Screening Aid

Tomato Fruit Borers

Neoleucinodes elegantalis (Guenée) and *N. silvaniae* Diaz and Solis

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The Tomato fruit borer, *Neoleucinodes elegantalis* (Guenée), is an important pest of solanaceous crops that is distributed throughout Mexico, Central America, the Caribbean, and South America. This species has been reported to cause damage to tomato (*Solanum lycopersicum*), eggplant (*S. melongena*), and pepper (*Capsicum annuum*), as well as tropical solanaceous fruits including tamarillo (*S. betaceum*) and naranjilla (*S. quitoense*). *Neoleucinodes silvaniae* Diaz and Solis is a similar species that has been reported to feed on lanceleaf nightshade (*Solanum lanceifolium*) in Colombia. Larvae cause damage by boring into fruit, and intense feeding on seeds and flesh can result in premature fruit drop and render fruits unmarketable. Damage by larvae may also predispose fruits to secondary fungal pathogens.

Fig. 1: Adult *Neoleucinodes elegantalis* (Photo by Hanna Royals).

Fig. 2: Larval damage in tomato fruit (Photo by Ana Elizabeth Diaz Montilla, Corpoica La Selva, Colombia).

Neoleucinodes elegantalis and *N. silvaniae* are members of family Crambidae (subfamily Spilomelinae), a large group of moths formally placed in the Pyralidae that contains many pests. *Neoleucinodes* consists of eight described species, with only two present in North America in the southern region of Florida. *Neoleucinodes elegantalis* is a small moth with a wingspan of 1.5–2.5 cm and *Neoleucinodes silvaniae* is very similar but slightly smaller. Wings of both species are white with a slightly translucent appearance. Forewing markings include four prominent dark patches, brownish red at the base and apex, light brown at the costal (anterior) margin, and dark orange brown along the dorsal (posterior) margin. All *Neoleucinodes* are similar in appearance and final identification to species requires dissection of adult genitalic structures.

This screening aid is designed to assist in the sorting and screening *Neoleucinodes* suspect adults collected from CAPS pheromone traps in the continental United States. It covers basic sorting of traps and first, and second level screening, based on morphological characters. Basic knowledge of Lepidoptera morphology is necessary to screen for suspects.

Fig. 3: Pupation in a folded leaf (Photo by Ana Elizabeth Diaz Montilla, Corpoica La Selva, Colombia).

Neoleucinodes 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 have a forewing length of 6–12 mm (0.24–0.47 in) (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) Wings are translucent white with variable brown and orange blotches (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, crambid-like moth meeting the above criteria should be sent forward to Level 1 Screening.

Fig. 3: Outline and approximate size of *Neoleucinodes*.

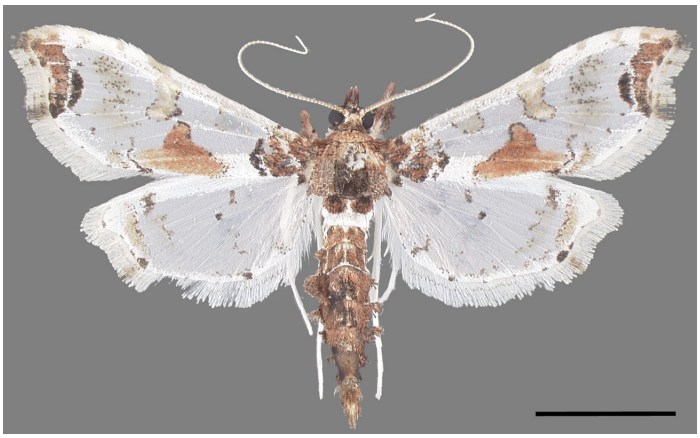

Fig. 4: Male *N. elegantalis*, scale = 5 mm (Photo: Hayden et al. 2013, IDtools.org).

Fig. 5: Female *N. elegantalis*, scale = 5 mm (Photo: Hayden et al. 2013, IDtools.org).

Moths that meet the sorting requirements should be screened for suspect crambids. Level 1 Screening is difficult for small moths (like crambids) 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 crambids in traps should not be manipulated or removed for screening unless expertise is available.

Crambid 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):

Fig. 6: Tympanum present at base of abdomen in all Pyraloidea. (Photo by Hanna Royals).

1) Tympanum present at base of abdomen and widely open anteriorly (Fig. 6). Noctuoidea have a tympanum on the thorax near the junction with the abdomen. Tympanal organs may be difficult to see without manipulating or cleaning the specimen.

2) Labial palpi pointed (Fig. 7). Some species have very long labial palpi.

