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NOCTUIDAE - *Chloridea virescens* (Fabricius) *Non-Rep*

Taxonomy

Noctuoidea: Noctuidae: Heliothinae: *Chloridea virescens* (Fabricius)

Common names: tobacco budworm

Synonyms: *Heliothis virescens*, *Heliothis spectanda*, *Phalaena rhexiae*, *Xanthia prasina*, *Xanthia viridescens*

Pogue (2013) resurrected the genus *Chloridea* for *virescens*, *subflexa*, *tergemina*, and ten other species formally placed in *Heliothis*. More information on this change is found in the Taxonomy section under the Detailed Information tab.

Larval diagnosis (Summary)

- Large retinaculum on the mandible
- Dorsal pinacula on A1, A2, and A8 covered with microspines
- Dorsal pinacula on A1 and A2 sometimes connected by a dark bar

Host/origin information

Chloridea virescens is most commonly recorded (80% of records) from the three countries listed here. Identifications from Peru are tentative as *C. virescens* may be confused with other Heliothinae (e.g., *C. tergemina*) in South America (see the Detailed Information tab):

Origin	Host(s)
Haiti	*Cajanus*
Mexico	*Cicer*, *Physalis*, *Zea mays*
Peru	*Pisum*

Recorded distribution

Chloridea virescens is widely distributed across the United States and southern Canada, although it does not survive the winter in northern states. This species is also present in Mexico, Central America, South America, and the Caribbean (Poole et al. 1993).

Identification authority (Summary)

Larvae of *C. virescens* can be identified to species using the above morphological characters if from North America, Central America, the Caribbean, or Hawaii. Identification to species in South America is often not possible because of potential confusion with *C. tergemina*, so it is safer to stop at genus *Chloridea*. There are no records of *C. virescens* outside of the Americas (and Hawaii).

Pest characterization

(Based on Cavey 2001, Poole et al. 2003)

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

This ranking characterizes *C. virescens* as not quarantine significant for the U.S.

Taxonomy (Detailed)

In a recent publication, Pogue (2013) determined that the *Heliothis* group was not monophyletic, with *H. virescens* and *H. subflexa* forming a clade separate from other members of the genus. To resolve this problem he resurrected the genus *Chloridea* for *virescens*, *subflexa*, *tergemina*, and ten other species formally placed in *Heliothis*. His evidence was based on a phylogenetic analysis incorporating three gene regions as well as morphological characters and his results agreed with


Fig. 1: Late instar, lateral view


Fig. 2: Late instar, lateral view

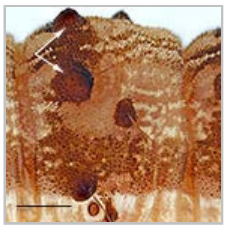


Fig. 3: A2 pinacula


Fig. 4: Microspines


Fig. 5: Crochets


Fig. 6: Head

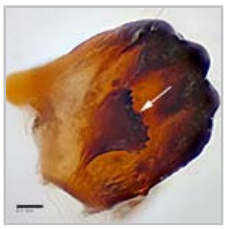


Fig. 7: Mandible


Fig. 8: Mandible


Fig. 9: Hypopharyngeal complex, lateral view

an earlier study performed by Cho et al. (2008). Here we follow this latest taxonomy and use the combination *Chloridea virescens* to refer to the tobacco budworm.

Pogue, M. G. 2013. Revised status of *Chloridea* Duncan and (Westwood), 1841, for the *Heliothis virescens* species group (Lepidoptera: Noctuidae: Heliothinae) based on morphology and three genes. Systematic Entomology 38, 523-542.

Fig. 10: Hypopharyngeal complex, lateral view

Larval diagnosis (Detailed)

The larva of the tobacco budworm, *Chloridea virescens*, was at least partially described by Garman (1920), Crumb (1956), Okumura (1961), Peterson (1962), Neunzig (1969), Godfrey (1987), Matthews (1991), Sannino et al. (1993), and Hardwick (1996). Several larval color patterns were photographed by Hardwick (1996), Cranshaw (2004), Angulo et al. (2006), and Wagner et al. (2011). Early literature was reviewed Kogan et al. (1978). Passoa (2007) gave a tentative key to separate *C. virescens* from other quarantine species of Heliothinae.

Typically, *C. virescens* has a large retinaculum on the mandible and the dorsal pinacula of A1, A2 and A8 are covered with microspines. The dorsal pinacula of A1 and A2 may be connected by a dark bar (Hardwick 1966), but this is not always true for the large volume of specimens intercepted by APHIS or a large series of preserved larva from a USDA lab culture (SPIC).

