CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Thaumatotibia leucotreta

Synonyms:
Cryptophlebia leucotreta
Cryptophlebia roerigii
Argyroploce leucotreta
Thaumatotibia roerigii

Common Name(s)
False codling moth, citrus codling moth, orange moth, and orange codlingmoth

Type of Pest
Moth, borer

Taxonomic Position
Class: Insecta, **Order:** Lepidoptera, **Family:** Tortricidae

Pest Recognition
This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infestations/infections in the field, select survey sites, and collect symptomatic material. For morphological descriptions, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.

Pest Description
Adult moths are grayish brown to dark brown with a 6–8 mm body and forewing length of 7–8 mm in males and 9–10 mm in females (Fig. 3) (Couilloud, 1994; Gilligan et al., 2011); females have a wingspan of 15–20 mm and males have wingspan of 15–18 mm (Couilloud, 1994; van der Straten et al., 2019). The male forewing is triangular, with an acute apex (Fig. 1), while the female forewing tends to be more elongate with a rounded apex (Fig. 2) (van der Straten et al., 2019). Male *Thaumatotibia leucotreta* moths are better distinguished from females by their large genital tuft, the long, dense, grayish-white scales on the hindlegs, heavily tufted hind tibia, and a semicircular pocket of multicolored scales near the posterior edge of the hindwing (see Fig.1 inset) (CABI, 2021; Couilloud, 1988; Gilligan et al., 2011; Gunn, 1921). The pocket of scales is a useful character that can distinguish *T. leucotreta* males from all other North American tortricids (van der Straten et al., 2019).

Figure 1. *Thaumatotibia leucotreta* adult male with closeup of the scale pocket on the hindwing (Todd M. Gilligan and Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS PPQ, Bugwood.org)

Figure 2. *Thaumatotibia leucotreta* adult female (Todd M. Gilligan and Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS PPQ, Bugwood.org)

Figure 3. *Thaumatotibia leucotreta* adults mating on citrus (Todd M. Gilligan and Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS PPQ, Bugwood.org)

Easily Mistaken Species

Thaumatotibia leucotreta larvae can be confused with many tortricid species because of similar appearance and damage, including *C. pomonella* (codling moth), and *Grapholita molesta* (Oriental fruit moth), which are both established in the United States (NAPIS, 2022). However, unlike the codling moth, *T. leucotreta*'s host range does not include

apples or pears (Pringle et al., 2015).

Commonly Encountered Non-targets

Pheromone lures with (*E*)- and (*Z*)-8-dodecenyl acetate may also attract *Cydia cupressana* (native), *Hyperstrotia spp*., *Cydia atlantic*a (exotic), *Cydia phaulopmorpha* (exotic), *Cryptophlebia peltastica* (exotic), and some other closely-related native moths from the tribe Grapholitini (Gilligan, 2013, personal communication).

Biology and Ecology

Thaumatotibia leucotreta is an internal fruit-feeding tortricid moth that does not undergo diapause and may be found throughout the year in warm climates on suitable host crops (CABI, 2021). In South Africa, *T. leucotreta* has four to ten non-discrete generations per year (Georgala, 1969; Stofberg, 1954). Males live from 14–34 days and females 16–48 days (Daiber, 1980). Females attract males by releasing pheromones, starting several hours after dark and peaking five hours later (Zagatti and Castel, 1987). Mated female moths deposit eggs singly or in small groups directly on fruits or on nearby leaves (Newton, 1989; Peña et al., 2002), preferring ripe or damaged fruit (Newton, 1989). Females lay an average of 456 eggs at 77°F, which dips to less than 90 eggs per female at 59°F (Daiber, 1980).

Eggs develop in 6–22 days depending on temperature, taking approximately 50–65 degree days to complete development, with a lower threshold temperature of 53.5°F (Daiber, 1979a). Eggs are sensitive to cold temperatures and extended periods of low humidity; temperatures below freezing that last two to three days can kill eggs (Blomefield, 1989; Daiber, 1979a).

First instar larvae find a suitable point of entry on the host fruit and bore into the flesh to begin feeding, often taking advantage of injuries or holes in the fruit's skin (Daiber, 1979b; Newton, 1989). Larvae hatching on leaves must find a suitable fruit to survive. There are five instars, all of which live and feed inside the fruit. Full development can take 12–33 days in warm weather, but up to 70 days in cool weather (Daiber, 1979b). Full grown larvae exit the fruit to spin a cocoon in the soil. This may occur while the fruit is still on the tree or after it has dropped (Blomefield, 1989).

