

Nomenclatural validation of three North American species of Heliiothinae (Lepidoptera: Noctuidae) and the adult description of *Heliolonche joaquinensis* Hardwick

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Abstract

Article 13.1.1 of the International Code of Zoological Nomenclature states that names published after 1930 must have a description that defines and differentiates the taxon with characters. Three species of Heliiothinae described by Hardwick (1996) are not in conformance with this Article; thus, they are **nomina nuda**. The following species are validated by descriptions and illustrations of the adult and genitalia: *Schinia angulilinea* **new species** (= *S. arizonensis* Hardwick), *S. maculata* **new species** (= *S. blanca* Hardwick), and *S. erythrias* **new species** (= *S. pulchra* Hardwick). The adult of *Heliolonche joaquinensis* Hardwick is described, along with illustrations of the adult and genitalia.

Key words: new species, *Schinia*, *Heliolonche*, redescription

Introduction

This is the seventh in a series of papers resolving taxonomic problems within North American Heliiothinae. Previous papers dealt with various species groups and descriptions of new species in the genus *Schinia* Hübner 1818 (Knudson et al. 2003, Pogue and Harp 2003a, b, c, Pogue and Harp 2004, Pogue and Harp 2005). In this paper, I provide descriptions for three species of *Schinia* for which Hardwick (1996) created nomina nuda in his revision of the group; I also describe the adult of *Heliolonche joaquinensis* Hardwick.

Hardwick (1996) proposed the names *Schinia arizonensis* Hardwick, *S. pulchra* Hardwick, and *S. blanca* Hardwick, but did not validate them according to Article 13 of the International Code of Zoological Nomenclature (1999) (Heppner 1996, Adams 1998,

1999). Article 13.1.1 states that names published after 1930 must “be accompanied by a description or definition that states in words characters that are purported to differentiate the taxon.” Instead of using words, Hardwick (1996) merely referred to figures of specimens.

The only mention in the literature of Hardwick’s proposed names are in book reviews by Brou (1997) and Adams (1998). *Schinia arizonensis* was found on the following websites: 1) www.butterfliesandmoths.org (Anonymous 2006a), 2) www.lepbarcoding.org/cl_nth_am.php (Hebert 2006), 3) mothphotographersgroup.msstate.edu/Files/59/West59b.shtml (Anonymous 2006b); and *S. blanca* was only found on www.lepbarcoding.org/cl_nth_am.php (Hebert 2006).

Materials and methods

Images of adult moths and genitalia were taken with a Microoptics Digital Imaging System using a Nikon D1X camera with a modified K2 long-distance lens and a pulsed xenon flash. The images were enhanced with Adobe PhotoShop® CS.

Dissections of genitalia follow the methods of Pogue (2002), but genitalia were mounted in euparal. The vesica was inflated with 99% isopropyl alcohol and stained in Orcein.

Specimen databases are maintained for the Heliiothinae of North America using Microsoft EXCEL® and FileMaker Pro® 7. All specimens are bar-coded with a unique number.

Material used in this study is deposited in the following public institutions and private collections, with acronyms in parentheses: California Academy of Sciences, San Francisco, California (CAS); Canadian National Collection, Ottawa, Ontario, Canada (CNC); National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM); and E. C. Knudson, Houston, Texas (ECK).

Schinia angulilinea Pogue, new species

(Figs. 1, 6–7, 14–15)

Schinia arizonensis Hardwick 1996: 135, **nomen nudum**.

Diagnosis. *Schinia angulilinea* shares a similar forewing pattern with *S. crotchii* (H. Edwards). The postmedial line in *S. angulilinea* is distinctly angulate between veins M1 and M2, whereas in *S. crotchii* this line is only slightly curved. The hindwing ground color in *S. angulilinea* is pale yellow to orange and white in *S. crotchii*. The angulate postmedial line in *S. angulilinea* is similar to the same line in *S. edwardsii* (Smith). These two species are easily separated based on forewing length, which is larger in *S. angulilinea* (12–14 mm) than in *S. edwardsii* (9–10.5 mm). The forewing pattern is more delineated and the

hindwing ground color is a brighter yellow with a more distinct discal spot in *S. edwardsii* than in *S. angulilinea*.

