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First report of range expansion of the cactus webworm, *Loxomorpha flavidissimalis* (Grote) (Pyraloidea: Crambidae), to central Mexico and central Texas, USA

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In Mexico, prickly pear cactus, *Opuntia ficus-indica* (L.) Mill. (Cactaceae), is widely cultivated for its nutritional (Hernández-Urbiola et al. 2011) and pharmaceutical value (Shetty et al. 2012). Its consumption as a fresh vegetable is a common element of Mexican culture (Russell and Felker 1987). Morelos State produces 30.9% of the edible nopalitos (young pads) of the country (3,905 ha) with an annual production of 367,836 tons (SIAP 2018). Traditional pests in the region are the cactus weevil, *Cactophagus spinolae* (Gyllenhal) (Coleoptera: Dryophthoridae) (López-Martínez et al. 2016), cochineal scale insect, *Dactylopius opuntiae* (Cockerell) (Hemiptera: Dactylopiidae) (Vanegas-Rico et al. 2010), and a thrips species, *Sericothrips opuntiae* Hood (Thysanoptera: Thripidae) (Pérez et al. 2016). Their periodical damage requires control strategies to reduce their economic and environmental impact.

Recently, local prickly pear cactus farmers in Morelos brought to our attention a new pest problem that had not been reported previously. Larvae of an undetermined lepidopteran (covering themselves with a silken web) were reported to be feeding on young

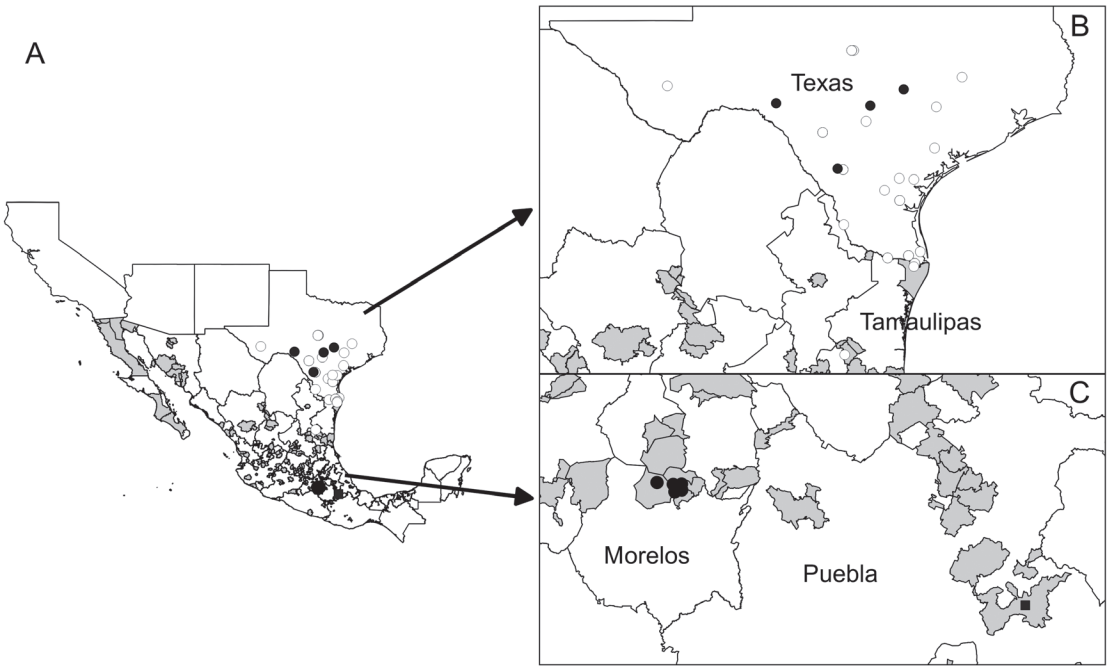


Fig 1. Geographic distribution of *Loxomorpha flavidissimalis* (Grote) (Pyraloidea: Crambidae). (A) full distribution; (B) northern distribution details: white circles = previous records, black circles = new records for Texas; (C) southern distribution details: black squares = new records for Mexico. Gray polygons in Mexico represent municipalities where *Opuntia ficus-indica* (L.) is cultivated.