Known Hosts

Thaumatotibia leucotreta is a generalist with respect to host plant selection and has been recorded feeding on over 50 different plant species, which allows the moth to survive in marginal conditions. Major crops on which *T. leucotreta* is a pest include citrus (*Citrus* spp.) (Economides, 1979), stone fruit (*Prunus* spp.) (Daiber, 1981), cotton (*Gossypium* spp.) (Reed, 1974), avocado (*Persea americana*) (Erichsen and Schoeman, 1992), litchi (*Litchi chinensis*), and macadamia (*Macadamia* spp.) (Steyn et al., 2019).

Apples and pears are not hosts, but are often reported in the literature because pheromone traps in apple and pear orchards catch moths (Pringle et al., 2015). Some other purported hosts appear to be doubtful or have little evidence to support them, such as mango and tomato (Grové et al., 2012).

The host list below includes cultivated and wild plants that 1) are infected or infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.

Preferred Hosts

Capsicum* spp.** * (peppers), ***Citrus* spp. (citrus), ***Gossypium* spp.*** (cotton), ***Litchi chinensis**** (litchi), ***Macadamia spp.**** (macadamia), ***Persea americana**** (avocado), ***Prunus persica**** (peach), *Punica granatum** (pomegranate), *Ricinus communis** (castor bean), and *Zea mays** (corn) (Blomefield, 1989; Daiber, 1981; Economides, 1979; Erichsen and Schoeman, 1992; Gunn, 1921; Kirkman and Moore, 2007; Mkiga et al., 2019; Pinhey, 1975; Reed, 1974; Steyn et al., 2019; Wohlfarter et al., 2010).

Other hosts

Abutilon spp. (Indian mallow), *Albuca* sp., *Annona cherimola** (cherimoya), *Annona glabra** (pond apple), *Annona muricata* (soursop), *Annona reticulata* (Bullock's heart, custard apple), *Annona squamosa* (sugar apple), *Asparagus crassicladus*, *Averrhoa carambola* (carambola), *Bauhinia galpinii* (red bauhinia), *Caesalpinia pulcherrima* (pride-of-Barbados), *Caesalpinia* spp. (nicker), *Calotropis procera* (sodom apple), *Capparis tomentosa* (African caper), *Carya illinoensis** (pecan), *Catha edulis* (khat), *Chrysophyllum cainito* (star apple), *Cola nitida* (bitter cola), *Crassula ovata, Diospyros mespiliformis* (jackalberry), *Diospyros pallens* (=*Royena pallens*) (pale-branched Royena), *Diospyros* spp.* (persimmon), *Englerophytum magalismontanum* (=*Bequaertiodendron magalismontanum*) (stamvrug), *Eriobotrya japonica* (loquat), *Eugenia uniflora* (Surinam cherry), *Ficus sur** (=*F. capensis*) (wild fig), *Flacourtia indica* (governor's-plum), *Garcinia mangostana* (mangosteen), *Harpephyllum caffrum* (wild plum), *Hibiscus cannabinus* (kenaf), *Hibiscus spp.** (hibiscus), *Juglans regia* (English walnut), *Juglans spp.** (walnut), *Mimusops zeyheri* (Transvaal red milkwood), *Musa* x *paradisiaca** (banana), *Olea* spp.* (olive), *Opuntia ficus-indica*, *Passiflora* spp, *Pennisetum purpureum* (elephant grass), *Phaseolus lunatus* (lima bean), *Phaseolus* spp.* (bean), *Physalis philadelphica** (=*P. ixocarpa*) (tomatillo), *Physalis* spp. (groundcherry), *Piper* spp.* (pepper plant/ peppercorns), *Psidium guajava** (guava), *Podocarpus* spp. (plum pine), *Prunus armeniaca** (apricot), *Prunus domestica** (plum), *Pseudolachnostylis maprouneifolia* (kudu berry), *Quercus* spp.* (oak, acorns), *Saccharum officinarum** (sugarcane), *Schotia* spp. (boer-bean), *Sechium edule* (chayote), *Senna petersiana* (=*Cassia petersiana*) (monkey pod), *Sida* spp. (fanpetals), *Solanum betaceum* (=*Cyphomandra betacea*) (tree tomato), *Solanum melongena** (eggplant), *Synsepalum dulcificum* (miraculous berry), *Syzygium cordatum* (water berry), *Syzygium jambos* (rose-apple), *Theobroma cacao** (cacao), *Thespesia garckeana* (=*Azanza garckeana*) (snot apple), *Triumfetta* spp. (bur weed), *Vachellia nilotica* (=*Acacia nilotica*) (acacia), *Vachellia tortilis* (=*Acacia tortilis*) (umbrella thorn), *Vigna* spp.* (cowpea), *Vitellaria paradoxa* (=*Butyrospermum parkii*) (shea butter tree), *Vitis* spp.* (grape), *Xeroderris stuhlmannii* (wing bean), *Ximenia caffra* (sourplum), *Yucca* spp.* (yucca), and *Ziziphus* spp.* (jujube) (CABI, 2021; Gunn, 1921; Kirkman and Moore, 2007; Pinhey, 1975).

