

LepIntercept

An identification resource for intercepted Lepidoptera larvae



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NOCTUIDAE - *Spodoptera litura* (Fabricius)

Taxonomy

Noctuoidea: Noctuidae: Noctuinae: *Spodoptera litura* (Fabricius)

Common names: rice cutworm, cluster caterpillar, cotton leafworm, tobacco cutworm, tropical armyworm, Egyptian cottonworm

Synonyms: *Prodenia litura*, *Noctua histrionica*, *Noctua elata*, *Prodenia ciligera*, *Prodenia tasmanica*, *Prodenia subterminalis*, *Prodenia glaucistriga*, *Prodenia declinata*, *Mamestra albisparsa*, *Prodenia evanescens*, *Orthosia conjuncta*

Larval diagnosis (Summary)

- Mandible with scissorial teeth resulting in a serrate cutting edge
- Ground color green to yellow brown to dark blue gray
- Subdorsal area often not contrasting with paler dorsum
- Middorsal line often present and conspicuous
- Spiracular stripe, if interrupted on A1, then equal in intensity on both the thorax and abdomen
- Dorsal triangles, if present, usually with an apical white dot
- Abdominal spiracles usually with a large black dot dorsally and a white spot posteriorly
- From Middle East to Asia on a wide range of hosts

Host/origin information

More than 85% of all interception records at U.S. ports of entry for *S. litura* are from Thailand on orchids.

| Origin | Host(s) |
|-----------|-------------------------------------|
| Thailand | <i>Dendrobium</i> , <i>Oncidium</i> |
| Malaysia | various |
| Singapore | various |

Recorded distribution

Spodoptera litura is widely distributed throughout Asia and Australasia, from Afghanistan, northwestern India, and Pakistan to Korea, China, and Japan, south to Australia and New Zealand. It is also present on many Pacific Islands as well as in Hawaii (Pogue 2002).

Identification authority (Summary)

Because the genus *Spodoptera* is hard to define as larvae, care must be taken to be sure the specimen is in this genus. Detailed descriptions of morphology and coloration are included on the Detailed Information page. Because this pest is polyphagous, the hostplant offers few clues. The one exception is *S. litura* on orchids from Thailand.

Pest characterization

(Based on Cavey 2001, Pogue 2002)

- Taxonomy: **High**. Species identification is possible in late instars.
- Distribution: **High**. *Spodoptera litura* does not occur in the U.S.
- Potential Impact: **High**. *Spodoptera litura* is a serious pest.

This ranking characterizes *Spodoptera litura* as quarantine significant for the U.S.

Larval diagnosis (Detailed)

The larva of *S. litura*, usually called the rice cutworm (USDA 1982), was described by Chu et al.

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Fig. 1: Late instar, lateral view



Fig. 2: Late instar, lateral view



Fig. 3: Early to mid-instar, lateral view



Fig. 4: Early instar, lateral view



Fig. 5: Late instar, dorsal view



Fig. 6: Late instar thorax, lateral view



Fig. 7: Early instar



Fig. 8: Crochets

(1965), Thakar and Srivastva (1983) and partially described by Gardner (1941, 1947), Mochida (1973), Weisman (1974), Bejakovich and Dugdale (1998), Pogue (2002), Sri et al. (2010), and Passoa (2011). Srivastava and Mathur (1964) described the mouthparts. Cox (1976), Bejakovich and Dugdale (1998), Sugi (1987), Wagner et al. (2011), and Komai et al. (2011) illustrated the larva in color.



Fig. 9: "Y" on head



Fig. 10: Head



Fig. 11: Hypo. complex



Fig. 12: Mandible



Fig. 13: Hypopharyngeal complex, dorsal view

Weisman (1986) did not include *S. litura* in his key. Several authors have partially described the larva, usually emphasizing different character sets. Sometimes there is conflicting information. Due to a lack of a modern detailed morphological description, we review the major available literature on the larval morphology of *S. litura* to support our diagnosis of this important quarantine pest.