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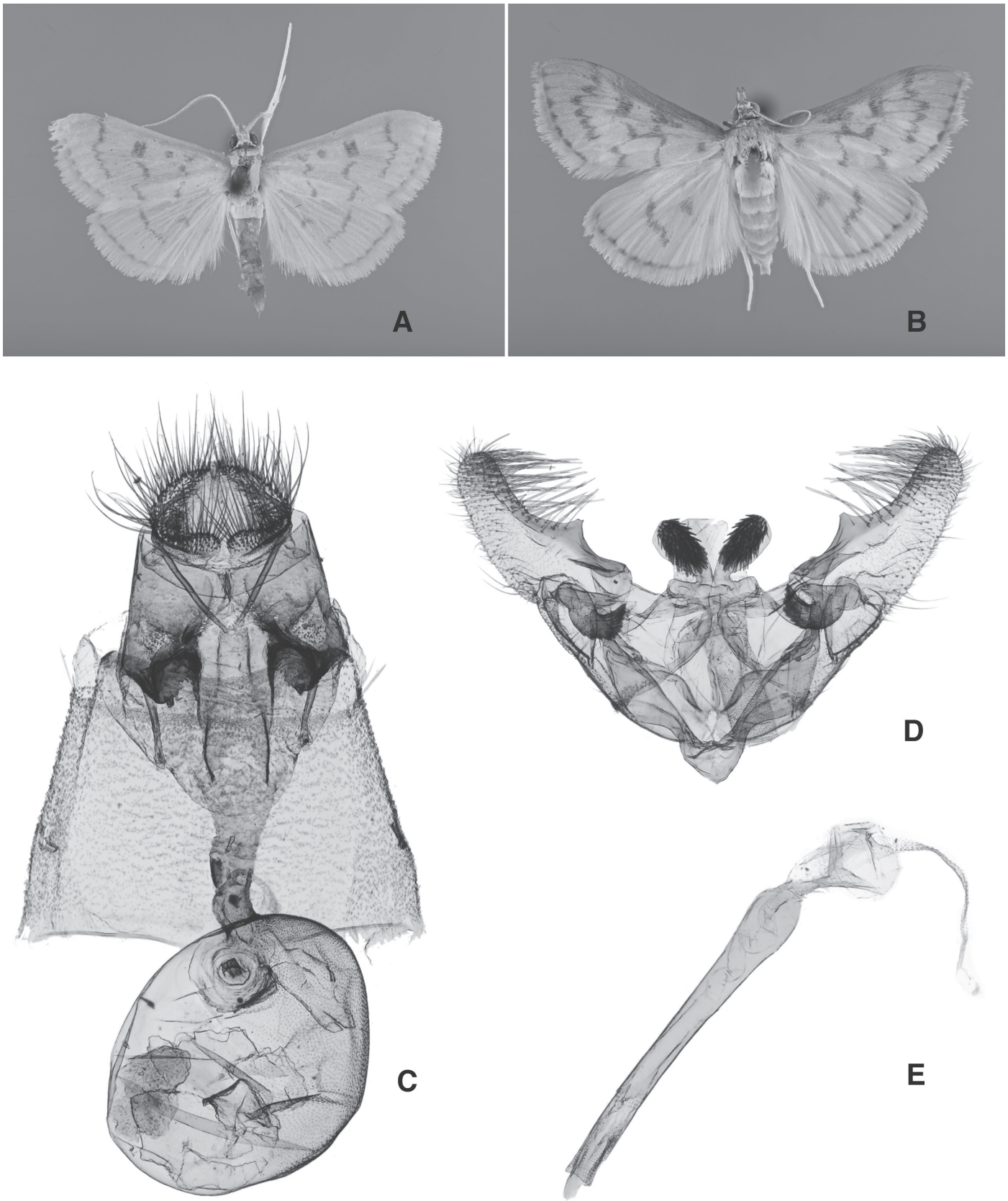


Fig. 2. Adults and genitalia of *Loxomorpha flavidissimalis* (Grote) (Pyraloidea: Crambidae): (A) male, Brownsville, Texas, USA, Aug 1909; (B) female, Morelos, Mexico; (C) female genitalia, US National Museum slide #115749, Morelos, Mexico, Nov 2017; (D) male genitalia, US National Museum slide #115750, Morelos, Mexico; (E) male phallus, US National Museum slide #115750, Morelos, Mexico.

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pads, resulting in reduction of quality and yield on those *Opuntia* (Cactaceae) plantations affected. Larval damage was similar to that of the cactus webworm, *Loxomorpha flavidissimalis* (Grote) (Lepidoptera: Crambidae), a minor lepidopterous pest, recently reported to feed on *O. ficus-indica* in Tamaulipas, Mexico; its distribution was reported to be central Texas south to northern Mexico (Lara-Villalón et al. 2016).

To confirm its presence and determine the taxonomic identity of this unknown larva, we conducted surveys in the 3 principal municipalities of nopalitos production in Morelos (Tepoztlán, Tlalnepantla, and Tlaycapan). Larvae were collected from infested young pads, and maintained in rearing cages with young *Opuntia* as food until adult emergence.

