

Systematics of *Schinia cupes* (Grote) complex: Revised status of *Schinia crotchii* (Hy. Edwards) (Lepidoptera: Noctuidae: Heliiothinae)

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Abstract

The revised status of *Schinia crotchii* is based on differences in male and female genitalic structures and distribution of larval host plant. *Schinia navarra* Dyar remains a synonym of *S. cupes* (Grote). Genitalia of both sexes of *S. crotchii*, *S. cupes*, and *S. deserticola* Barnes and McDunnough are described and illustrated for the first time. Distributions of larval hosts of both *S. crotchii* and *S. deserticola* are mapped and compared with adult moth distributions.

Key words: systematics, genitalia, morphology comparison, host plant, *Calylophus berlandiera* Spach var. *berlandiera*, *Camissonia claviformis*

Introduction

We are currently preparing a fascicle on the Noctuidae subfamily Heliiothinae for the “Moths of America North of Mexico” series. Several projects must be resolved before this fascicle can be completed. One of these is a phylogeny of *Schinia*, the most diverse genus in the subfamily, currently with 112 species (Hardwick 1996). We have discovered taxonomic problems within several species complexes that must be resolved before a phylogeny can be constructed. The most efficient way to treat such a large genus is to define and revise species groups within *Schinia* based on morphological characters within the context of a phylogeny. This paper addresses one of these species complexes.

During routine dissections of *Schinia cupes* (Grote), as defined by Hardwick (1996), it was discovered that the large hair pencil on the second sternite of the male was either

present or absent in various specimens. Further research revealed that specimens lacking a hair pencil were referable to *Schinia crotchii* (Hy. Edwards), and those with a hair pencil to *S. cupes*. Hardwick (1996) reared *S. crotchii* (identified as *S. cupes*) from *Calylophus berlandiera* Spach var. *berlandiera* (Onagraceae) (misidentified as *Orthocarpus purpurascens* Benth) from Riverside Co., California. When the host plant distribution was plotted (Fig. 22) it matched the distribution of *S. crotchii* and not *S. cupes*. The host plant of *S. cupes* remains unknown. Hardwick (1996) treated *S. deserticola* Barnes and McDunnough as a separate species and not a subspecies as did the original authors. *Schinia deserticola* is easily separated from *S. crotchii* by the light coloration of the forewing as compared with the much darker *S. crotchii*. Both *S. crotchii* and *S. deserticola* have the male abdominal hair pencil, but there are 3 coils in the vesica of *S. deserticola* (Fig. 15) versus 4 coils in that of *S. crotchii* (Fig. 13).

Specimens were examined from the following institutions and private collections: American Museum of Natural History, New York, NY (AMNH); Charles E. Harp private collection, Littleton, CO (CH); Canadian National Collection, Ottawa, ON (CNC); Colorado State University collection (CSU); Edward C. Knudson private collection, Houston, TX (ECK); Eric H. Metzler private collection, Columbus, OH (EHM); James K. Adams private collection, Calhoun, GA (JKA); Oklahoma State University collection, Stillwater, OK (OKS); Oregon State University collection, Corvallis, OR (OSUC); Ronald Leuschner private collection, Manhattan Beach, CA (RL); Texas Lepidoptera Atlas by Bordelon and Knudson (TLA); University of Arizona collection, Tucson, AZ (UAT); University of Idaho collection, Moscow, ID (UIM); and National Museum of Natural History, Washington, DC (USNM).

Schinia cupes (Grote)

(Figs. 1–2, 7, 10–11, 16, 19, 22)

Heliopsis cupes Grote 1875: 113. — Grote 1882: 36. — Grote 1883: 152.

Trichosellus cupes; Grote 1890: 36. — Grote 1895: 69. — McDunnough 1938: 106.

Schinia cupes; Smith 1883: 232. — Smith 1891: 54. — Smith 1893: 280. — Dyar 1903: 188. — Barnes and McDunnough 1917: 39. — Franclemont and Todd 1983: 159. — Poole 1989: 894. — Poole and Gentili 1996: 771. — Hardwick 1996: 89.

Schinia navarra Dyar 1914: 162. — Barnes and McDunnough 1917: 39. — Franclemont and Todd 1983: 159. — Poole 1989: 894. — Poole and Gentili 1996: 771. — Hardwick 1996: 89.

Trichosellus navarra; McDunnough 1938: 106.

Diagnosis. There are no differences in maculation between *S. cupes* and *S. crotchii*. They are separable by distribution with *S. cupes* occurring from Colorado and New Mexico, east to Kansas, Oklahoma, and Texas and *S. crotchii* from Arizona and Utah, west to California and Washington. The second abdominal sternite in the male of *S. cupes* bears a pair of hair pencils (Fig. 7), which are absent in *S. crotchii* (Fig. 8). In the male aedeagus, the vesica

has 4 coils in *S. cupes* (Fig. 11) and 3 coils in *S. crotchii* (Fig. 13). In the female genitalia the papillae anales are more pointed in *S. cupes* (Fig. 19) and more broadly rounded in *S. crotchii* (Fig. 20). The ductus bursae is narrower at the base of the ostium bursae in *S. cupes* (Fig. 16) and wider in *S. crotchii* (Fig. 17).

