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Neelendra K. Joshi
Pennsylvania State University

David J. Biddinger
Pennsylvania State University

Shelby Fleischer
Pennsylvania State University

Steven Passoa
Ohio State University

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First Report of the Adventive Species *Sitochroa palealis* (Lepidoptera: Crambidae) in Pennsylvania and its Attraction to the Sex Pheromone of the European Corn Borer, *Ostrinia nubilalis* (Lepidoptera: Crambidae)

Neelendra K. Joshi^{1, 2*}, David J. Biddinger^{1,2}, Shelby Fleischer², Steven Passoa³

Abstract

Sitochroa palealis (Denis and Schiffermüller, 1775) (Lepidoptera: Crambidae), a newly detected crambid moth in the United States, is found for the first time in orchard and row crop agroecosystems in Adams and Centre counties, Pennsylvania, during 2011. In Adams County, *S. palealis* male and female adults were net collected from flowers and found in white pan traps used to sample bee populations near apple orchards, while in Centre County adults were found in wire-cone traps baited with the sex pheromone of the European corn borer (*E*-strain), *Ostrinia nubilalis* (Hübner) (Lepidoptera: Crambidae). Additional records of *S. palealis* from four Ohio counties (Marion, Wayne, Franklin, and Delaware) are given. A brief discussion on the current economic importance of *S. palealis* in the United States is provided, and its importance as a non-target in European corn borer surveys is highlighted.

Sitochroa palealis (Denis and Schiffermüller, 1775) (Lepidoptera: Crambidae) is known as the carrot seed moth (Beadle and Leckie 2012). Larvae feed on various weed and crop species belonging to Apiaceae (Umbelliferae) (Gaedike 1980). In the Old World, *S. palealis* has been reported from several Asian (Park 1979), European (Karsholt and Razowski 1996, Asselbergs et al. 2008, Shodotova 2008,) and North African (Balachowsky 1972) countries. The United States distribution includes several midwestern states (Illinois, Indiana, Michigan and Wisconsin) based on collections taken as early as 2002 (Passoa et al. 2008). There are currently records for southeastern Canada (Jean Francois Landry, pers. comm.) and the northeastern United States (Beadle and Leckie 2012), including New York (R. Hoebeke pers. comm.).

Here we report the first detection of *S. palealis* in orchard and row crop agroecosystems of Pennsylvania, and the first information about its capture in sex pheromone traps. Unconfirmed photographs of *S. palealis* from Allegheny County, Pennsylvania can be found on-line (Bugguide 2012). We also report on some distribution records from central Ohio.

***Sitochroa palealis* Discovery and Identification.** Adults of *S. palealis* (Fig. 1) were found in several locations in Adams and Centre counties, Pennsylvania during 2011. In Adams County, *S. palealis* adults were found in 16 oz Solo[®] white plastic bowls (Solo Cup Company, Lake Forest, Illinois) used in water

¹Pennsylvania State University, Fruit Research & Extension Center, Entomology, 290 University Dr, Biglerville, PA 17307.

²Pennsylvania State University, Department of Entomology, 501 ASI Building, University Park, PA 16802.

³United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Forest Service Northern Research Station and The Ohio State University, 1315 Kinnear Road, Columbus, Ohio, 54321

*Corresponding author: (e-mail: nkj105@psu.edu).



Figure 1. *S. palealis* (mounted specimen) collected from Centre County, Pennsylvania during 2011.

pan trap monitoring of bee species near apple orchards; two specimens were collected in early August at the Pennsylvania State University Fruit Research and Extension Center near Biglerville, PA. We subsequently collected (by net) four additional adults feeding on the flowers of wild bergamot (*Monarda fistulosa* L.) and wild carrot (*Daucus carota* L.). Moths were identified to species by D. J. Biddinger (Pennsylvania State University) using Passoa et al. (2008) and on-line resources (North American Moth Photographers Group 2012). Specimens were forwarded to the Pennsylvania Department of Agriculture, and were confirmed as *S. palealis* (APEPA 112493511002, M. Alma Solis).

In Centre County, *S. palealis* adults were found in Hartstack wire cone traps (Hartstack et al. 1979, also see UKY 2012 for trap design). Four traps were placed along the edges of fields and sweet corn plots in Rock Springs, PA and monitored weekly from 4 June to 3 September, 2011. Traps were baited with sex pheromone lures from Hercon Environmental (Emigsville, PA) designed to capture European corn borer, *Ostrinia nubilalis* (Hübner) (Lepidoptera: Crambidae), as part of the PestWatch regional monitoring program (Fleischer et al. 2007). In Pennsylvania, and much of the northeast, two pheromone races of European corn borer exist in sympatry (O'Rourke et al. 2010): a *Z*-race where the sex pheromone is comprised of a 97:3 ratio of *cis*- to *trans*-11-tetradecenyl acetate, and an *E*-race, where the pheromone is a 1:99 ratio of these isomers (Klun et al. 1973). Two traps were baited for the *E*- and *Z*- strain of European

corn borer, respectively. We only captured *S. palealis* in traps baited with the *E*-strain lures (*E* isomer of the sex-pheromone component, which is 99 % *E* and 1% *Z* isomers of 11-tetradecenyl acetate). The first adults were recorded in the trap captures during the week of 5 July 2011 (Fig. 2). Emergence pattern of *S. palealis* (in terms of weekly adult captures in wire cone traps) is illustrated in Fig. 2. All specimens were identified to species, and voucher specimens are in the laboratory of S. J. Fleischer. It is interesting to note that the adults of *S. palealis* were captured in traps baited with a blend of sex pheromone that is currently used to attract adult males of a particular ecotype of European corn borer. Both species are in the tribe Pyraustini (Crambidae: Pyrautinae), so this could be due to some similarities in the constituents of sex pheromone components of *S. palealis* and *E*-strain of European corn borer.