Description. Male: *Head:* Vertex white with brown-tipped scales, frons bulbous, ventral lip not produced, white with brown-tipped scales. Labial palp with white and light brown flat scales, hairlike scales white and light brown with longer scales ventrally and shorter ones dorsally. Antenna filiform, scape and dorsal scales white. Eyes globular. *Thorax:* Patagium, tegula, meso- and metathorax with hairlike scales white, white tipped with light brown and white tipped with fuscous; flat scales underlying hairlike ones a mixture of white and white tipped fuscous. Venter cream. Foreleg with femur white and light brown, ventral hairlike scales cream; tibia shorter than basitarsus, light brown and white, inner side with 1 large and 2 smaller spines, outer side with 2 large spines; tarsi light brown with white apical rings. Middle leg and tarsi brown mixed with some white scales. Hind leg white mixed with some brown scales, tarsi white. *Forewing:* Male length 12–14 mm (n = 8). Basal area proximal to antemedial line a mixture of light brown and fuscous scales; antemedial line white, at costa line faint and slightly curved proximally to Cu vein, from Cu vein to posterior margin line distinct and greatly curved distally; orbicular spot oval, light brown ringed with fuscous; reniform spot light brown bordered with fuscous proximally and distally; postmedial line with a distinct bulge between veins M1 and M2, white, bordered with fuscous distally; subterminal line straight, white; small fuscous triangular spots between veins along outer margin; veins white; fringe mixed with light fuscous and white scales. Underside ground color cream; orbicular and reniform spots fuscous; angulate gray band from costa to posterior margin. *Hindwing:* Ground color pale yellow to orange; discal spot rectangular, fuscous; marginal band fuscous with a short pale yellow bar along margin; fringe white with fuscous basally. *Abdomen:* Gray dorsally with lighter scales along distal margins of tergites; gray mixed with white ventrally, white scales tending to be more concentrated along distal margins of sternites; hair pencils absent, scent pockets vestigial on second sternite.

Genitalia (Figs. 6–7): Uncus moderately elongate (0.37 X valve length). Valve wide (length 5.5 X width), costal margin gently curved; ampulla large (0.07 X valve length); corona present; sacculus well developed and greatly produced; posterior margin evenly curved. Juxta quadrate, distal margin a sharp median projection, patch of small spines in membranous area distal to juxta. Saccus V-shaped. Aedoeagus slightly curved, dorsal patch of dense minute spicules; vesica with 2 coils and minute spicules.

Female. As in male except forewing length 11–13 mm (n = 2). *Genitalia* (Figs. 14–15): Papillae anales semi-circular, apex round. Ovipositor semi-telescopic. Anterior and posterior apophyses thin and slight. Eighth segment with fine spicules; distal margin with fine, medium-sized setae. Ostium bursae lightly sclerotized, U-shaped, minute spicules present. Ductus bursae wide, approximately 0.25 X length. Appendix bursae with 2 coils. Corpus bursae ovate, apex slightly produced; signa composed of 2 scobinate bars.

Holotype ♂, in USNM, with the following labels: 1) White Mts., Ariz. June 25, 1930;

2) USNM ENT 00143399 [bar code label]; 3) Holotype ♂, *Schinia angulilinea* Pogue.

Paratypes. 7 ♂, 2 ♀. ARIZONA: White Mts., [no date] (1♂), genitalia slide USNM 49618, June 25, 1930 (2♂, 1♀), ♀ genitalia slide USNM 49619, July 25, 1930 (1♂), July 25-27, 1930 (1♂), Aug. 2, 1930, (1♂) genitalia slide USNM 46857; Apache Co., White Mts., 25 mi W Springerville, 10,000 ft., 25 July 1930 (1♂), E.R. Tinkham (CNC) (Hardwick holotype); Cochise Co., Huachuca Mts., Ramsey Canyon, 11 Sep. 1967 (1♀), R.F. Sternitzky (CNC).

Flight period. Late June to early September.

Distribution. Known only from Apache and Cochise counties in eastern Arizona.

Discussion. Hardwick (1996) created a nomen nudum by not describing *S. arizonensis* using descriptive words, but stated "... as illustrated in the figure." According to Hardwick (1996), *S. angulilinea* had been confused with *S. edwardsii* until he examined the holotype of *S. edwardsii* and concluded that they were distinct species.

The distribution of *S. edwardsii* is from northwestern Wyoming west to Montana, Idaho, and eastern Oregon. *Schinia angulilinea* is known only from eastern Arizona.