Description. *Male: Head:* Cream mixed with some black scales; short scales on frons and long hairlike scales on vertex. Labial palpus white basally with remainder brown mixed with a few white scales. Eyes large and globular. *Thorax:* Mixture of white hairlike and spatulate scales with a tapered stalk, tapered scales white with brown apices. Foreleg femur with ventral fringe and inner surface light brown, outer surface white with some brown scales; tibia white and light brown, largest and stoutest spine on inner side and closest to basitarsus, two slender spines dorsal to it, outer side with four stout spines becoming shorter and less robust dorsally; tarsi brown with white apical rings. Mid- and hindlegs white and brown; tarsi white and brown with white apical rings. Underside white. *Forewing:* Length 12.0–14.5 mm (n=10). Ground color light brown; antemedial line white and sinuate; claviform spot light brown outlined in brown; orbicular spot outlined with brown and with a small central white dash; reniform spot outlined with brown and with a small central white angulate dash; postmedial line white and sinuate; subterminal line a series of white arrowheads between veins and with a brown spot at their tips; outer margin with elongate brown marks between veins; fringe brown mixed with white. Underside white with orbicular and reniform spots; postmedial band brown. *Hindwing:* Ground color white with a brown discal spot and marginal band, with a few white spots along margin; veins in white discal area highlighted with brown scales. *Abdomen:* Dorsum white mixed with brown, venter mostly white mixed with some brown scales; hair pencils and associated scent pockets on second sternite present (Fig. 7). *Genitalia* (Figs. 10–11): Uncus elongate, approximately 0.3 X length of valve, apex blunt. Valve elongate (length greater than 7 X width), costal margin distinctly curved at 4/5 length, posterior margin gently curved to a truncate apex; ampulla elongate; sacculus with ventral margin produced. Juxta quadrate with a curved dorsal margin. Saccus V-shaped. Aedoeagus slightly curved; vesica with a basal diverticulum and 4 coils.

Female: As in male except forewing length 14.0–15.0 mm (n=10). *Genitalia* (Figs. 16, 19): Papillae anales lightly sclerotized, broadly triangulate, apex narrowly rounded; anterior apophyses approximately 0.95 times length of posterior apophyses; ductus bursae narrow widening beyond middle to more than twice width at ostium bursae, elongate (approximately 1.8 times length of corpus bursae); appendix bursae longer than corpus bursae, with 3 coils; corpus bursae ovate; signa consists of 4 scobinate bars.

Type material. *Heliiothis cupes* Grote: Male holotype is in The Natural History Museum, London. Type locality: Texas.

Schinia navarra Dyar: Male holotype is in the National Museum of Natural History, Washington, DC. Type locality: Cotulla, Texas (type no. 19076).

Biology. *Schinia cupes* is associated with sandy plains, and with *Calylophus berlandiera* Spach var. *berlandiera* (Onagraceae), although its life history is unknown. This plant overlaps the distribution of *S. cupes* and is found at many of its collection localities. Harp observed two males resting on Berlandier's sundrops (*C. berlandiera*) at Big Springs, TX (Howard Co.) in April 2003. He further observed that adults fly in and around the proximity of their hostplants during the early morning. In addition, males can also be seen on gravelly/sandy openings until late morning awaiting receptive females. As temperatures rise during late morning, adults disappear to shady areas where they presumably "rest." Adults were attracted to lights in suitable habitat.

Schinia cupes has two broods with the first flying from late-March to mid-June and a second smaller brood flying in late-July to September (Fig. 24). The earliest and latest flights are in the southern part of its range, and in the northern part, a compressed single brood flies in June.

Across much of its range, *S. cupes* flies with *S. simplex* Smith, *S. citrinella* (Grote and Robinson), *S. roseitincta* (Harvey), and *S. errans* Smith during the first brood, and flies with *S. saturata* (Grote), *S. nubila* (Strecker), *S. coercita* (Grote), *S. citrinella*, *S. mortua* (Grote), and *S. bicuspidata* Smith during the second brood.

Distribution (Fig. 22). Texas, west to New Mexico, and north to Kansas and Colorado.

