

FIELD KEY TO THE LARVAE OF SPODOPTERA OF AMERICA NORTH OF
MEXICO

(Last Update: 16 March, 2008)

Steven Passoa, USDA-APHIS-PPQ
Ohio State University, Museum of Biodiversity
1315 Kinnear Road, Columbus, Ohio 43212
steven.c.passoa@usda.gov

The following key, based on Levy and Habeck (1976), Passoa (1991), Godfrey (1987), and Pogue (2002), is designed to identify larvae of *Spodoptera* found in the continental United States and Canada. It also functions as a screening aid to help recognize two exotic species, *S. litura* and *S. littoralis*, which are sometimes intercepted in the eastern United States. *Spodoptera littoralis* was collected from Ohio greenhouses in 1986 and then eradicated (Rings et al. 1992: 99). In 2002, and again in 2007, single adults of *Spodoptera litura* were trapped in southern Florida (Smith 2007). *Spodoptera pecticornis* was omitted from this key because it is not known to be established in North America, and more importantly, is immediately recognizable by its host, waterlettuce (*Pistia stratiotes*), and aquatic habits (see Pogue 2002:104).

Several caveats are in order. This key works best with late instar larvae. Early instars of *S. frugiperda* and *S. exigua* (“*Laphygma*” group) might key out correctly. Conversely, if the larva is a middle instar (about 5-10 mm) with a swollen thorax (“*Prodenia*” and “*Xylomyges*” groups), this key cannot be used. The first instars of several eastern USA species are pale with dark pinacula and in no case can be identified with this key.

Attention to detail (for example, the form of the triangles, trapezoids, dots or dashes) is the secret to correctly identifying larvae of *Spodoptera*. The shapes of the markings in *Spodoptera* are often highly variable, including intergrades between shapes. In case of doubt, choose the shape that best describes the marking in question (and endeavor to secure and examine more than a single individual whenever possible). This key works best with living caterpillars. Consult the text and photographs in Pogue (2002) for the appearance of preserved larvae in alcohol.

It is also important to understand that there are typical color forms, atypical forms, and sometimes forms where color cannot be used to identify the species. The characters given in the text will identify most common color forms. This key provides details on many atypical forms which are often encountered when *Spodoptera* populations are high. Condition statements (“if this, then that”) are used to account for variation in patterns and markings. Larvae of *S. androgea* and *S. pulchella* are poorly known and thus their color variation has never been fully documented.

Occasionally the key mentions distribution within the United States and potential origin of the host. For example, *S. latifascia* does not stray into New York, Pennsylvania, or Ohio (Forbes, 1954, Tietz 1936, Rings et al. 1992). Hence, knowing the range will

help separate many occurrences of *S. latifascia* and *S. ornithogalli* in the eastern United States. A “confirmed New World origin” is defined as a distribution where the specimen is most likely a native species from the United States or Latin America and there is little or no chance the caterpillar is associated with imported plant material from the Old World. The opposite case is when larvae are associated with "high hazard areas" such as a greenhouse, nursery or port-of-entry. Imported produce and cut flowers often pass through these areas which may harbor an exotic species of *Spodoptera*. Users should pay special attention to couplets 5 and 6 when identifying *Spodoptera* larvae from high hazard areas. Only the most typical and best known color forms of *S. littoralis* and *S. litura* were included in the key. It is assumed that any outbreak will include these forms in at least part of the population. Characters for recognizing *S. littoralis* were taken from Beck (2000) and Brown and Dewhurst (1975); those of *S. litura* were from Pogue (2002) and photographs by M. van der Straten (PPO, The Netherlands).

- 1 Dorsal abdominal pinacula larger than diameter of the spiracles on A1-7, these pinacula either conspicuous (brown or black color forms, or pale (green color form; cuticle with pavement-like granules when magnified 25 times or more *S. frugiperda*
- 1' Dorsal abdominal pinacula inconspicuous and smaller than the diameter of the spiracles on A1-7; cuticle smooth when magnified 25 times or more.....2
- 2 Mesothoracic lateral dark spot normally present; dorsal abdominal markings either a scattered series of small spots and dashes, or a paired row of large elongated dashes that are mostly not triangular*S. exigua*
- 2' Mesothoracic lateral dark spot normally absent (present only in *S. praefica* from the western USA); abdominal dorsum without markings or with at least some triangular markings, but never with a series of small dots and dashes.....3
- 3 Thorax clearly swollen; small larvae approximately 5-10 mm long; young *Spodoptera* spp. (“*Prodenia*” and “*Xylomyges*” groups)(this key will not work)
- 3' Thorax not swollen; larvae larger than 5-10 mm long.....4
- 4 Dorsal triangle on A1 larger than the dorsal triangle of A6 or triangles present only on A1 and A8.....5
- 4' Dorsal triangle on A1 absent, equal to, or smaller than the dorsal triangle of A6.....7
- 5 Spiracular stripe less intense in front of the lateral dark spot on A1 than behind it; if lateral dark spot or spiracular stripe on A1 is absent, then the dorsal triangles lack spots at their apex and the mesothorax and metathorax lack contrasting paired dorsal white spots; head usually light orange brown, often with reticulations; confirmed New World origins only*S. eridania*
- 5' The spiracular stripe continues uninterrupted in intensity from the thorax to the abdomen, if a lateral dark spot or dark band is present on A1, then the intensity of the spiracular stripe is equal in front and behind the markings; mesothorax and metathorax often with contrasting paired dorsal white spots; spots often present at the apex of the dorsal triangles; head dark, not light orange brown; larva associated with high hazard areas containing produce and nursery stock imported from the Old World.....6