3) Proboscis (tongue) is scaled (Fig. 7). Members of the Tortricidae have an unscaled proboscis.

4) Chaetosema (patch of bristle-like setae) absent in the Spilomelinae (not shown). This structure is present in most Tortricidae. Note that the presence or absence of chaetosemata may be difficult to see without a high-quality microscope.

Fig. 7: Head of female *Neoleucinodes elegantalis* showing scaled proboscis and long, pointed labial palpi (Photo: Hayden et al, 2013, IDtools.org).

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, 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 plastic wrap (or other material), as this will guarantee specimens will be seriously damaged or pulled apart – making identification difficult or impossible.

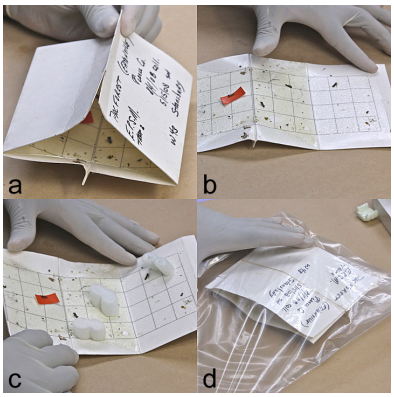

Fig. 8: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag.

Suspect crambids should be cleaned and removed from stick traps to identify suspect *Neoleucinodes* individuals. Instructions on cleaning specimens caught in sticky traps are found here: http://idtools.org/id/leps/tortai/dissections.html. Level 2 Screening is based on the shape of the frons and forewing markings. Genitalic dissection by a specialist is required for species-level identification.

Frons Shape and Labial Palps

Neoleucinodes prophetica and *N. torvis* are the only two species in North America that may be confused with *N. elegantalis* and *N. silvaniae,* and both are restricted to southern Florida. *Neoleucinodes* species (Fig. 9) have a round frons that is non-projecting. Males and females of *N. prophetica*, *N. torvis,* and *N. silvaniae* have palps with the third segment no longer than the second (Fig. 10). In *N. elegantalis*, there is sexual dimorphism, with the third segment on the palps of the female being much longer than the second (Fig. 11).

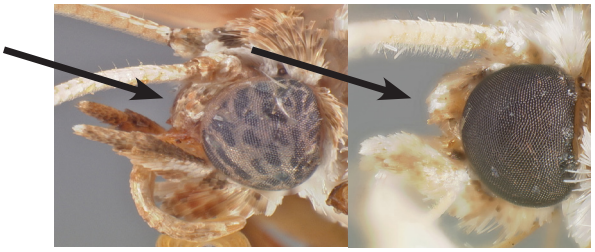

Fig. 9: Comparison of a non-projecting frons (left) and a projecting frons (right).

Fig. 10: *Neoleucinodes elegantalis* male

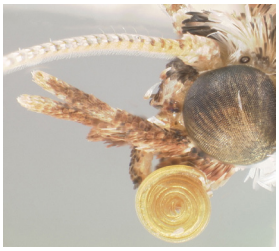

Fig. 11: *Neoleucinodes elegantalis* female

Wing Pattern and Size

Neoleucinodes elegantalis is somewat larger than *N. silvaniae* and *N. prophetica*, and *N. torvis* is significantly smaller than the rest. In wing pattern, *N. elegantalis* and *N. silvaniae* are identical with the orange triangle on the dorsal (posterior) margin of the forewing strongly colored, while it is less so in *N. prophetica* and *N. torvis* (Fig. 14).

Fig. 14: Comparison of wing pattern and relative sizes in *N. elegantalis* (left), *N. torvis* (center) and *N. prophetica* (right). *Neoleucinodes silvaniae* not shown. Scale bar = 5 mm (Photos: Hayden et al. 2013, IDtools.org).

(All photos on this page are from IDtools.org)

Key to Sort and Screen *Neoleucinodes* Suspects in the United States

1. Moth forewing length 6–12 mm; overall shape is typical for a crambid (Fig. 3); and wings are a translucent white with variable markings (Figs. 4–5) 2
1'. Moth forewing length smaller or larger than 5.5–13 mm; overall shape is not typical for a crambid; and wings are not translucent white..... Not *Neoleucinodes*

2. Third segment of labial palps much longer than second in females than in males (*N. elegantalis*) or equal to second segment in both sexes (*N. silvaniae*); and orange triangle on dorsal forewing margin darkly colored and strongly outlined ..... ***Neoleucinodes***
2'. Third segment of labial palps about same size in females and males; and orange triangle on dorsal forewing margin not darkly colored or strongly outlined ..... Not *Neoleucinodes*

Citation

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References for more information on *Neoleucinodes*

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Acknowledgments

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