Material Examined. All specimens are from USNM, except as noted otherwise. **U.S.A.: COLORADO:** CHAFFEE CO. Salida (AMNH). PROWERS CO. Holly, downtown gas station along Hwy. 50, 9 June 2001 (2♂), C.E. Harp (CH). PUEBLO CO. Pueblo, north end, off Hwy 1-25 at mkr. #102, 4705', 20 June 1999 (1♂), C.E. Harp (CH). WELD CO. 1 mi W of Roggen, frontage road along Hwy I-76, 4702', 26 June 2002 (1♂), C.E. Harp (CH). **KANSAS:** FINNEY CO. Garden City, 10 June 1935 (1♂), H.H. Walkden. **NEW MEXICO:** COLFAX CO. 6 mi S of Maxwell, Hwy. I-25 at mkr. #420, 6040', 8 Aug. 2002 (1♂ 1♀), C.E. Harp (CH). LUNA CO. Deming, 1–7 Sep. (2♀), Barnes Collection; OTERO CO. High Rolls, Sep. (1♂), Barnes Collection. UNION CO. Clayton, SE edge of town along Hwy. #87, 5067', 16 May 2000 (1♀), C.E. Harp (CH). **OKLAHOMA:** CARTER CO. Springer, 26 May 1986, J.K. Adams (JKA). KIOWA CO. Lugert, 1350', 11 June 1937 (1♂), Standish & Kaiser (OKS). PAYNE CO. Stillwater, 21 Apr. 1940 (1♂), V.T. Nailon (OKS). ROGER MILLS CO. Cheyenne, 7 June 1937 (2♂ 1♀), Standish & Kaiser (OKS). **TEXAS:** [No specific locality], 21 May 1925 (1♀), Barnes Collection; BEXAR CO. San Antonio (1♀), J. Jermy; San Antonio, 8 mi SE of Hwy. I-410 off Hwy. I-37 at exit 125, 26 May 1987, J.K. Adams (JKA). BLANCO CO. Davis Ranch, 1300', 2 Apr. 1959 (1♀), J.F. McAlpine (CNC). BRAZOS CO. College Station, 24 Mar. 1936 (1♂), J. Jermy, 20 May (1♂ 1♀), 14 June (1♂), P.O. Glick. BREWSTER CO. Alpine, 1–7 Apr. 1926 (2♂ 1♀), 8–14 Apr. 1926 (11♂ 8♀), 15–21 Apr. 1926 (5♂ 1♀), 22–30 Apr. 1926 (2♂ 1♀), 1–7 May 1926 (1♀), 1–7 Sep. 1926 (1♂), O.C. Poling; 6.5 mi S. Alpine, 9 Aug. 1991 (1♂) E.H. Metzler (EHM); Alpine, Davis Mts., 26 May 1981 (1♀), E.C. Knudson, 11 Sep.

1958 (1♂ 1♀), 12 Sep 1958 (5♂ 1♀), R.R. McElvare. BRISCOE CO. Caprock Canyons State Park, 10 May 1996 (1♂), C. Bordelon (CH). BROWN CO. Lake Brownwood State Park (TLA). CAMERON CO. Brownsville, 16–23 Mar. (1♂). COLEMAN CO. [no specific locality] (TLA). COTTLE CO. [no specific locality] (TLA). CROCKETT CO. [no specific locality] (RL). CULBERSON CO. Guadalupe Mtn. Nat. Park, Lamar Canyon, 24 Aug. 1996, C. Bordelon (TLA). DALLAS CO. Dallas, 21 Apr. (1♀). EL PASO CO. [no specific locality] (TLA). FREESTONE CO. [no specific locality] (TLA). GARZA CO. Post, gas station, Hwy #380 nr. jct. of Hwy. #84, 2616', 24 Apr. 2002 (1♂), C. Harp (CH). HIDALGO CO. Pharr (AMNH). HOWARD CO. 2 mi E of Big Spring, S of refinery, I-20 at mkr. #180, 24 Apr. 2002 (1♂), C. Harp (CH); 2 mi S of Big Spring, gas station, roadside along Hwy. #87, 2667', 23 Apr. 2002 (4♀) C. Harp (CH); 2 mi W of Big Spring, gas station, I-20 at mkr. #174, 2470', 24 Apr. 2002 (7♂ 3♀), C. Harp (CH). JEFF DAVIS CO. Fort Davis, Fort Davis Motor Inn, 8 Sep. 1996, J.K. Adams (JKA). Limpia Canyon, Davis Mts., 8 Aug. 1991 (4♂ 9♀) E.H. Metzler (EHM). KERR CO. Kerrville, May 1900 (1♂), 6 Apr. 1959 (1♂ 1♀), 7 Apr. 1959 (1♂), 19 Apr. 1959 (2♂), R.H. Whitmore (CNC). LA SALLE CO. [no specific locality] (TLA). LLANO CO. Llano, 14 Mar. 1906 (1♀), F.C. Pratt. MARTIN CO. Stanton, gas station off Hwy. I-20, 2660', 24 Apr. 2002 (2♂), C. Harp (CH). MAVERICK CO. [no specific locality] (TLA) (AMNH). PECOS CO. [no specific locality] (TLA) (RL). RANDALL CO. Palo Duro State Park (RL). REAL CO. Rio Frio, 11 May 1910 (2♀), F.C. Pratt. SAN PATRICIO CO. [no specific locality] (TLA). STARR CO. Falcon State Park, 11 Apr. 1988, E. Knudson (ECK). TARRANT CO. [no specific locality] (TLA). TERRELL CO. Sanderson, 6 Sep. 1996, J.K. Adams (JKA). TRAVIS CO. [no specific locality] (TLA). UVALDE CO. Concan, 30 Apr. 1992, R. Leuschner (RL). Sabinal, Apr. 1910 (2♀), 26 May 1910 (1♀), F.C. Pratt; Concan, Neal's Lodges, 1300', 19 Apr. 1990 (1♀), N. McFarland (CNC). VAL VERDE CO. [no specific locality] (TLA). Del Rio, 1 Apr. 1922 (1♀), 25 Apr. 1959 (1♂ 1♀), M.R. MacKay (CNC). VICTORIA CO. Victoria, 4 Apr. (1♂). WEBB CO. Laredo, 26 Sep. 1951 (1♂), male genitalia slide USNM 47000, A.B. Gurney. WILLIAMSON CO. Georgetown, 10 Apr. 1937 (1♀), 14 Apr. 1937 (1♀), female genitalia slide USNM 47001, 16 Apr. 1937 (1♂), L.J. Milne.

