

about 4; the flagellum is also somewhat stouter. The yellow fascia of *caelebs* is narrower because the costa is less arched, and in its basal half it barely exceeds the cubital vein instead of following the first anal all along its basal half. It is difficult to define exactly how the genitalia differ; the juxta of *caelebs* is oval or very slightly cordate, that of *dimidiata* definitely cordate (concave lateral margins); the gnathos is longer and its base narrower, but the great thickness of the genitalia relative to their width makes it difficult to present on a single conventional preparation a satisfactory view of all the organs and particularly the gnathos.

#### ACKNOWLEDGMENTS

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#### LITERATURE CITED

HERRICH-SCHAEFFER. 1855. Samml. aussereur. Schmett., Pl. 43, fig. 222.

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## THE LIFE HISTORY OF *SCHINIA CITRINELLUS* (NOCTUIDAE)

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*Schinia citrinellus* (Grote & Robinson, 1870, p. 180) feeds in the larval stage on *Croton californicus* Muell-Arg. *C. californicus* is distributed from southern California to Arizona (Munz, 1963), but *citrinellus* occurs from the southern California deserts eastward at least to central Texas (Brazos Co.), so presumably other species of *Croton* serve as its food plant in the more eastern areas of its range. *Schinia citrinellus* has two annual flight periods, one in the spring and one in late summer and early fall. These probably correspond closely with the blossoming periods of its host plants. The spring flight period on the deserts of southern California extends between the end of March and the middle of June.

#### Behaviour

*Schinia citrinellus* is evidently an exclusively nocturnal species, and no adult activity was noted during daylight hours on the deserts of southern

California at a time when moths were being taken in moderate abundance in a light trap. The eggs are deposited among the small buds or within the partially open buds at the apex of the plant. The rather unusual opaque white eggs of *citrinellus* are difficult to detect in the hairy, pale-grey vestiture of the *Croton* buds.

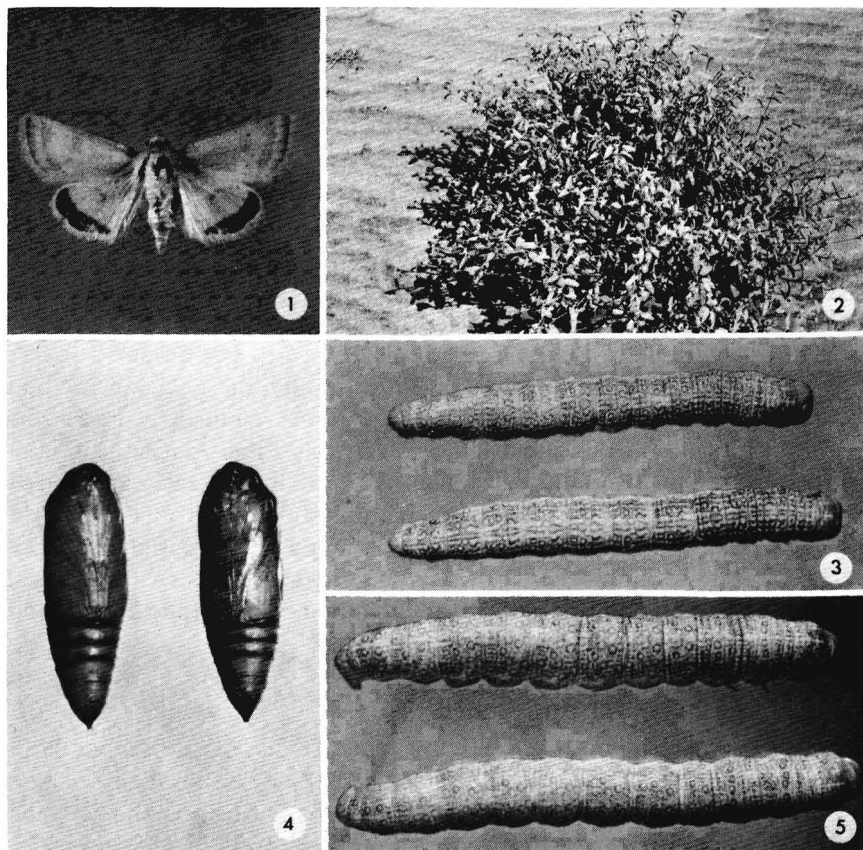
A single wild-caught female deposited a total of 176 eggs in captivity. The majority of these hatched on the fourth day after deposition, a few on the fifth day.