Gardner (1941) studied *S. litura* in India. He noted the frons of *S. litura* is dark brown to black, the spiracle of A7 is two thirds as large as the one on A8, and SD1 is dorsad of the spiracle on the abdominal segments. The labral notch is wide but shallow, the setae are short, the skin is smooth, and the spiracles are black. Later, Gardner (1947) placed *S. litura* in his "Division A, group A2," using some of the above characters. Members of group A2 appear to have a relatively unspecialized morphology; perhaps the most significant characters are the short setae, position of SD1 dorsad of the spiracle on A8, a bisetose SV group on A1, a trisetose SV group on A2, stemmata 1 and 2 closely spaced and the frontal pores in line with the F1 setae. The spinneret of *S. litura* has two projections and an elongate rounded apical lobe (Gardner 1947: fig. 16).

Chu et al. (1965: plate 5: fig. 80) illustrated the larva of *S. litura* from China. The P setae are evenly spaced, the labrum has a developed notch, the apex of the spinneret has an elongated round apical lobe, and his illustration of the mandible shows five teeth with a few minute serrations on the cutting margin. A black patch on the abdominal segments surrounds both the spiracle and a lighter spot at the posterior margin.

Mochida (1973) compared twenty larvae each of *S. litura* from Japan to *S. littoralis* from Egypt. The basal margin of the labrum is convex in *S. litura* but linear in *S. littoralis*. The pattern of coloration around the abdominal spiracles was better developed in *S. litura* than to *S. littoralis*. Other features of the head, mouthparts and thoracic claws were considered "characteristic" of each species but they were not enumerated by Mochida (1973). The figures do show some major differences. *Spodoptera litura* has the MD setae in a straight line on the head, P2 almost dorsad of P1, a rectangular mandible, and the apex of the spinneret rounded. This differs from *S. littoralis*, which has the MD setae in a curved line, P2 more widely spaced from each other than P1, a square shaped mandible, and the apex of the spinneret pointed. Both species have four setae on the prothoracic shield.

Weisman (1974) defined a "*Prodenia* group" that included *S. litura* and other species of *Spodoptera*. He mentioned a broad and flat spinneret, almost equal in length to the labial palpus, with a middorsal groove and two small projections at the apex. The SD setae are off the prothoracic shield and SD1 of the mesothorax [and metathorax] are connected to the associated tonofibrillary platelet by a minute sclerotized bar. The mandible has no retinaculum.

Aitkenhead et al. (1974) thought the markings on A1 of *S. litura* extended more laterally than in *S. littoralis* but otherwise two species could not be told apart in the field. Brown and Cantrell (1978) illustrated the mandible of *S. litura* and noted the presence of white spots on the dorsum. Beardsley (1982) published a key to Hawaiian noctuids. After eliminating unrelated species, he separated *S. litura* from *Elaphria* and other *Spodoptera* in Hawaii by the spacing of stemmata 3 and 4, spiracle size and color, the lack of dorsal round spots on A2, and the relatively broad spinneret. The description of *S. litura* by Thakar and Srivastva (1983) included a short text and diagrammatic figures. There was no diagnosis.

Bejakovich and Dugdale (1998: 16, 17, 52) defined *S. mauritia* and *S. litura* by having L2 below the level of the spiracle on A8; the D, SD and L setae with a slightly truncate or expanded apex; presence of "eyespot" (white spots) on the mesothorax and metathorax and a swollen area at D2 on the last two thoracic segments compare to the prothorax. They recognized two color forms of *S. litura* in New Zealand interceptions. Both have a white spot on a dark "sclerite" [patch] posterodorsad of the abdominal spiracles. These markings may be "vivid" (*S. litura* from Australia) or "drab" (*S. litura* from the eastern Pacific).

Pogue (2002) added that the distance between P2 is greater than that separating the P1 setae, the mandible has teeth, the front extends about 1/2 to 3/4 the distance to the epicranial notch and there are about 127 crochets on one side of the body. He also recognized two color forms. Important color characters include the dorsal segmental triangles of A7 and A8 being larger than those on A1-6, all with a small white spot at their apex, and the presence of a white or light spot caudal to the spiracle.

Passoa (2011) compared *S. litura* and *S. littoralis* to other North American *Spodoptera* as part of a screening key to allow more rapid recognition of these exotic species if ever introduced to North America. For typical specimens of *S. litura*, the dorsal triangle of A1 is larger than the triangle on A6, the spiracular line may be interrupted on A1 but there is no loss of intensity on the thorax compared to the abdomen and dorsal spots are often present on T2 and T3. The ground color varies from green to brown, a middorsal line may be present and the abdominal triangular markings have a white spot at the apex.