- 6 Ground color of larva usually a shade of brown or gray, rarely green; subdorsal area strongly contrasting with the paler dorsum; middorsal line usually absent; spiracular stripe uninterrupted from the thorax to abdomen; dorsal triangular markings usually present only on A1 and A8, or just A8; if all abdominal segments have triangular markings, then the markings lack a white spot at their apex; found once in Ohio greenhouses and then eradicated.....*S. littoralis*
- 6' Ground color of larva varies from green to brown; subdorsal area not strongly contrasting with the paler dorsum; middorsal line often present; spiracular stripe often interrupted on A1 by a black band or spot; at least some dorsal triangular markings with a white spot at their apex, these triangles either found on all abdominal segments, or on just on A1 and A8; most likely to be found in south Florida*S. litura*
- 7 Mesothoracic marking shaped like a trapezoid equal in size to the dorsal triangle on A8
- 7' Mesothoracic marking shaped like a triangle or hemisphere, rarely a trapezoid, all these markings always smaller than the dorsal triangle of A8; rarely the mesothoracic marking is reduced to a white spot or the dorsal triangles are absent.....9
- 8 Larva from south Florida *S. androgea* or *S. dolichos*
- 8' Larva from central Florida throughout the southern USA, sometimes straying far northward in late summer and fall*S. dolichos*
- 9 Dorsal abdominal triangles with a single large white spot at the middle or close to the apex that is larger than half the diameter of the spiracle of A1-7; if dorsal abdominal triangles are absent then at least some of the white spots are bordered with black semicircles..... *S. albula*
- 9' Dorsal abdominal triangles solid (without markings inside) or with either lines, many fine spots, or dashes passing through them; if a single white spot is present at the middle or close to the apex of the triangle, then this spot is smaller than half the diameter of the spiracle of A1-7; rarely white dashes may be present at the base of the dorsal triangles; if dorsal triangles are absent then no white spots bordered with black semicircles are present.....10
- 10 Dorsal abdominal triangles absent on A1, thin or absent on A2, and with several thin narrow lines passing through them on the other abdominal segments; known in the USA only from south Florida*S. pulchella*
- 10' Dorsal abdominal triangles either present on A1-2, or if dorsal triangles are absent on A1-2, then any remaining dorsal triangles lack thin narrow lines passing through them; widely distributed throughout the United States.....11
- 11 Mesothorax with a small dark lateral rectangular spot; distribution restricted to the western United States (Montana, Colorado and Utah west to the Pacific Coast)..... *S. praeifica*
- 11' Mesothorax lacks a small dark lateral rectangular spot; widely distributed throughout the United States12

12 Dorsal abdominal triangles solid, without any lines or dots passing through them.....	13
12' Dorsal abdominal triangles not solid, with a variable number of lines and/or dots passing through them	15
13 Dorsal abdominal triangles on A1-8 equal in size	<i>S. ornithogalli</i>
13' Dorsal abdominal triangles on A7 and A8 larger than the others	12
14 Larva found in the Gulf States	<i>S. ornithogalli</i> or <i>S. latifascia</i>
14' Larva not found in the Gulf States	<i>S. ornithogalli</i>
15 Markings through dorsal abdominal triangles form a solid, or nearly solid, line; subdorsal line white or yellow; mesothoracic spot either triangular, elongate oval, or semicircular; widely distributed throughout the USA	<i>S. ornithogalli</i>
15' Markings through dorsal triangles composed of a series of large dots; subdorsal line white or orange; mesothoracic spot either semicircular or faintly trapezoidal, never triangular or elongate oval; widely distributed in the southern United States	<i>S. latifascia</i>