The fully formed larva has the habit of resting for a considerable period after it has chewed an exit hole in the chorion but before it has made its escape from the shell. After freeing itself from the egg, the larva makes its way down through the blossom or bores through the petals of the bud to reach the orange glands located on the surface of the receptacle; the first-stadium larva feeds almost exclusively on these glands. In later stadia, other floral parts are consumed. The small seed capsules are fed on to a limited extent but the more mature stone-like fruits are never attacked. The last-stadium larva feeds preponderantly on the buds, but unlike most heliothidine larvae, will also feed on the leaves of its host plant. At the cessation of feeding, the larva makes its way to the ground and tunnels into the soil to pupate.

#### Descriptions of Stages

The ultimate-stadium larva and the pupa of *Schinia citrinellus* have previously been described by Comstock (1931). The immature stages on which the following descriptions are based, constituted the progeny of a single female taken at Thousand Palms, near Indio, California. The durations of stadia listed are those obtained from rearings maintained at room temperature. Rearing techniques employed were those outlined by Hardwick (1958). The estimate of variation following the means for various values is the standard deviation.

**Adult** (Fig. 1). Head, thorax and forewing dull creamy-yellow; museum specimens often rather intensely yellow as a result of the action of the killing agent. Abdomen cream or creamy-grey. Forewing almost immaculate, usually with a vague dark reniform and subterminal band; these evidently only the transmission of dark markings from the underside of the wing. Forewing usually with a few scattered dark points, the most consistently present being at the apico-costal margin of the reniform spot. Fringe concolorous with remainder of wing. *Hind wing* white with a brown outer-marginal band containing a white median shade; outer band often evanescent near anal angle. A brown discal spot usually present. Fringe white. *Underside* of forewing white with brown orbicular and reniform spots, and subterminal band. Usually a series of brown sagittate marks at outer margin of wing, these occasionally fusing to form a brown marginal band. Costal and outer areas of wing often suffused with yellow. Underside of hind wing white or pale cream, often with a brown spot on disc, and another near anal angle of wing.



Figs. 1-5. *Schinia citrinellus* (Grt.) and its food plant. 1, Adult, Palm Springs, Calif.; 2, food plant, *Croton californicus* Muell.-Arg.; 3, 5, dorsal aspect of ultimate-stadium larvae; 4, ventral aspect of pupae.

*Expanse*:  $26.1 \pm 1.4$  mm (34 specimens).

**Egg.** Of a peculiar white opacity unusual in heliothidine eggs; showing little change until a few hours before hatching when mouth parts and head capsule become visible through chorion.

*Dimensions of egg*: length,  $0.593 \pm 0.030$  mm; diameter,  $0.451 \pm 0.033$  mm (20 eggs).

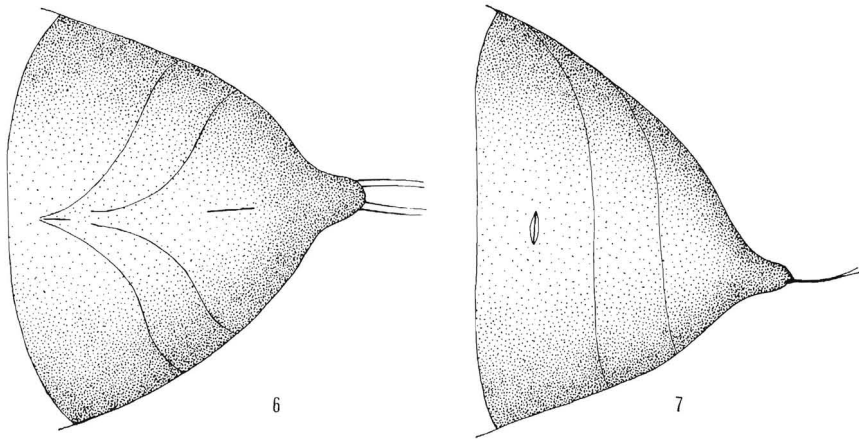
*Incubation period*:  $4.1 \pm 0.3$  days (157 eggs).

**First-Stadium Larva.** Head black. Prothoracic and suranal shields dark smoky-brown. Trunk creamy-grey. Spiracles with light- to medium-brown rims. Thoracic legs medium smoky-brown.

*Head width*:  $0.300 \pm 0.013$  mm (25 larvae).

*Duration of stadium*:  $4.1 \pm 0.3$  days (46 larvae).

**Second-Stadium Larva.** Head pale pinkish-cream, mottled with pale fawn dorsally. Prothoracic and suranal shields white or pale cream, mottled with light green. Macula-



Figs. 6, 7. Apical abdominal segments of pupa. 6, Ventral; 7, right lateral.

tion of trunk well defined. Mid-dorsal band greyish-green. Subdorsal area with white marginal lines and a greyish-green median band. Supraspiracular area greyish-green, usually with a white or pale cream, irregular and broken, median line. Spiracular band narrow, white or pale cream, often discontinuous. Suprapodal area light greyish-green. Mid-ventral area pale grey. Spiracles with light-brown rims. Setae of trunk light brown with white or cream bases; setal bases interrupting maculation of trunk. Thoracic legs pale pinkish-cream.