Mandibular terminology can cause confusion. The retinaculum is a projection, sometimes toothlike, on the oral surface of the mandible (Stehr 1987). Various authors have used the term basal tooth, basal process (Crumb 1956, Boyer et al. 1977) or inner tooth (Godfrey 1987) to describe the retinaculum of *C. virescens*. Here we follow Passoa (1985) who restricted the term inner tooth to the small toothlike projections on a mandibular ridge. Larger projections on the oral surface are called a retinaculum, as in Stehr (1987) and Okumura (1961).

The retinaculum of *C. virescens* is usually well developed, but depending on the diet (Boyer et al. 1977), it may be reduced to a thin ridge or groove called a mandibular scar. When the retinaculum is well developed, *H. zea*, can be eliminated as a possibility because it never has a large retinaculum on the mandible. Brazzel et al. (1953) and Neunzig (1969: 11) illustrated the mandibular variation of *C. virescens*. Because of this variation, presence of microspines covering the dorsal pinacula of A8 is the most accurate way to identify *C. virescens* (Boyer et. al 1977).

A pinaculum is called a chalaza if it is elevated and conical (Stehr 1987). Because there is a continuous variation in height from a pinaculum to a chalaza in larval *Heliothis*/*Helicoverpa*, we have chosen the more general term, pinaculum, for all of these situations. Peterson (1962: L36) used chalazae in his descriptions of Heliothinae.

Separation of *C. virescens* from *H. zea* is discussed in the data sheet for *H. zea*. The presence of a mandibular retinaculum and microspines on the body pinacula separates most *C. virescens* from most *H. zea*. The reduced retinacum in *C. virescens* and presence of microspines on the edge of the pinacula in *H. zea* are the usual exceptions.

Chloridea virescens is associated with several species of *Physalis* (Robinson et al. 2002) where it can be confused with *C. subflexa*, a *Physalis* specialist. The SD2 seta is surrounded by a sclerotized area in *C. subflexa* but not in *C. virescens* (Peterson 1962: L36, Wagner et al. 2011).

Typically, *Heliothis phloxiphaga* has conical pinacula all over the body. Conical pinacula in *C. virescens*, if present, are only on A1, A2 and A8. Some specimens of *H. phloxiphaga* can be recognized by having dark arcs on the head (Crumb 1926) or pinacula ringed with white (Lange and Michelbacher 1937).

As with *H. zea*, only the mid- to last instars 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 separate *C. virescens* and *H. zea* as early instars. For the quarantine decisions in the United States, *C. virescens*, *H. zea*, *C. subflexa*, and *H. phloxiphaga* all have the same action status, thus efforts to identify earlier instars is usually not justified.

Identification of *C. virescens* in South America is complicated because the larva of *C. tergemina* is poorly known. Hallman (1978) suggested that the two species can be separated by the height of dorsal pinacula on A1 and A2; they are equal in *C. virescens* but at least 2.5 times as high as the neighboring segments in *C. tergemina*. Clearly, this character will not be valid for many PPQ samples. Matthews (1991:41) compared a series of Heliothinae larvae using photographs. From his figures (Matthews 1991: figs. 696, 697), the hypopharyngeal complex of *C. virescens* has a spinose distal region followed by more than ten blades. In contrast, the distal region of the hypophargngeal complex of *C. tergemina* is smooth dorsally and there are less than ten blades. The mandible of *C. virescens* is rectangular, not square like as in *C. tergemina* (Matthews 1991: figs. 711, 712). Matthews (1991) did illustrate cuticle texture, but comparisons are premature unless one can be sure the photos are the same view from the same areas of the body.

The key to Chilean noctuids by Angulo et al. (2006) included *C. virescens* but not *C. tergemina*. Beardsley (1982) used the mandible and presence of microspines on the dorsal pinacula to identify *C. virescens* in Hawaii.

Identification authority (Detailed)

Chloridea virescens is highly polyphagous and widely distributed, but there are no records outside of the Americas except for Hawaii. Using the mandible and microspine distribution characters discussed above, *C. virescens* can be identified to species from North America, Central America, the Caribbean, and Hawaii.

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.