Etymology. The species epithet is a compound latin word meaning angled line, referring to the distinct angle in the postmedial line of the forewing.

Schinia erythrias Pogue, new species

(Figs. 2, 8–9)

Schinia pulchra Hardwick 1996: 164, **nomen nudum**.

Diagnosis. *Schinia erythrias* has a pinkish cast to the maculation of the forewing, which is similar in *S. buta* Smith and the pink form of *S. oleagina* Morrison from California. The difference between *S. erythrias* and the other two species is in the width of the antemedial and postmedial lines, which are wider in *S. erythrias* than in either *S. buta* or *S. oleagina*. The distributions are also distinct. *Schinia erythrias* is known only from the type locality in Durango, Mexico, whereas *S. oleagina* is distributed in the southwest from California to Texas, and *S. buta* is known from southern California.

Description. Male: *Head:* Vertex cream with a pale flush of pink, frons flat, ventral lip not produced, white. Labial palp white. Antenna filiform, scape and dorsal scales white. Eyes globular. *Thorax:* Patagium, tegula, meso- and metathorax with hairlike scales cream-colored flushed with pink. Venter white. Foreleg femur white; tibia longer than basitarsus, cream-colored with a few pinkish scales medially on inner margin, inner side with 2 robust, flat spines and 1 smaller spine, outer side with 3 flat spines that become smaller from base to apex; tarsi white, with a few pinkish scales. Middle and hind legs white; tarsi white. *Forewing:* Male length 12–13 mm (n = 4). Ground color pale pink; basal area concolorous with ground color; antemedial line thin, curved, cream; orbicular spot absent; reniform spot absent; postmedial line sinuate, white; fringe white. Underside ground color white with a faint horizontal band of pinkish scales along R vein. *Hindwing:* Ground color

pink; discal spot absent; marginal band absent; fringe white. *Abdomen*: Cream-colored; hair pencils and scent pockets absent.

Genitalia (Figs. 8–9): Uncus short (0.32 X valve length), robust. Valve moderately elongate (length 6.7 X width), costal margin slightly angled at 4/5 length; ampulla minute (0.03 X valve length); posterior margin angled at 3/4 length with several stout hairs, corona present; sacculus well developed and greatly produced. Juxta broadly rounded ventrally, dorsal margin angled toward middle with a round apex resembling an inverted V-shape. Saccus a narrow V-shape. Aedoeagus slightly curved, dorsal patch of dense minute spicules; vesica with more than 2 coils and minute spicules.



FIGURES. 1–5. Adults. 1, *Schinia angulilinea*, ♂, Holotype, Arizona, White Mts., USNM 143399; 2, *Schinia erythrias*, ♂, Holotype, Mexico, Durango, 6 mi N Nombre de Dios; 3, *Schinia maculata*, ♂, Holotype, Sinton, Welder Wildf. Ref., Tex., 10-X-64, A. & M. E. Blanchard; 4, *Heliolonche joaquinensis*, ♀, Holotype, Edison, 8 mi ESE, Kern Co., Calif., 4 IV 1978, V. J. Hardwick; 5, *Heliolonche joaquinensis*, ♂, Taft, Calif., 31 Mar. 1943.

Female. Unknown.

Holotype ♂, in CAS, with the following labels: 1) Mex. Durango, 6 mi N Nombre de Dios, VIII-20-60; 2) P.H. Arnaud, Jr., E.S. Ross, D.C. Rentz; 3) Holotype *Schinia pulchra* Hardwick, 4) Holotype ♂, *Schinia erythrias* Pogue.