The unspecialized morphology of *S. litura* is shown by its location on the last couplet of Beardsley (1982), and both keys by Gardner (1941, 1947), only after all the other species are eliminated. From the above studies, we suggest the following morphological characters: spinneret with two projections and an elongate rounded apical lobe; mandible with four scissor-like teeth and no retinaculum; SD1 on T2 and T3 connected to the associated tonofibrillary platelet by a minute sclerotized bar; SV group bisetose on A1; SD1 dorsad of the spiracle on A8 and the body setae short, most not much longer than the vertical height of the 8th abdominal spiracle. Passoa (1991) listed nine general characters to separate *Spodoptera* from other economic noctuids in Honduras, a few of these not mentioned above are applicable to *S. litura*, for example, four abdominal prolegs present (larva not a looper), lateral spot often present on first abdominal segment (this spot is a practical method of recognizing *Spodoptera* larvae in the field), hypopharyngeal complex with coarsely spined posterior portion lacking a dense brush of stout bristles, cuticle smooth under low magnification, and head with an inverted "Y" because adfrontal areas are outlined in white (see Wagner et al. 2011). There appears to be variation in the spinneret of *S. litura* as the figures of Chu et al. (1965) and Mochida (1973) do not match, perhaps the former being more typical. There also seems to be variation in the spacing of the P setae, the labral notch and the shape of the mandible according to the available illustrations. With our limited material, we could not

confirm that the D, SD and L setae of *S. litura* have a slightly truncate or expanded apex as mentioned by Bejakovich and Dugdale (1998). There is a long ridgelike blade on the hypopharyngeal complex and SD1 is hairlike on A9.

The following color characters are most important for recognizing *S. litura*: middorsal line often present and conspicuous; dorsal triangles absent on all segments, present on A1 to A8, only A1 and A8 or just A8; the dorsal triangle of A1 usually much larger than that of A6; the spiracular line, if interrupted on A1, then equal in intensity on both the thorax and abdomen; abdominal spiracles with a dorsal dark spot enclosing a smaller white spot posterior to the spiracle, and apex of dorsal triangles with a small apical white spot. These patterns are visible on living and usually preserved larvae.

There are both larval and adult color differences for *S. litura* across its range (Bejakovich and Dugdale 1998, Pogue 2002). Both the "drab" and "vivid" larval color forms occur together in Japan (Komai et al. 2011: plate 236). The significance of morphological or color variation of *S. litura* is not known.

We have chosen the most common states in both morphology and color based on United States port interceptions. Exceptions to the above diagnosis are known and more may be expected. Bejakovich and Dugdale (1998) and Mohn (2001) illustrated examples of a *S. litura* with a pale abdominal dorsum and only traces of a spiracular stripe or abdominal triangles. In other cases (Example Here), the dorsal triangles are well developed and all are almost equal in size.

Identification authority (Detailed)

Because the genus *Spodoptera* is hard to define as larvae, care must be taken to be sure the specimen is in this genus. The thoracic bar on SD1 occurs in many noctuids, it is not an indication of *Spodoptera* by itself. Morphological characters were described in detail above to help with doubtful cases. Both the morphology and color must match *Spodoptera*. If either is not correct, it is better to stay at family Noctuidae.

Accurate identification of *S. litura* involves origin, morphology and color pattern. Because this pest is polyphagous, the hostplant offers few clues. The one exception is *S. litura* on orchids from Thailand.

There have been interceptions of *Spodoptera* on orchids from Thailand for many years, going back to at least to the 1970's (Ford 1988: 6). Some of these are *S. exigua*, easily recognized by the characters given in our data sheet. Because orchids are not a field host for *S. litura*, there was doubt about this association (Ford 1988). However, the Netherlands Plant Protection Organization has reared *S. litura* from Thailand orchids several times from 2005-2007 (M. van der Straten, pers. comm.), thus confirming this pathway. Because there are still only two easily separated *Spodoptera* on orchids from Thailand, even young larvae of *S. litura* (second to last instar) can be named. This is the rare exception, otherwise, larvae of *Spodoptera* with an unknown origin, or those young enough to have a swollen thorax, should only be identified to genus.

