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NOCTUIDAE - *Helicoverpa zea* (Boddie) *Non-Rep*

Taxonomy

Noctuoidea: Noctuidae: Heliothinae: *Helicoverpa zea* (Boddie)

Common names: corn earworm, tomato fruitworm, cotton bollworm

Synonyms: *Heliothis zea*, *H. umbrosus*, *H. ochracea*, *H. stombleri*

Prior to the mid-20th century, the name *armigera* was often used to refer to *H. zea* in the New World.

Larval diagnosis (Summary)

- Mandible without retinaculum
- No microspines on middle to top of the body pinacula
- Body color and patterns variable
- Larvae of *H. zea* can difficult to separate from those of *H. phloxiphaga* in Mexico or sibling species in South America; see the detailed larval diagnosis for more information
- There are no consistent morphological characters that can be used to separate the larvae of *H. armigera* and *H. zea*

Host/origin information

The majority of interception records (>70%) are from Mexico, with nearly half of those associated with corn (*Zea mays*). Larvae of *H. zea* are highly polyphagous and interceptions have been recorded from more than 180 types of plants. Records in PestID from locations outside of the Americas or the Caribbean could represent *H. zea* or any of several sibling species with poorly known larvae.

Origin	Host(s)
Dominican Republic	*Capsicum*
Ecuador	various
Guatemala	various
Mexico	*Capsicum*, *Cicer*, *Lactuca*, *Ocimum*, *Phaseolus*, *Physalis*, *Zea mays*
Nicaragua	various
Peru	*Psium*, *Zea mays*
Trinidad and Tobago	*Capsicum*

Recorded distribution

Helicoverpa zea is widely distributed throughout the Americas. It is present in North, Central, and South America, the Caribbean, and Hawaii. It has also been recorded from other Pacific Islands (populations which likely did not establish) (Hardwick 1965).

Identification authority (Summary)

Only mid- to late instar larvae can be identified using the mandible and lack of microspines on the pinacula; early instars should be identified only to subfamily. Although *H. zea* is only recorded from the New World, the presence of other *Helicoverpa* can make a species-level identification difficult. Consult the Detailed Information tab for information on other species present in South America. The discovery of *H. armigera* in Brazil makes species-level identifications from that country impossible using only morphology.

Pest characterization

(Based on Cavey 2001, Hardwick 1965)

- Taxonomy: **High.** Species identification is often possible.
- Distribution: **Low.** *Helicoverpa zea* occurs in the U.S.
- Potential Impact: **High.** *Helicoverpa zea* is a pest species.

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Fig. 1: Late instar, lateral view

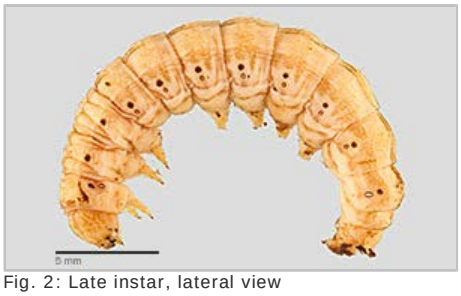


Fig. 2: Late instar, lateral view


Fig. 3: Mid-instar, lateral view


Fig. 4: Late instar, dorsal view


Fig. 5: Late instar, dorsal view


Fig. 1: Late dorsal, lateral view

This ranking characterizes *H. zea* as not quarantine significant for the U.S.

Larval diagnosis (Detailed)

The larva of the corn earworm, *Helicoverpa zea*, was at least partially described by many authors including Garman (1920), Crumb (1956), Okumura (1961), Peterson (1962), Hardwick (1965), Neunzig (1969), Pastrana and Henandez (1979), Godfrey (1987), and Hardwick (1996). Several larval color patterns were photographed by Hardwick (1996), Cranshaw (2004), and Wagner et al. (2011). Brazzel et al. (1953) illustrated variation in the mandibles of *H. zea*. Early literature was reviewed Kogan et al. (1978). The Heliothinae guide (below) provides keys to separate *H. zea* from other quarantine species of Heliothinae.

Larval variation in the *Chloridea*/*Heliothis*/*Helicoverpa* complex can complicate identifications. Although simplified keys work for most situations in the United States, APHIS intercepts so many individuals that exceptions are common and have to be discussed.

Typically, *H. zea* is recognized by having no retinaculum on the mandible and a lack of microspines on the body pinacula (e.g., Godfrey 1987). These characters separate *H. zea* from most *Chloridea virescens*. The mandible of *H. zea* normally lacks a retinaculum, although a small tooth may be present. A retinaculum, usually well developed in *C. virescens*, may be reduced to a thin ridge or "scar." Each of these cases was illustrated by Brazzel et al. (1953) and Neunzig (1969: 11). A small number of microspines may be found on the body pinacula of *H. zea* in the fifth and sixth instars, but only around the edges (Brazzel et al. 1953: 16). The microspines of *C. virescens* tend to reach at least the middle of the body pinacula on many segments (see *C. virescens* fact sheet). Boyer et al. (1977) suggested the most accurate way to evaluation the microspine character was to use the dorsal pinacula on A8.