Discussion. Grote (1875) placed *S. cupes* in *Heliothis* where it remained until he transferred it to *Trichosellus* (Grote 1890). In McDunnough's (1938) checklist, *S. cupes* was retained in Grote's genus *Trichosellus*, and *S. crotchii* was treated as a synonym. Smith (1883) correctly placed *S. cupes* in *Schinia*.

Schinia crotchii (Hy. Edwards) Revised Status

(Figs. 3–4, 8, 12–13, 17, 20, 22)

Heliothis crotchii Hy. Edwards 1875: 135.

Schinia crotchii; Smith 1883: 232. — Smith 1891: 54. — Smith 1893: 280. — Dyar 1903: 188. —

Barnes and McDunnough 1917: 39. — Franclemont and Todd 1983: 159. — Poole 1989: 894.

— Poole and Gentili 1996: 771. — Hardwick 1996: 89. [all authors treat as synonym of *S. cupes*]
Trichosellus crotchii; McDunnough 1938: 106, as synonym of *T. cupes*.

Diagnosis. See discussion under *S. cupes*.

Description. The maculation of *S. crotchii* is indistinguishable from that of *S. cupes*. The descriptions of the abdomen and genitalia only address the differences between *S. crotchii* and *S. cupes*. **Male: Abdomen:** Hair pencils in male absent; scent pockets present (Fig. 8). **Forewing:** Length 12.0–13.0 mm (n=10). **Genitalia** (Figs. 12–13): As in *S. cupes*, but valve and saccus slightly narrower. Vesica with a basal diverticulum and 4 coils.

Female: As in male except forewing length 11.5–14.5 mm (n=10). **Genitalia** (Figs. 17, 20): Papillae anales broadly rounded with a broadly rounded apex; ductus bursae narrow widening beyond middle to less than twice width at ostium bursae.

Type material. *Heliothis crotchii* Grote: Male holotype is in The Natural History Museum, London. Type locality: San Diego, California.

Biology. Hardwick (1996) described the early stages of *S. crotchii* in detail, but the host plant was given as *Orthocarpus purpurascens* Bentham (Scrophulariaceae), which is now recognized as *Castilleja exserta* (Heller) Chuang & Heckard ssp. *exserta*. There are currently three recognized subspecies: *latifolia* (S. Wats.) Chuang & Heckard is reported from Marin Co., California; and *venusta* (Heller) Chuang & Heckard is reported from San Mateo Co., Santa Clara Co., southwestern San Bernardino Co., and eastern Kern Co., California. Herbarium records for the nominate subspecies match the distribution throughout the range of *S. crotchii*, except for those records in Washington and Idaho.

Distribution (Fig. 22). From southeastern Arizona west to the Peninsular Ranges of southern California and north in southeastern Washington and southern Idaho.

Material Examined. All specimens are from USNM, except as noted otherwise. **U.S.A.: ARIZONA:** [No specific locality] (1♂ 1♀), Barnes Collection, B. Neumoegen (1♂). **MARICOPA CO.** Phoenix, 16–23 Apr. (1♀). **MOHAVE CO.** Kingman, 20 Apr. 1954 (1♂), 21 Apr. 1954 (1♂ 1♀), male genitalia slide USNM 47011, 23 Apr. 1954 (1♀), female genitalia slide USNM 47016, H.P. Wilhelm. **PIMA CO.** Redington (1♂), male genitalia slide USNM 47012; Tucson, 19 Apr. 1938, G.D. Butler (UAT). **CALIFORNIA:** [No specific locality] (1♀), female genitalia slide USNM 47022, 24 Apr. 1924 (1♂), E.A. Dodge; southern [no specific locality] (1♂), Barnes Collection (1♀), B. Neumoegen. **FRESNO CO.** Coalinga, 2 Apr. 1942 (♂), 2 Apr. 1943 (♂) (CNC), 2 Apr. 1943, W.C. Cook (UIM); Fresno (1♂), E.A. Schwarz. **KERN CO.** Shafter, 28 Apr. 1948 (♀), R. v.d. Bosch (CNC). **RIVERSIDE CO.** 2 mi N Aguanga, 1992 (3♂ 1♀), D.F. & V. Hardwick (CNC); **SAN BERNARDINO CO.** Cajon Pass, 20 Apr. 1939 (1♂), Guedet Collection; Loma Linda, 1–7 Mar. (1♂), 16–23 Mar. (1♂ 1♀), male genitalia slide USNM 47005, 8–15 Apr. (1♀), Barnes Collection. **STANISLAUS CO.** 4 Apr. (1♂). **IDAHO:** **TWIN FALLS CO.** Twin Falls, 11 June 1951 (1♂), J.B. Douglas, 15 June 1959 (1♂), K.E. Gibson (CNC). **WASHINGTON:** **WALLA WALLA CO.** Walla Walla, 3 June 1957, W.C.

Cook (UIM). WHITMAN CO. Pullman, 10 June 1898 (1♂), Barnes Coll.

Discussion. Smith (1883) synonymized *S. crotchii* with *S. cupes* based on material from Washington Territory, which would make the species Smith was discussing *S. crotchii* and not *S. cupes*.

The distribution of larval host plant of *S. crotchii* is concordant with the distribution of the moth except for records in southeastern Washington and southern Idaho. Perhaps the plant is there but has never been collected. *Schinia crotchii* is single brooded (Fig. 24) and flies from early March to the end of May, with a single record from early June.