Typically, the forms of *S. litura* can be summarized as follows. Early instars have a swollen thorax and usually either a band or a large black spot on A1. Heavily marked later instars have white spots on the mesothorax and metathorax, a middorsal stripe, dorsal triangles on all the abdominal segments with apical white spot and abdominal spiracles with a dorsal dark spot enclosing a smaller white spot posterior to the spiracle. Drab or poorly marked forms of *S. litura* will lack the thoracic spots, dorsal triangles and either or both of the spots near the spiracle. In these cases, origin may be the only way to separate them from *S. littoralis* pending confirmation of morphological characters mentioned by Mochida (1973). *Spodoptera litura* can be identified from India west throughout Asia; *S. littoralis* from about Israel east to northern Africa and Europe. Doubtful specimens from Israel to India can be left at genus. The presence of a middorsal stripe in *S. litura* was considered distinctive (EPPO data sheet), but this character is also variable. Although *S. litura* does not occur in Europe naturally, it is common in cut flowers from the Netherlands.



Key to recognizing *Spodoptera litural/littoralis* intercepted at U.S. ports of entry

Origin records

Spodoptera litura has been intercepted from the following locations:

China, Hawaii, Hong Kong (?), India, Israel, Japan, Malaysia, Netherlands, New Zealand, Philippines, Singapore, Taiwan, Thailand, Viet Nam

Although *S. litura* does not occur in Europe naturally, it is common in cut flowers from the Netherlands.

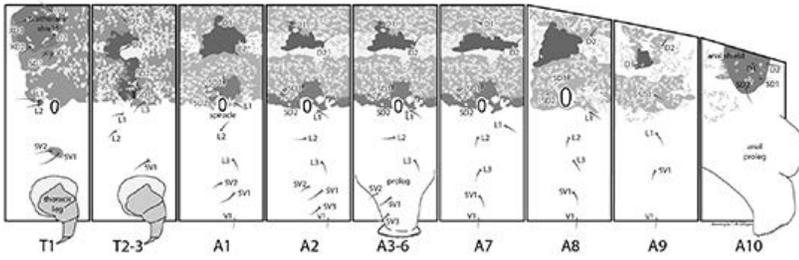
Host records

Spodoptera litura has been intercepted on the following hosts:

Actinidia sp., *Alocasia* sp., *Anemone* sp., *Anethum graveolens*, *Arachnis* sp., *Aranda* sp., *Aranthera* sp., *Ascocenda* sp., *Begonia* sp., *Brassica* sp., *Callistephus chinensis*, *Capsicum* sp., *Chrysanthemum* sp., *Citrus* sp., *Cleome* sp., *Cymbidium* sp., *Dendrobium* sp., *Dischidia pectenoides*, *Echinodorus* sp., *Euphorbia lactea*, *Euphorbia* sp., *Gardenia* sp., *Gomphrena globosa*, *Jasminum* sp., *Lactuca sativa*, *Lisianthus* sp., *Lotus* sp., *Ludwigia* sp., *Mokara* sp., *Nelumbo nucifera*, *Nelumbo* sp., *Nymphaea* sp., *Ocimum sanctum*, *Ocimum* sp., *Oncidium aureum*, *Oncidium basilicum*, *Oncidium bicallosum*, *Oncidium* sp., *Orchidaceae*, *Origanum* sp., *Origanum vulgare*, *Pelargonium* sp., *Philodendron* sp., *Platycerium* sp., *Rosa* sp., *Rotala* sp., *Sageretia thea*, *Solanum* sp., *Tagetes* sp., *Thymus* sp., *Vanda* sp., *Zantedeschia* sp.

Setal map

Spodoptera litura (Fabricius)



Gilligan, T. M. & S. C. Passoa. 2014. LepIntercept: An identification resource for intercepted Lepidoptera larvae. Identification Technology Program (ITP), USDA/APHIS/PPQ/SS/T, Fort Collins, CO (accessed at www.lepintercept.org).

Spodoptera litura setal map



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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.