With regard to Ohio, the earliest records include larvae from the heads of *Daucus carota* at the Marion County campus of the Ohio State University during September 2008. A series of adults was collected by R. Downer from July to the first of August at lights in Wooster (Wayne County) during 2009. Recently, adults were collected at lights or on clover at Powell (Delaware County) during early July of 2011 and 2012. Attempts to find larvae on *Daucus carota* at The Ohio State University main campus in Columbus, Ohio (Franklin County) were negative from 2002-2011. In 2012, larvae were collected there in late July. All the above specimens were collected by S. Passoa, unless otherwise indicated, and are in his collection. It is unlikely that *S. palealis* appeared first in central Ohio. Unfortunately, there are no specimens of *S. palealis* from Ohio in the Charles A. Triplehorn collection at the Ohio State University before 2008; thus it is unclear if the spread was from the west (Indiana), north (Michigan) or even the east (New York or Pennsylvania). Passoa et al. (2008) speculated that *S. palealis* may have entered North America through ports-of-entry along the Great Lakes. This hypothesis could change if specimens collected before 2002 exist from other regions.

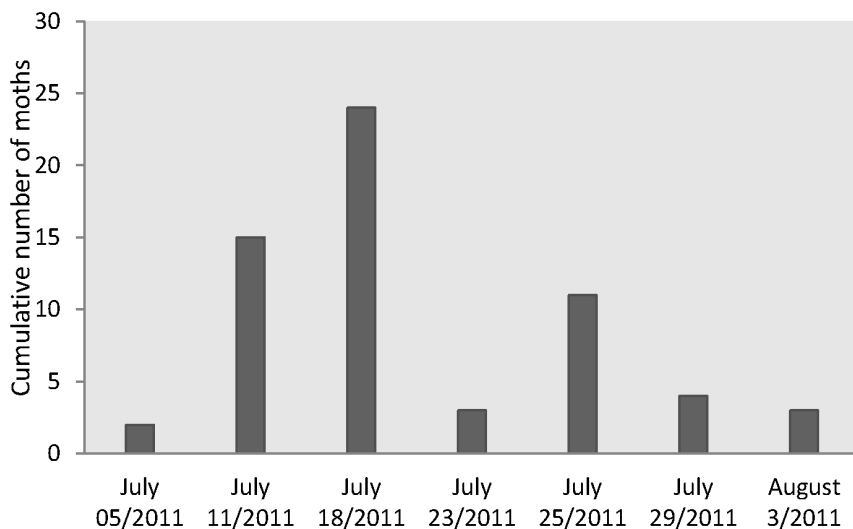


Figure 2. Cumulative weekly adult captures of *S. palealis* in wire cone traps baited with sex pheromone of the *E*-strain of European corn borer in Centre County, Pennsylvania during 2011.

Economic Importance and Management Implications. Because *S. palealis* is a newly detected immigrant species in the United States, our knowledge about its life history in local climatic conditions is limited. Larval stages of *S. palealis* feed on seeds of different Apiaceae. Thus, it could be a pest if carrots are grown for seeds or breeding purposes. In Europe, it destroyed carrot seeds completely while feeding on seed-heads (Balachowsky 1972). Although established in the United States for at least 10 years, *S. palealis* has not yet damaged crops to that extent in any parts of the known range. However, economic damage from immigrant insects is not always immediately apparent, and can change over time. One recent moth example is *Noctua pronuba* (L.); damage to lawns and crops were not reported until recently (S. Passoa, unpublished data). In contrast to its potential pest status, Passoa et al. (2008) speculated that larval populations could help control introduced weeds belonging to Apiaceae. This was indeed the case at Lakeshore State Park, Wisconsin, during early August 2011 (S. Borkin, pers. comm.). Larvae ate the flowers, leaves and even the stems of *Daucus carota*. Observed larval damage in Ohio and Pennsylvania has not yet been as severe.

A third component to the importance of *S. palealis* is its non-target status in European corn borer traps. Besides our records, there is a series of specimens at Cornell University also taken from European corn borer pheromone traps in various counties of New York (E. R. Hoebeke, pers. comm.). We expect continued survey of the European corn borer in the northeastern United States will help clarify the true distribution of *S. palealis*, and it will continue to attract attention as it spreads throughout the region. This moth seems to have a complicated impact on several ecosystems, and can be collected in a variety of ways including larval surveys, and adults at lights or in pheromone traps. Many habitats are suitable (agricultural, urban areas, state parks and preserves); the only requirement seems to be presence of a hostplant.

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