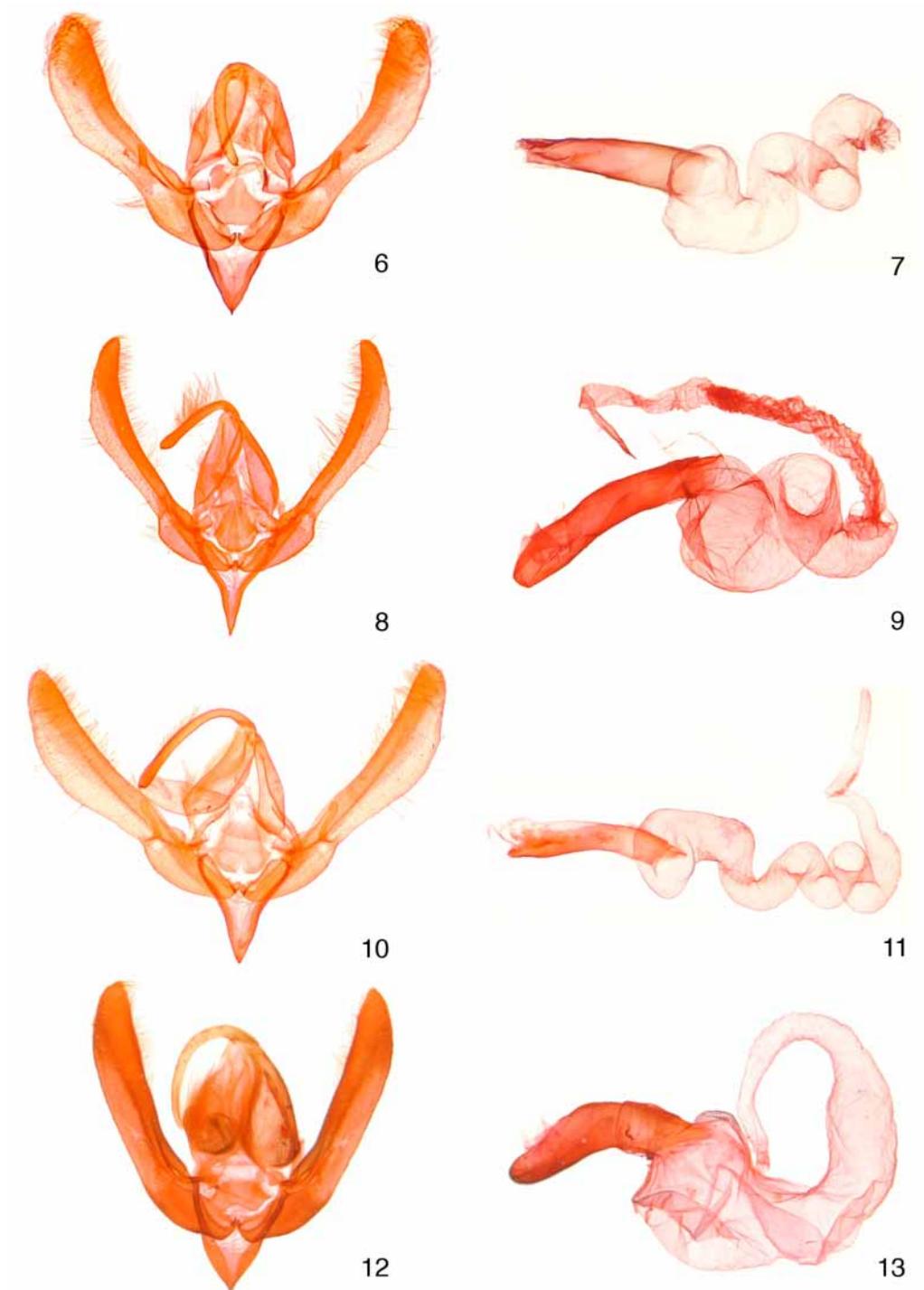
Paratypes. 3 ♂. Same data as holotype; ♂ genitalia slide MGP 1200.

Flight period. Late August.

Distribution. Known only from the type locality in Durango, Mexico.

Discussion. Hardwick (1996) created a nomen nudum by failing to use descriptive words in his description of *S. pulchra*, stating “... as illustrated in Figure” Even if Hardwick (1996) had described *Schinia pulchra* Hardwick in a valid manner, it would have been a junior homonym of *Schinia pulchra* Köhler (Köhler 1953).

Etymology. The species epithet refers to the pinkish maculation of the forewing.



FIGURES. 6–13. Male genitalia. 6, *Schinia angulilinea*, genital capsule; 7, *Schinia angulilinea*, aedeagus; 8, *Schinia erythrias*, genital capsule; 9, *Schinia erythrias*, aedeagus; 10, *Schinia maculata*, genital capsule; 11, *Schinia maculata*, aedeagus; 12, *Heliolonche joaquinensis*, genital capsule; 13, *Heliolonche joaquinensis*, aedeagus.

***Schinia maculata* Pogue, new species**

(Figs. 3, 10–11, 16–17)

Schinia blanca Hardwick 1996: 185, **nomen nudum**.