***Schinia deserticola* Barnes and McDunnough**

(Figs. 5–6, 9, 14–15, 18, 21, 23)

Schinia cupes deserticola Barnes and McDunnough 1916: 5. — Smith 1891: 54. — Smith 1893: 280. — Dyar 1903: 188. — Barnes and McDunnough 1917: 39. — Franclemont and Todd 1983: 159. — Poole 1989: 894. — Poole and Gentili 1996: 771.

Trichosellus cupes deserticola; McDunnough 1938: 106.

Schinia deserticola; Hardwick 1996: 91.

Diagnosis. The ground color in *S. deserticola* is a dirty white compared with light brown in both *S. cupes* and *S. crotchii*. The orbicular spot is distinct and more separated from the antemedial line in *S. deserticola* (Figs. 5–6) than in *S. cupes* and *S. crotchii* (Figs. 1–4). The hair pencils in the male abdomen are present in *S. deserticola* as they are in *S. cupes*. In the female genitalia the papillae anales have the ventral margin angulate in *S. deserticola* (Fig. 21) and straight in *S. cupes* and *S. crotchii* (Figs. 19–20).

Description. *Male: Head:* Frons cream with short narrow scales; vertex a mixture of white hairlike scales and tapered spatulate scales with brown apices. Labial palpus white with some light brown scales on middle and at apex of outer surface. Eyes large and globular. *Thorax:* Mixture of white hairlike and spatulate scales with tapered stalks, tapered scales white with brown apices. Foreleg femur and ventral fringe white; tibia white and light brown; largest and stoutest spine on inner side and closest to basitarsus; slender dorsal setae absent; outer side with three stout spines becoming shorter and less robust as they progress dorsally; tarsi light brown with white apical rings. Mid- and hindlegs white with some light brown scales; tarsi light brown with white apical rings. Underside white. *Forewing:* Length 10.5–14.5 mm (n=10). Ground color light brown; antemedial line white and sinuate; claviform spot absent; orbicular spot ground colored, outlined with brown with a light brown center; reniform spot ground colored outlined with brown and with a large light brown center; postmedial line white and sinuate; subterminal line white and irregular with a series of brown arrowheads between veins; outer margin with elongate brown marks between veins; fringe mixed brown and white. Underside white with light brown orbicular and reniform spots; wide light brown postmedial band, variable in intensity, extends from costa to vein CuA2, in some specimens band extends to posterior mar-

gin. *Hindwing*: ground color white, discal spot and marginal band brown, a few white spots along margin; veins in white discal area highlighted with brown scales. *Abdomen*: White; hair pencils and associated scent pockets on second sternite present (Fig. 9). *Genitalia* (Figs 14–15): As in *S. crotchii*, but valve slightly narrower. Vesica with a basal diverticulum and 3 coils.

Female: As in male except forewing length 10.5–14.5 mm (n=10). *Genitalia* (Figs 18, 21): Papillae anales lightly sclerotized, broad ventral margin angulate, apex narrowly rounded; anterior apophyses approximately 0.90 times to equal in length of posterior apophyses; ductus bursae widening beyond middle to less than twice width at ostium bursae.

Type material. *Schinia cupes deserticola* Barnes and McDunnough: Male lectotype designated by Hardwick (1996) is in the National Museum of Natural History, Washington, DC. Type locality: southern Arizona.

Biology. The life history and descriptions of the immature stages of *deserticola* are given by Hardwick (1996). The larval plant host is *Camissonia claviformis* (Torr. & Frem.) Raven (Onagraceae).

Distribution (Fig. 23). Southern California to southeastern Arizona and north to west central Utah and southeastern Oregon.

Material Examined. All specimens are from USNM, except as noted otherwise. 91 males and 104 females. **U.S.A.: ARIZONA:** southern, 1–15 Apr. (1♂), Barnes Collection. LA PAZ CO. Ehrenberg, 21 Mar. 1939 (1♂), F.H. Parker. MARICOPA CO. Wickenburg, 2000', 21 Mar. 1993 (1♀), D.F. & V. Hardwick (CNC). MOHAVE CO. Kingman, 23 Apr. 1954 (1♂), G.W. Rawson (1♀), O. Buchholz; Pierce Ferry, 5–7 May 1967 (1♀), D. Davis. **CALIFORNIA:** [No specific locality] (1♀); Mohave Desert, 20 Apr. 1930 (1♂), J.A. Comstock. IMPERIAL CO. 1–15 Mar. 1922 (1♀), O.C. Poling, 15 Mar. (3♂ 17♀), 15–30 Mar. 1922 (18♂ 22♀), O.C. Poling; Dixieland, 1–15 Mar. 1922 (11♂ 11♀), 15–30 Mar. 1922 (8♂ 10♀), male genitalia slide USNM 47002, O.C. Poling; Foot of Fish Cr. Mtns., 600 ft., 6 Apr. 1992 (3♂), D.F. & V. Hardwick (CNC). INYO CO. Mar. 1921 (1♀), 20 Mar. (1♂), 21 Mar. (1♂), McElvare Collection; Darwin, 27 Apr. 1940 (1♀). KERN CO. Baker, 6 Apr. 1935 (5♂ 1♀), J.A. Comstock. RIVERSIDE CO. Blythe, 15 Mar. 1937 (1♂ 3♀), McElvare Collection; Mecca, Mar. (4♂), K.R. Coolidge, 27 Mar. 1922 (2♂ 1♀), E. Shoemaker; Mecca, Box Canyon, 300', 21 Mar. 1985 (1♂), D.F. & V. Hardwick (CNC); Palm Springs, 16–23 Mar. (2♂ 1♀), 18 Mar. (1♀), 12 Apr. 1932 (1♀), 14 Apr. 1932 (1♀), McElvare Collection; Palm Desert, 5 Mar. 1960 (2♂), R.H. Leuschner (CH); Shaver's Well, 1 Apr. 1935 (1♂), 1 May 1938 (1♀), J.A. Comstock. SAN BERNARDINO CO. Cajon Pass, 20 Apr. 1939 (1♀), Guedet Collection; 2 mi S Kelso, 2400', 2 Apr. 1987, D.F. Hardwick (1♀); Needles, 4 Apr. 1937 (2♂ 2♀), L.M. Martin; Newberry Springs, 4 Apr. 1937 (8♂ 16♀), male genitalia slides USNM 47006, 47013, female genitalia slide USNM 47003, D. Meadows; San Bernardino, 8–15 Apr. (1♀); nr. Yermo, 5 Apr. 1941 (1♂), R.R. McElvare; Yermo, 20 Mar. 1937 (1♀), J.A. Comstock, 9 Apr. 1939 (2♂), G. Beevor. SAN DIEGO CO. 3 mi SE Ocotillo Well's, 17 Mar. 1978 (1♂), D.F. Hardwick (CNC). San

