half the forewing length; and forewing pattern with a thumb-shaped marking at the base of the wing, a wide band extending from the dorsal margin, a narrower band extending from the costal margin, and a dark brown or black mark between these two outer bands (Figs. 8-10) ..... ***A. xylosteana suspect***
3'. Forewing costal fold absent or much shorter than half the forewing length; or forewing pattern drastically different than described here and illustrated in Figs. 8-10 ..... Not *A. xylosteana*

Citation

Gilligan, T. M. and S. C. Passoa. 2014. Screening aid: Variegated golden tortrix, *Archips xylosteana* (Linnaeus). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 6 pp.

References for more information on *A. xylosteana* 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. 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).

Moth Photographers Group. Mississippi State U. (http://mothphotographersgroup.msstate.edu/Plates.shtml)

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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.