Diagnosis. *Schinia maculata* is one of the “white” species of *Schinia*. It looks similar to *S. unimacula* Smith, but the reniform spot is much larger in *S. maculata* than in *S. unimacula*. The known distributions of these two species are not even close to one another. *Schinia maculata* is known from the Welder Wildlife Refuge, Sinton, San Patricio County, and 10 mi S of Falfurrias, Brooks County, in southeastern Texas; *S. unimacula* is distributed from the panhandle of Oklahoma west to California, south to central New Mexico and Arizona, and north to Oregon, Washington, and Idaho (Pogue and Harp 2003a). The only “white” species that is sympatric with *S. maculata* is *S. chrysellus* (Grote). The distinct reniform spot in *S. maculata* easily distinguishes it from the smaller reniform spot that is coalesced with the median band in *S. chrysellus*. The forewing color is shiny white in *S. chrysellus* and not shiny in *S. maculata*. Another species with which *S. maculata* could be confused is *S. nundina* (Drury). *Schinia nundina* has an almost identical reniform spot, but the rest of the forewing has many more tan maculations than *S. maculata*.

Description. Male: *Head*: Vertex white with brown-tipped scales, frons bulbous, ventral lip not produced, cream. Labial palp short, barely extending past frons, white. Antenna filiform, scape and dorsal scales white. Eyes globular. *Thorax*: Patagium, tegula, meso- and metathorax with flat scales white, fewer white hair-like scales intermixed. Venter white. Foreleg with inside of femur brown and outside white; tibia length equal to basitarsus, cream, inner side with 1 robust, flat spine and 3 smaller spines, outer side with 4 flat spines that become smaller from base to apex; tarsi darker cream than tibia with white apical rings. Middle and hind legs with white femur, cream tibia, and slightly darker cream tarsi with white apical rings, hind leg tends to be overall paler than middle leg. *Forewing*: Male length 13.0–13.8 mm (n = 5). Ground color white; basal area concolorous with ground color; antemedial line faint, consists of a few brown and pale rufous scales medially; orbicular spot absent; reniform spot black, centered with white; postmedial line sinuate, white, bordered with cream scales and a few brown scales proximally and with a broad band of cream scales and more patches of brown scales distally; subapical spot distinct, black; small black spots between veins along outer margin; fringe white. Underside ground color white; reniform spot dark gray to black; subterminal band from costa to posterior margin, dark brown at costa becoming fainter and lighter in color toward posterior margin. *Hindwing*: Ground color white; discal spot a faint bar, gray; marginal band brown interrupted by white medially; fringe white. *Abdomen*: White with underlying gray scales, genital tuft cream.

Genitalia (Figs. 10–11): Uncus elongate (0.43 X valve length). Valve wide (length 5.5 X width), costal margin slightly curved; ampulla large (0.13 X valve length); corona present; sacculus well developed and greatly produced; posterior margin evenly curved.

Juxta quadrate, distal margin heavily sclerotized, forming a distinct bar along margin. Saccus a narrow V-shape. Aedoeagus slightly curved, dorsal patch of dense minute spicules; vesica with 2 coils and minute spicules.

Female. As in male except forewing length 13–15 mm (n = 3). *Genitalia* (Figs. 16–17): Papillae anales knife-like, apex pointed. Ovipositor non-telescopic. Anterior and posterior apophyses wide and robust. Eighth segment with fine spicules; distal margin elongate, stout setae. Ostium bursae lightly sclerotized, minute spicules present. Ductus bursae narrow, approximately 0.15 X length. Appendix bursae with 3 coils. Corpus bursae ovate; signa composed of 4 scobinate bars.

Holotype ♂, in USNM, with the following labels: 1) Sinton, Welder Wildlife Refuge, Texas, 10-X-64, A & ME Blanchard; 2) USNM ENT 00144152 [bar code label]; 3) Holotype ♂, *Schinia maculata* Pogue.

Paratypes. 4 ♂, 3 ♀. Same data as holotype except, 9 Oct. 1964 (1♂), 10 Oct. 1964 (1♂), 11 Oct. 1964 (1♂, 1♀), ♂ genitalia slide USNM 49592, ♀ genitalia slide USNM 49630, 12 Oct. 1964 (1♂, 2♀); Brooks Co., 10 mi. S of Falfurrias, U.S. 281 rest area, 28 Oct. 2002 (1♂), Bordelon and Knudson (ECK).

Flight period. Mid-October.

Distribution. Known only from southeastern Texas.