Felipe Wash, 4 Mar. 1937 (1♂ 1♀), E. Shoemaker. **OREGON:** HARNEY CO. Cottonwood Cr., Pueblo Mts., 28 May 1960 (6♂), S.G. Jewett, Jr. (OSUC). **UTAH:** EMERY CO. Goblin Valley State Park, 1 June 1997 (2♀), Opler & Buckner (CSU).

Discussion. Barnes and McDunnough (1916) described *S. deserticola* as a subspecies of *S. cupes*. *Schinia deserticola* inhabits desert and other arid habitats. It is single brooded, flying from early March to early May, with a single record from early June. The peak flight period of *S. deserticola* is earlier than that of *S. crotchii* (Fig. 24).

The host plant distribution of *S. deserticola* matches well with the adult distribution (Fig. 23).

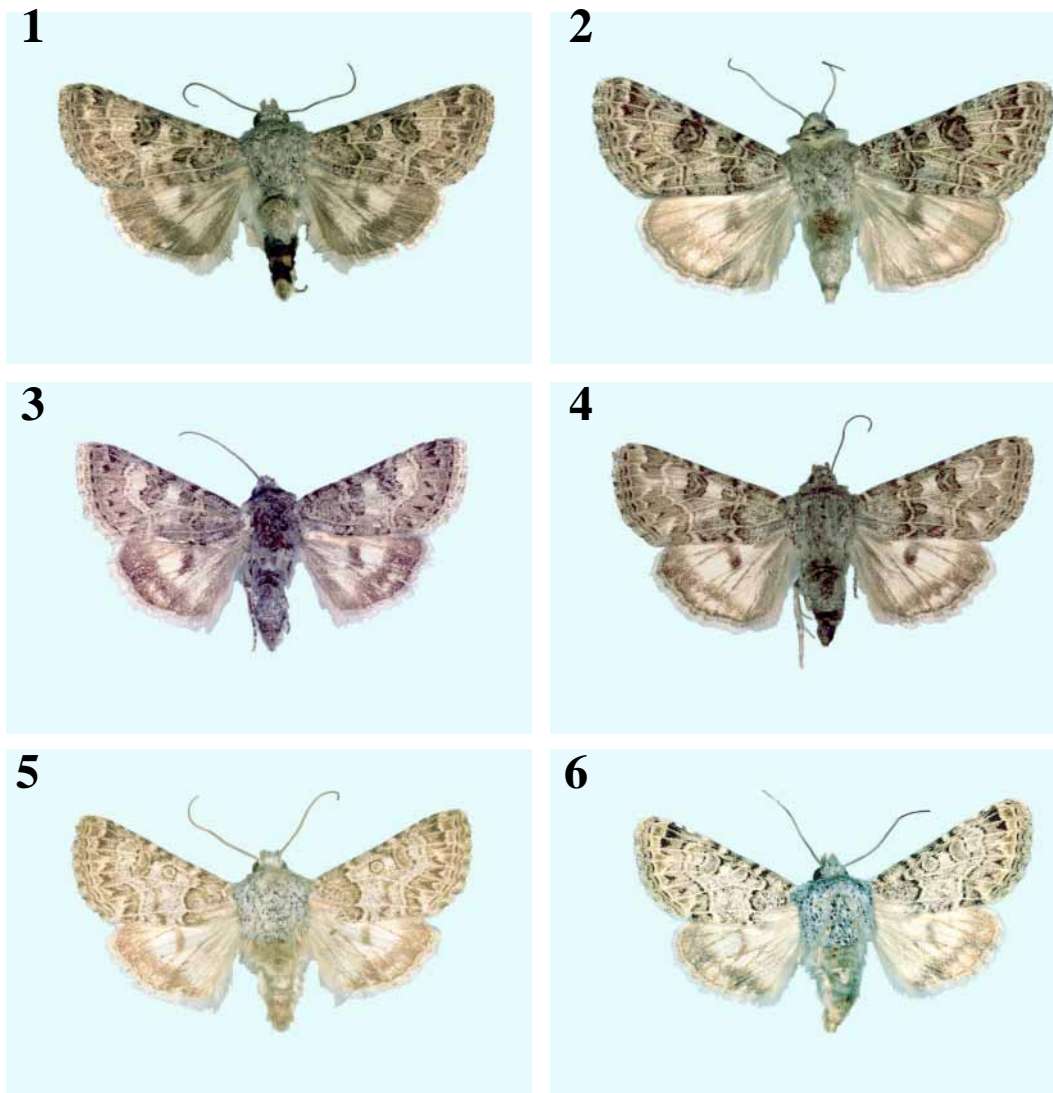
Acknowledgments

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FIGURES 1–6. Adults. 