Identification of *C. virescens* from South America is often not possible because of potential

confusion with *C. tergemina*. We will give suggestions as a guide, but it is safer to stop at genus *Heliothis*. Hallman (1978) noted that *C. tergemina* was collected only from tobacco in Colombia. Poole et al. (1993) added *Solanum* as a host, but there are no records outside the Solanaceae. Thus, specimens from non-solanaceous hosts are most likely *C. virescens* if other characters fit. Origin is most helpful. It is possible to identify *C. virescens* from Guyana, Suriname, and French Guiana because *C. tergemina* does not occur in these countries (Poole et al. 1993). The morphological characters we list to separate *C. virescens* from *C. tergemina* all need confirmation.

Interceptions from Chile are best left at subfamily Heliothinae. Jana-Saenz and Angulo (1985) stated that there is a complex of native species associated with economic plants in that country, *Schinia chilensis* being an example. Without larval morphology, hostplant information or even the number of species in the complex, it is hard to know how useful Angulo et al. (2006) would be to PPQ for identification of Heliothinae.

Consult Passoa (2007) for further details on other *Heliothis* likely to be confused with *C. virescens* in South America. Besides a need to study the fauna in Chile, Poole et al. (1993) pointed out *C. tergemina* is a group of three distinct populations. Hallman (1978) left one larva as "unknown" in his key. The fauna of South America is in need of more study.

Origin records

Chloridea virescens has been intercepted from the following locations:

Anguila, Antigua and Barbuda, Barbados, Colombia, Dominican Republic, Ecuador, El Salvador, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Peru, Puerto Rico, St. Kitts and Nevis (?), St. Lucia, St. Maarten, Trinidad and Tobago

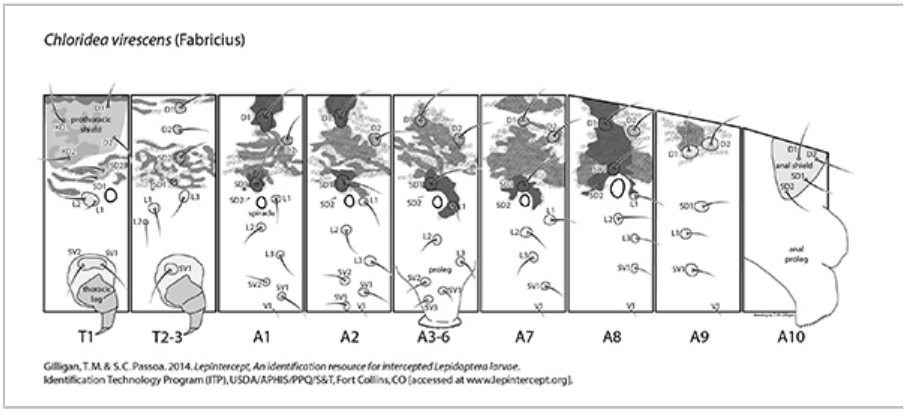
Identifications from Peru are tentative as *C. virescens* may be confused with other Heliothinae (e.g., *C. tergemina*) in South America

Host records

Chloridea virescens has been intercepted on the following hosts:

Abelmoschus esculentus, *Abelmoschus* sp., *Acacia* sp., *Achillea* sp., *Allium fistulosum*, *Anigozanthos* sp., *Antirrhinum majus*, *Antirrhinum* sp., *Apium graveolens*, *Aster* sp., *Brassica campestris*, *Brassica* sp., *Brunia* sp., *Cajanus cajan*, *Campanula* sp., *Capsicum annuum*, *Capsicum* sp., *Carica papaya*, *Chrysanthemum* sp., *Cicer arietinum*, *Cicer* sp., *Citrus* sp., *Cucurbita* sp., *Delphinium* sp., Fabaceae, *Fragaria* sp., *Helianthus annuus*, *Helianthus* sp., *Hydrangea* sp., *Lablab purpureus*, *Lablab* sp., *Lactuca* sp., *Lagenaria siceraria*, *Limonium* sp., *Mentha* sp., *Moluccella* sp., *Ocimum basilicum*, *Ocimum* sp., *Opuntia* sp., *Origanum majorana*, *Origanum* sp., *Origanum vulgare*, *Phaseolus lunatus*, *Phaseolus* sp., *Phaseolus vulgaris*, *Physalis philadelphica*, *Physalis pubescens*, *Physalis* sp., *Pisum sativum*, *Pisum sativum* var. *macrocarpon*, *Pisum* sp., *Pithecellobium dulce*, *Saccharum officinarum*, *Salvia officinalis*, Solanaceae, *Solanum lycopersicum* var *lycopersicum*, *Solanum melongena*, *Thymus vulgaris*, *Tulipa* sp., *Vicia faba*, *Vigna unguiculata*, *Zea mays*, Zingiberaceae

Setal map



Chloridea virescens setal map

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