Pest Importance

Thaumatotibia leucotreta is a pest of economic importance to numerous valuable crops throughout sub-Saharan Africa and some islands of the Atlantic and Indian Oceans. Larval feeding and development can affect fruit or cotton boll development and can give rise to secondary fungal and bacterial rots (Van der Geest and Evenhuis, 1991). In Kenya and Tanzania, *T. leucotreta* was found infesting 12 percent of African eggplant (*Solanum aethiopicum*), 11 percent of chili peppers (*Capsicum* spp.), and 3 percent of okra (*Abelmoschus esculentus*) (Mkiga et al., 2019). In the same study, oranges were infested at the rate of 26.9 percent in Kenya and 20.7 percent in Tanzania (Mkiga et al., 2019). Most of the major economic host plants of *T. leucotreta* are widely grown in the United States. In 2017, cotton was grown on 15,874,682 acres, oranges on 602,830 acres, avocado on 64,455 acres, peppers on 48,801 acres, and macadamia nuts on 18,403 acres (NASS, 2019).

Pathogens or Associated Organisms Vectored

This species is not known to be associated with pathogens or other organisms.

Known Distribution

Africa: Angola, Benin, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Democratic Republic of Congo, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Réunion, Rwanda, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar, and Zimbabwe; **Asia:** Israel (Hill, 1983; Mkiga et al., 2019; Nimubona, 2010; Onah et al., 2016; Reed, 1974 Cauquil et al., 1986; CIE, 1976; Djieto-Lordon et al., 2014; Levi-Zada et al., 2020; Mück, 1985; Staeubli, 1976).

Pathway

Infestation by *T. leucotreta* generally causes the fruit to drop before harvest. However, larval infestations that occur near fruit harvest may not be detected and infested fruit can be inadvertently delivered to packinghouses and packaged for export (Moore et al., 2016).

Increased international trade and tourism between the United States and many African countries has increased the risk of introduction of this pest. Since 1984, *T. leucotreta* has been intercepted at least 960 times in passenger baggage and 245 times in permit cargo. Most interceptions are of larvae and occur in bell peppers (*Capsicum* spp.), eggplant (*Solanum melongena*), and clementines (*Citrus* spp.) (ARM, 2022).

Very few host commodities of *T. leucotreta* can be imported into the United States from areas where the pest is present. Oranges and litchis are allowed from South Africa, but oranges must be cold-treated, and litchis must be irradiated. *Capsicum frutescens* is allowed from Israel but must be grown in approved greenhouses in a specific area of the country (APHIS, 2021).

Use the PPQ Commodity Import and Export manuals listed below to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) are in use. These manuals are updated regularly.

Agricultural Commodity Import Requirements(ACIR) manual: ACIR provides a single source to search for and retrieve entry requirements for imported commodities. https://acir.aphis.usda.gov/s/

Plants for Planting Manual: This manual is a resource for regulating imported plants or plant parts for propagation, including buds, bulbs, corms, cuttings, layers, pollen, scions, seeds, tissue, tubers, and like structures. https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/plants_for_planting.pdf

Treatment Manual: This manual provides information about treatments applied to imported and domestic commodities to limit the movement of agricultural pests into or within the United States. https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf

Potential Distribution within the United States

A climate suitability map for *T. leucotreta* is available. Surveys for this moth should only be considered in areas where it is likely to establish. Most of the southeast, southwest, the west coast, Hawaii, and Puerto Rico are suitable for false codling moth establishment (SAFARIS, 2022). Economically important hosts are distributed throughout these areas.

Survey and Key Diagnostics

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://caps.ceris.purdue.edu/approved-methods.

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USDA-APHIS-PPQ-ST staff developed this datasheet. Cite this document as:
PPQ. 2022. Cooperative Agricultural Pest Survey (CAPS) Pest Datasheet for *Thaumatotibia leucotreta* (Tortricidae): False codling moth. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC. 10pp

Versions

2007: Datasheet completed (Version 1)
January 2014 (Version 2)

- *Thaumatotibia roerigii* added as a synonym.
- Diagnostic larval characters added.
- Number of generations increased from “four to six” to “four to ten.”
- Added Israel to distribution as “locally present.”
- Emphasized the nearly circular pocket of scales in the hind wing as the importantidentifying character for this species.1234

December 2022 (Version 3)

- Updated to the new template
- Adding recent citations/updating datasheet

Reviewer(s)

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