Discussion. Hardwick (1996) created a nomen nudum by not describing *S. blanca* using descriptive words, simply stating "... as illustrated in figure ...". The sexes are similar and there seems to be little individual variation.

Etymology. The species epithet refers to the distinct reniform spot on the forewing.

***Heliolonche joaquinensis* Hardwick**

(Figs. 4–5, 12–13, 18–19)

Heliolonche joaquinensis Hardwick 1996: 203.

Diagnosis. *Heliolonche joaquinensis* resembles *H. pictipennis* (Grote) with the black hindwing and white angular band. The forewing is longer in *H. joaquinensis* than in *H. pictipennis* and the white angular band in the forewing in *H. joaquinensis* becomes more of an enlarged angular patch than a band in *H. pictipennis*.

Description. Male: *Head:* Vertex cream mixed with black hair-like scales; frons bulging, ventral lip not produced, concolorous with vertex. Labial palp with basal and middle segment cream, apical segment black, long black hair-like scales ventrally. Antenna filiform, scape and a few scales at base white, front black, back white. Eye ellipsoid. *Thorax:* Patagium, tegula, and mesothorax with hair-like scales cream mixed with black; metathorax cream. Venter cream. Foreleg femur cream with long cream ventral fringe; tibia shorter than basitarsus, cream mixed with black, inner side with 1 large spine, outer side with 1 short spine; tarsi black, mixed with white, white apical rings. Middle and

hind legs white mixed with black; tarsi black with white apical rings. *Forewing*: Male length 8.5–9.0 mm (n = 3). Ground color cream with a faint orange tinge overlaying black; orbicular spot small, round, white overlain with ground color; reniform spot and trapezoidal patch below Cu vein coalesced into an angular band, white overlain with ground color; fringe mixed black and white. Underside ground color white with dark gray horizontal band below Cu vein at base, reniform spot round, dark gray. *Hindwing*: Ground color black; angular band white; fringe white. *Abdomen*: Black mixed with cream hairlike scales, lateral fringe cream mixed with black, genital tuft cream; hair pencils and scent pockets present.

Genitalia (Figs. 12–13): Uncus elongate (0.41 X valve length), gradually narrowing from base to pointed apex. Valve moderately elongate (length 6.7 X width), costal margin straight; posterior margin straight, then slightly curved at 4/5 length; ampulla absent; corona present; sacculus well developed and slightly produced. Juxta rectangular with ventral margin indented medially, with lateral projections, dorsal margin gently curved. Aedoeagus curved at middle, dorsal patch of dense minute spicules; vesica swollen basally, curved dorsad, with minute spicules.

Female. As in male except forewing length 8.0–9.5 mm (n = 10). *Genitalia* (Figs. 18–19): Papillae anales semi-circular, apex round. Ovipositor telescopic. Anterior and posterior apophyses wide and robust. Ninth and distal 1/5 to 1/4 of eighth segment finely rugose; a band of short, stout setae below rugose area of eighth segment. Ostium bursae membranous, minute spicules absent. Ductus bursae wide, approximately 0.32 X length. Appendix bursae a small projection, not coiled. Corpus bursae ovate; signa composed of 2 scobinate bars.