Typically, *Heliothis phloxiphaga* has conical pinacula all over the body. Conical pinacula in *H. zea*, if present, are only on A1, A2, and A8. Some specimens of *H. phloxiphaga* have flat pinacula (Hardwick 1996: N7, N8); these can be confused with *H. zea*. Unlike *H. zea*, *H. phloxiphaga* sometimes has dark arcs on the head (Crumb 1926) or pinacula ringed with white (Lange and Michelbacher 1937).

Normally, *H. zea* does not feed on *Physalis* (Godfrey 1987), while *Chloridea subflexa* is a *Physalis* specialist. However, Robinson et al. (2002) recorded *H. zea* from a species of *Physalis*, thus morphological characters should be carefully checked to separate larvae found on *Physalis*. Peterson (1962: L36) illustrated differences in the spine pattern of A4 which can be used to separate *C. subflexa* from *H. zea*. In addition, the SD2 seta is surrounded by a sclerotized area in *C. subflexa* but not in *H. zea* (Peterson 1962: L36, Wagner et al. 2011).

The key by Hardwick (1965) is useful but not practical for APHIS. The first couplet lacks entries for Europe, Central America and the Caribbean. Granted, these areas can be treated with other existing keys. A bigger problem with his morphometric study is that the cuticle stretches between instars causing the pinacula to shrink (Neunzig 1969:11). It is unknown if this affects the setal ratios that Hardwick (1965) used to recognize species, although he claimed a high success rate for the key.

Identification authority (Detailed)

Helicoverpa zea is highly polyphagous and widely distributed, but there are no records outside of the Americas, Hawaii and scattered collections on other Pacific Islands that may not have established (Hardwick 1965). The above diagnoses will allow species identifications from North America, Central America and the Caribbean.

It should be noted that *H. phloxiphaga* occurs only as far south as Mexico, and is quite rare in United States port interceptions. The other species (*H. zea*, *C. virescens*, and *C. subflexa*) are commonly intercepted.

Only the mid to last instars of *H. zea* can be identified by the mandible and cuticle microspines. First and second instars should be left at subfamily or consult Neunzig (1969) if there is a reason to make an identification of early instars of *H. zea* and *C. virescens*. For the quarantine decisions in the United States, both have the same action status, and this effort is usually not justified.

Identification of *H. zea* from South America is often not possible. One problem is the introduction of *H. armigera* to Brazil (Czepak et al. 2013). No characters are yet known to separate *armigera* from *zea*; thus we can only go to genus *Helicoverpa* from Brazil.

It is possible to identify *H. zea* from Ecuador, Colombia, and Venezuela. There are sibling species of the *zea* complex in Peru and other parts of South America, especially *H. gelotopoeon*. For Peru and the rest of South America, it is best to say "*Helicoverpa* sp." Consult the Heliothinae guide (below) for details.

For Hawaii, if the interception is from corn, and the larva has conical pinacula on A1, A2 and A8, then it can be called *H. zea* (Beardsley 1982). *Helicoverpa hawaiiensis* (Beardsley 1982) and some *H. zea* (SPIC) have flat pinacula. *Chloridea virescens* also occurs in Hawaii (Beardsley 1982); it may be identified by the characters given above.

Key to the identification of *Helicoverpa armigera* suspects intercepted at U.S. ports of entry (includes *H. zea*)


Fig. 7: Mid-instar, thorax


Fig. 8: A8 pinacula


Fig. 9: Crochets


Fig. 10: Head


Fig. 11: Hypo. complex


Fig. 12: Hypopharyngeal complex, dorsal view


Fig. 13: Mandible


Fig. 14: Mandible

Identification guide to larval Heliothinae (Lepidoptera: Noctuidae) of quarantine significance

Origin records

Helicoverpa zea has been intercepted from the following locations:

Argentina, Barbados, Belize, Bolivia, Brazil, British Virgin Islands, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Puerto Rico, St. Lucia, Trinidad and Tobago, US Virgin Islands, Venezuela

Locations from outside of the Americas or the Caribbean have been omitted as these likely represent misidentifications.

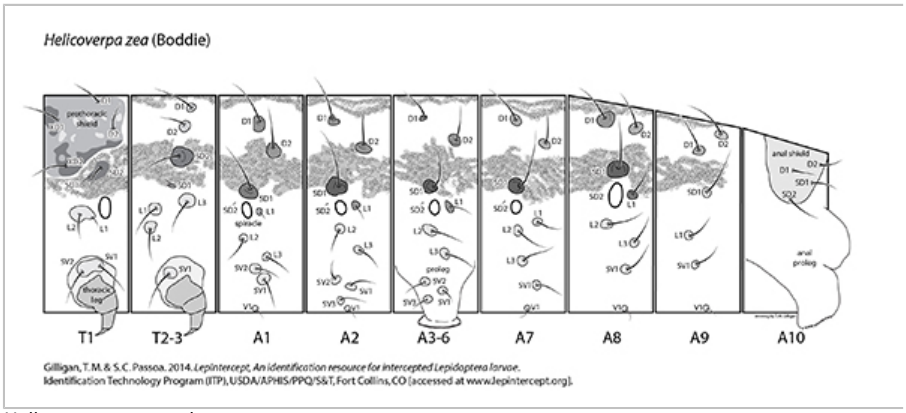
Host records

Helicoverpa zea has been intercepted on the following hosts:

Abelmoschus esculentus, *Abelmoschus* sp., *Allium fistulosum*, *Allium porrum*, *Allium* sp., *Aloe vera*, *Alstroemeria* sp., *Amaranthus caudatus*, *Amaranthus* sp., *Ananas comosus*, *Anethum graveolens*, *Annona cherimola*, *Antirrhinum majus*, *Antirrhinum* sp., Apiaceae, *Apium graveolens*, *Apium graveolens* var. *dulce*, *Apium* sp., *Artemisia dracunculus*, *Artocarpus altilis*, *Aster* sp., *Basilicum* sp., *Beta vulgaris* var. *cicla*, *Brassica chinensis*, *Brassica oleracea*, *Brassica oleracea* var. *botrytis*, *Brassica oleracea* var. *capitata*, *Brassica pekinensis*, *Brassica rapa*, *Brassica rapa* ssp. *chinensis*, *Brassica rapa* ssp. *pekinensis*, *Brassica* sp., *Cajanus cajan*, *Calendula officinalis*, *Calendula* sp., *Campanula* sp., *Capsicum annuum*, *Capsicum frutescens*, *Capsicum sinense*, *Capsicum* sp., *Carthamus* sp., *Chamaedorea* sp., *Chamomilla* sp., *Chenopodium album*, *Chenopodium berlandieri* ssp *nuttalliae*, *Chenopodium* sp., *Chichorium* sp., *Chicorum* sp., *Chrysanthemum* sp., *Cicer arietinum*, *Cicer* sp., *Cichorium intybus*, *Cichorium* sp., *Citrullus lanatus*, *Clematis* sp., *Colocasia* sp., *Corchorus capsularis*, *Coriandrum sativum*, *Cucumis sativus*, *Cucurbita maxima*, *Cucurbita pepo*, *Cucurbita* sp., *Cyamopsis tetragonoloba*, *Cynara cardunculus*, *Cynara scolymus*, *Daucus carota*, *Delphinium elatum*, *Delphinium* sp., *Dianthus caryophyllus*, *Dianthus* sp., *Equisetum* sp., *Eucalyptus* sp., Fabaceae, *Fragaria* sp., *Gerbera* sp., *Gladiolus* sp., *Gypsophila paniculata*, *Gypsophila* sp., *Helianthus annuus*, *Helianthus* sp., *Juglans* sp., *Lablab* sp., *Lactuca sativa*, *Lactuca sativa* var. *capitata*, *Lactuca* sp., *Lagenaria siceraria*, *Lagenaria* sp., *Leucadendron* sp., *Leucospermum* sp., *Limonium perezii*, *Limonium* sp., *Lippia* sp., *Luffa acutangula*, *Lycopersicon lycopersicum*, *Malus domestica*, *Mangifera indica*, *Matricaria recutita*, *Matricaria* sp., *Matthiola incana*, *Medicago sativa*, *Mentha arvensis*, *Mentha longifolia*, *Mentha piperita*, *Mentha* sp., Mimosoideae, *Moluccella* sp., *Momordica charantia*, *Momordica* sp., *Ocimum basilicum*, *Ocimum* sp., *Opuntia* sp., *Origanum majorana*, *Origanum* sp., *Origanum vulgare*, *Phaseolus* sp., *Phaseolus vulgaris*, *Pimenta* sp., *Pisum sativum*, *Pisum sativum* var. *macrocarpon*, *Pisum* sp., *Pithecellobium dulce*, Poaceae, *Polianthes tuberosa*, *Porophyllum* sp., *Portulaca oleracea*, *Pyrus communis*, *Raphanus sativus*, *Rosmarinus officinalis*, *Rubus* sp., *Saccharum officinarum*, *Salvia officinalis*, *Salvia sclarea*, *Salvia* sp., *Scabiosa* sp., Solanaceae, *Solanum integrifolium*, *Solanum lycopersicum* var *lycopersicum*, *Solanum melongena*, *Solanum* sp., *Solidago* sp., *Spinacia* sp., *Spiraea* sp., *Spondias purpurea*, *Suaeda* sp., *Tagetes erecta*, *Tagetes* sp., *Thymus* sp., *Thymus vulgaris*, *Vicia faba*, *Vigna* sp., *Yucca elephantipes*, *Zea mays*, *Zea* sp., *Zingiber* sp.

There are several records in PestID of *H. zea* from Mexico on *Physalis* (*Physalis ixocarpa*, *Physalis philadelphica*, *Physalis pubescens*), some of these possibly represent interceptions of *C. subflexa*.

Setal map



Helicoverpa zea setal map

Click here to download a full-size printable PDF of this larval setal map

LepIntercept - An identification resource for intercepted Lepidoptera larvae
by Todd M. Gilligan and Steven C. Passoa
Identification Technology Program (ITP), Fort Collins, CO. Last updated February 2014.