Collections from the following locations produced the following material: 11 specimens Mexico: Morelos, Tlalnepantla, La Vía, 18.996778°N, 98.979583°W, 14/11/2017, 2070 msnm, A. González Hernández coll., National Museum of Natural History; Tlalnepantla, Ahuacomulco, 8/11/2017 and 5/12/2017, 19.007861°N, 98.980022°W; Tlalnepantla, La Vía, 8/11/2017 and 5/12/2017, 18.996777°N, 98.979583°W; Tlayacapan, San José, 9/11/2017 and 7/12/2017, 18.973027°N, 99.007277°W; Tlayacapan, San Agustín, 9/11/2017 and 7/12/2017, 18.981111°N, 98.975750°W; Tepoztlán, San Juan, 13/05/2018, 19.015666°N, 99.088583°W; and included data from a specimen deposited in NMNH: Puebla, Tehuacán, 10/10 (USNMENT01464127), and from specimens at the University of Texas Insect Collection, Austin, Texas, USA: Dimmit Co., Catarina, 12 mi. E., 24 to 28 VII 76. 28.347500°N, 99.614722°W; Kendall Co., Boerne, Delmar Cain, photographer, 29.880779°N, 98.614313°N; Travis Co.: Austin, Brackenridge Field Lab, 30.284166°N, 97.778333°W, 24 Jul 1999, BL trap, J. E. Gillaspy coll.; same data, but 1 Aug 1999; same data but 21 Oct 1996; Val Verde Co., Dolan Falls, Dev[ils] River, 28 Oct 1995, J. Gillaspy coll., 29.884400°N, 100.993400°W. These localities are shown on the maps of Fig. 1.

Adults sent to author MAS were dissected following Brown et al. (2009). Male and female genitalia were compared with specimens of *Loxomorpha* Amsel (Lepidoptera: Crambidae) species from the Western Hemisphere, deposited in the National Museum of Natural History, Washington, DC, USA. Voucher specimens are deposited in Centro Nacional de Referencia Fitosanitaria, Mexico City, Mexico, and National Museum of Natural History, Washington, DC, USA. The species was confirmed to be the cactus webworm, *L. flavidissimalis*, formerly reported to be restricted to southern Texas and northeastern Mexico by Lara-Villalón et al. (2016). The specimen from Tehuacán (USNMENT01464127) was collected in Oct 1910, and represents the oldest known Mexican record. It demonstrates that this species is native to Mexico and has expanded its distribution from central Texas to central Mexico, where it feeds naturally on *Opuntia engelmannii* subsp. *lindheimeri* (Engelm.) U. Guzmán & Mandujano (Cactaceae), and infrequently on *Cylindropuntia leptocaulis* (DC) F.M. Knuth (Cactaceae) (Mann 1969). As *Opuntia* monocultures expand in size, it is possible that the cactus webworm also will increase its population size, threatening the quality and yield of edible nopalitos on plantations.

Although many "yellow" pyralid species occur in several subfamilies of Crambidae, it is the Pyraustinae that is composed of these colored moths. However, *L. flavidissimalis* is an unusually bright "yellow" species that is assigned to the Spilomelinae, based on internal genitalic structures (Fig. 2C, D, E). We found that females (Fig. 2B) are slight larger (10 mm; n = 5) than the males (Fig. 2A) (8 mm; n = 5). Fresh specimens (Fig. 2B, collected and reared in 2017) are brighter yellow, with darker brown lines than older field collected specimens (Fig. 2A, collected in 1909); specimens that have lost scales are not as brightly colored and may appear to lack lines completely. Lines on the wings of females (Fig. 2B) are considerably more scalloped than males (Fig. 2A). Indeed, females (Fig. 2B) may have (or sometimes lack) a distinctive brown line along the Cu vein between the medial and basal line, but this character is always lacking in males (2A). Furthermore, newly reared material provided an opportunity to photograph the genitalia of both sexes (Fig. 2C, D) to facilitate correct identification.

We thank prickly pear pad producers for access to their plantations in Morelos. We also thank Consejo Nacional de Ciencia y Tecnología for providing a doctoral scholarship to the senior author at Facultad de Ciencias Agropecuarias, Universidad Autónoma del Estado de Morelos (No. 331402). Alex Wild (University of Texas Insect Collection) provided photographic material with data regarding the pyralid moths in his care. Ben Prosheck (Systematic Entomology Laboratory, USDA) dissected and photographed the adult specimens and genitalia for this publication.

Summary

Prickly pear cactus pads of *Opuntia ficus-indica* (L.) (Cactaceae) are cultivated in Mexico for fresh consumption. We report that *Loxomorpha flavidissimalis* (Grote) (Lepidoptera: Crambidae), the cactus webworm, was observed recently in farms in Morelos and has expanded its distribution south from its previously known distribution of northern to central Mexico. Female and male genitalia are fully illustrated to facilitate identification. The cactus webworm represents an additional potential pest to cultivated prickly pear cactus in central Mexico.

Key Words: prickly pear pads; pest; cactus webworm; Lepidoptera; Morelos

Sumario

El nopal verdura *Opuntia ficus-indica* (L.) (Cactaceae) es cultivado en México para su consumo en fresco. Aquí, reportamos a *Loxomorpha flavidissimalis* (Grote) (Lepidoptera: Crambidae), el gusano telarañero, afectando a plantaciones en Morelos, ampliando su distribución al sur, desde sus registros previos al norte de México hasta la zona central del país. La genitalia de la hembra y macho es ilustrada para facilitar su identificación. El gusano telarañero representa una plaga potencial adicional a los nopales cultivados en el centro de México.

Palabras Clave: nopalitos; plaga; gusano telarañero; Lepidoptera; Morelos

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