1, *Schinia cupes*, male, Texas, Williamson Co. Georgetown, USNMENT 00145033; 2, *S. cupes*, female, Texas, USNMENT 00145030; 3, *S. crotchii*, male, California, southern, USNMENT 00145087; 4, *S. crotchii*, female, California, San Bernardino Co. Loma Linda, USNMENT 00145094; 5, *S. deserticola*, male, California, San Bernardino Co. Needles, USNMENT 00145165; 6, *S. deserticola*, female, California, San Bernardino Co. Needles, USNMENT 00145167.

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FIGURES 7–9. Second sternite of male abdomen. 7, *Schinia cupes*; 8, *S. crotchii*; 9, *S. deserticola*.

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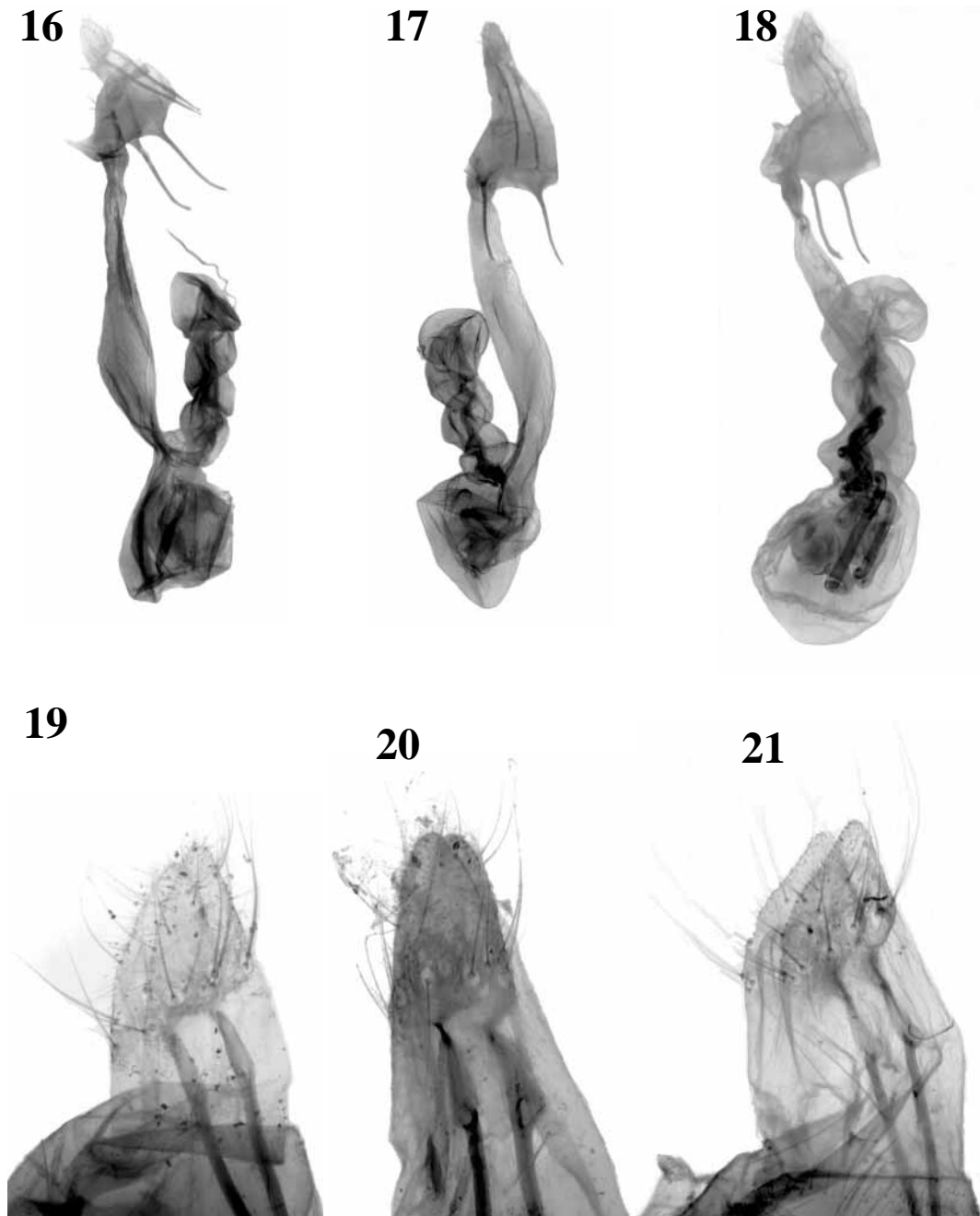
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FIGURES 10–15. Male genitalia and aedeagus. 10, *Schinia cupes*; 11, *S. cupes*, aedeagus; 12, *S. crotchii*; 13, *S. crotchii*, aedeagus; 14, *S. deserticola*; 15, *S. deserticola*, aedeagus.