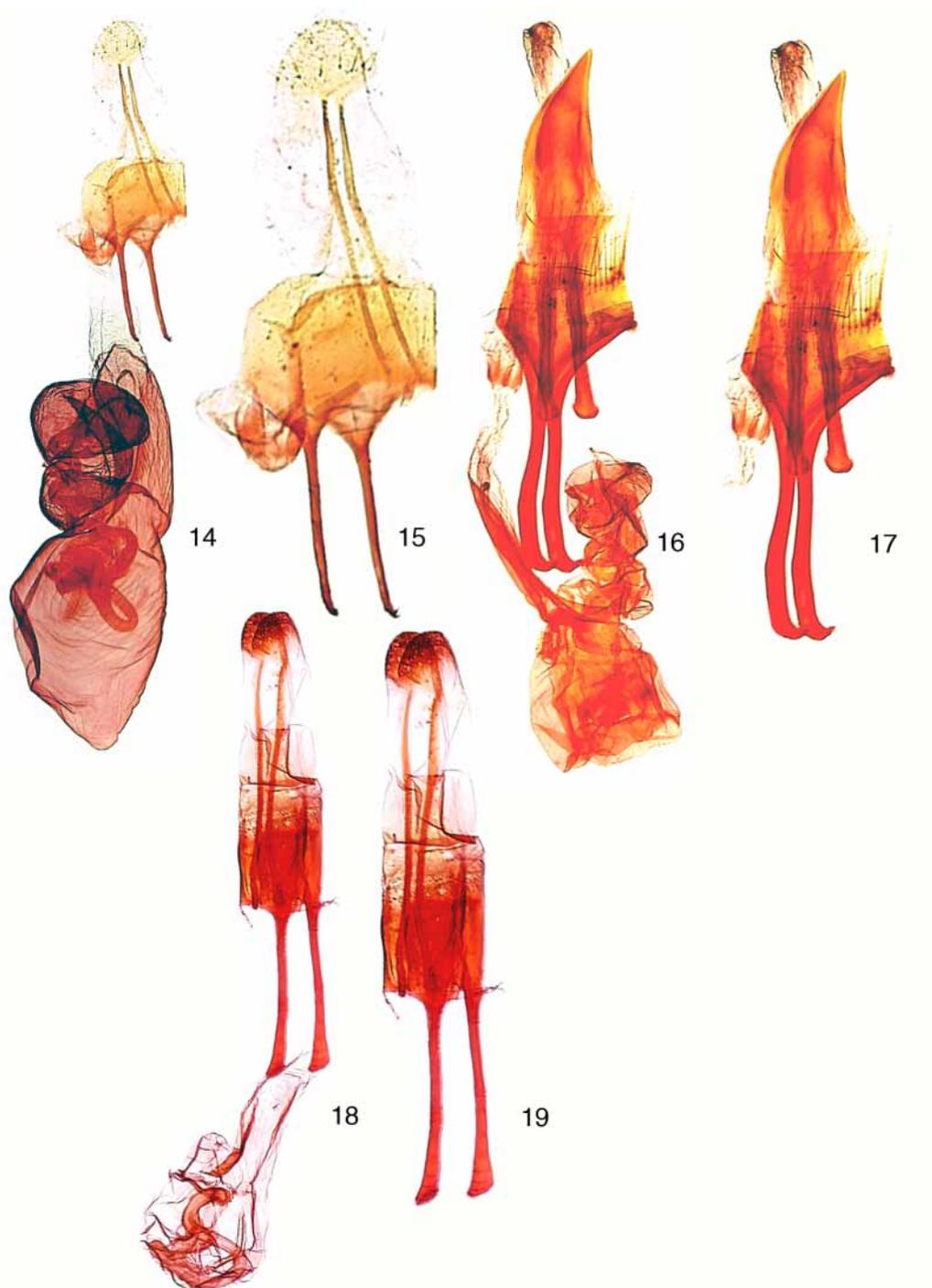
Holotype ♀, in CNC, with the following labels: 1) Edison, 8 mi ESE, Kern Co., California, 4 IV 1978, V. J. Hardwick; 2) FIG L17 [hand written in black ink]; 3) Holotype *Heliolonche joaquinensis* Hardwick, 1995, CNC Type 22048.

Paratypes. 5♂, 19♀. Same data as holotype (2♂, 11♂ ♀), D. F. Hardwick (CNC), 2♂ genitalia slides MGP 1199,1202, ♀ genitalia slide MGP 1201. CALIFORNIA: Kern Co., Taft, 31 Mar. 1943 (3♂, 5♀) (CNC); Maricopa, Monolopia, 10 Apr. 1943 (1♀), W. C. Cook (CNC). San Benito Co., nr. Pinnacles National Monument, 1 May 1991 (2♀), D. & V. Hardwick (CNC).

Flight period. Middle of March to early May.

Distribution. Found in the San Joaquin Valley from San Benito and Fresno counties in the north and Kern and Santa Barbara counties in the south (Hardwick 1996).

Discussion. Although Hardwick (1996) did not describe the adult moth, he did describe the larva, thus validating the name according to the International Code of Zoological Nomenclature. The species has become extinct at the type locality from a flood that occurred in the spring of 1983 (Hardwick 1996).



FIGURES. 14–19. Female genitalia. 14, *Schinia angulilinea*, genitalia; 15, *Schinia angulilinea*, papillae anales; 16, *Schinia maculata*, genitalia; 17, *Schinia maculata*, papillae anales; 18, *Heliolonche joaquinensis*, genitalia; 19, *Heliolonche joaquinensis*, papillae anales.

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