FIGURES 16–21. Female genitalia and papillae anales. 16, *Schinia cupes*; 17, *S. crotchii*; 18, *S. deserticola*; 19, *S. cupes*, papillae anales; 20, *S. crotchii*, papillae anales; 21, *S. deserticola*, papillae anales.

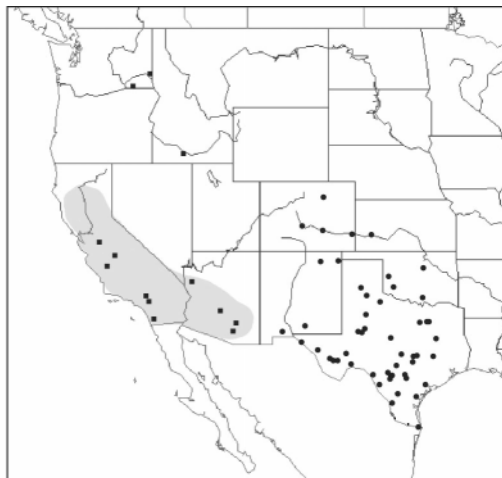


FIGURE 22. Collecting localities for *Schinia cupes* (circles) and *S. crotchii* (squares), shaded area is distribution of host plant *Castilleja exserta exserta* (Onagraceae).

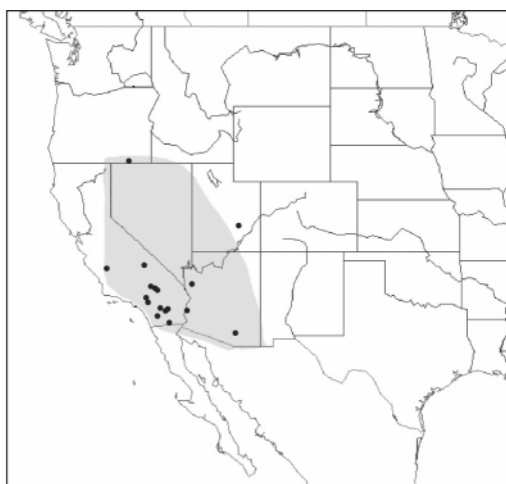


FIGURE 23. Collecting localities and shaded host plant distribution for *Schinia deserticola*, host plant *Camissonia claviformis* (Onagraceae).

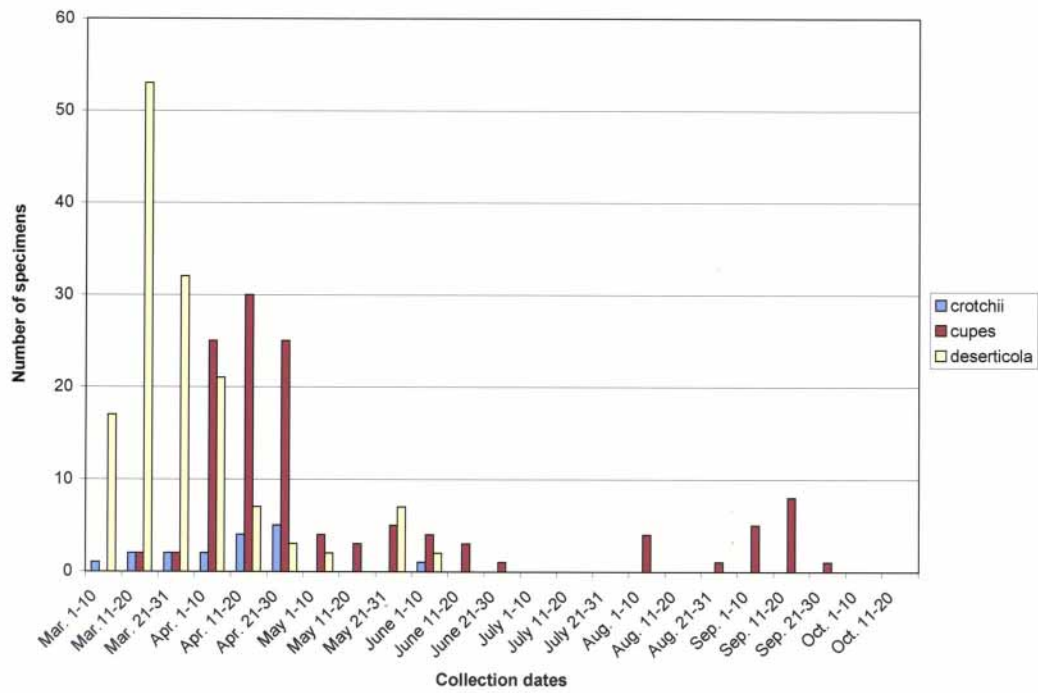


FIGURE 24. Seasonal phenology of *Schinia cupes*, *S. crotchii*, and *S. deserticola*.