*Head width:*  $0.558 \pm 0.026$  mm (25 larvae).

*Duration of stadium:*  $3.1 \pm 0.5$  days (46 larvae).

**Third-Stadium Larva.** Head cream, mottled with fawn. Prothoracic shield light green, mottled with cream, and usually with three cream longitudinal lines. Suranal shield light green, mottled with cream or white. Maculation of trunk complex. Mid-dorsal band greyish-green or light olive-green, with a white or cream, often discontinuous, median line. Subdorsal area with marginal white lines and a median band concolorous with mid-dorsal band; median band usually with a discontinuous white median line. Supraspiracular area green, with a discontinuous white median line. Spiracular band narrow, white or cream, occasionally discontinuous. Suprapodal area greyish-green, mottled with white or cream. Mid-ventral area pale grey, suffused with green. Setae of trunk with enlarged cream or white bases that interrupt the general pattern. Spiracles with light- to medium-brown rims. Thoracic legs cream suffused with pale green.

*Head width:*  $0.92 \pm 0.04$  mm (25 larvae).

*Duration of stadium:*  $3.1 \pm 0.5$  days (46 larvae).

**Fourth-Stadium Larva.** Head pale cream, variably mottled dorsally with grey or fawn. Prothoracic shield white or pale cream, marked with dark green; usually a median and a pair of submarginal lines free of mottling. Suranal shield white, mottled with light green. Trunk greyish-green with numerous, frequently irregular and broken, longitudinal white lines; setal bases large and white. Mid-dorsal band medium to dark greyish-green with a discontinuous median white line. Subdorsal area white with a pair of discontinuous, greyish-green median lines. Supraspiracular area green, heavily and irregularly mottled with white. Spiracular band irregular, white or pale cream. Suprapodal area green, of a more greyish appearance than dorsum, mottled with white or pale cream. Mid-ventral area pale grey suffused with pale green. Spiracles with

light-brown rims. Thoracic legs pale cream, suffused with brown distally and with green proximally.

*Head width:*  $1.64 \pm 0.09$  mm (25 larvae).

*Duration of stadium:*  $3.5 \pm 0.7$  days (46 larvae).

**Fifth-Stadium Larva** (Figs. 3, 4). Head flesh-colored, inconspicuously mottled with pale fawn. Arcs free of mottling diverging upward and outward from centre of face. Prothoracic shield pale cream or white, mottled with pale greenish-grey; a median and a pair of submarginal lines free of mottling. Suranal shield pale greyish-green, mottled with white or pale cream. Maculation of trunk highly unusual, and with normal zonation of dorsum difficult or impossible to distinguish. Dorsum creamy-white with a confusing array of circles, bars, and undulating lines of greyish-green. Spiracular band creamy-white. Suprapodal area greyish-green mottled with cream. Mid-ventral area paler green than suprapodal area. Spiracles with light-brown rims. Thoracic legs cream, weakly suffused with green.

*Head width:*  $2.52 \pm 0.08$  mm (11 larvae).

*Duration of stadium:*  $4.9 \pm 0.8$  days (46 larvae).

**Pupa** (Figs. 4, 6, 7). Uniform mahogany brown. Spiracles on abdominal segments 5, 6 and 7 borne in shallow oval pits; spiracular sclerites moderately projecting. Anterior marginal areas of abdominal segments 5, 6 and 7, with a narrow band of fine but rather conspicuous pitting. Proboscis terminating well anterior to apexes of wings. Cremaster consisting of an elongate conical prolongation of the tenth abdominal segment bearing apically four elongate slender setae.

*Length from anterior end to posterior margin of fourth abdominal segment:*  $9.2 \pm 0.3$  mm (14 pupae).

#### ACKNOWLEDGMENTS

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#### LITERATURE CITED

- COMSTOCK, J. A. 1931. Studies in Pacific Coast Lepidoptera. Bull. So. Calif. Acad. Sci. 30: 15-20.
- GROTE, A. R. AND C. T. ROBINSON. 1870. Description of American Lepidoptera, No. 5. Trans. Amer. Entomol. Soc. 3: 176-182.
- HARDWICK, D. F. 1958. Taxonomy, life history, and habits of the elliptoid-eyed species of *Schinia* (Lepidoptera: Noctuidae), with notes on the Heliiothidinae. Can. Entomol. Suppl. 6. 116 p.
- MUNZ, P. A. 1963. A California Flora. University of California Press, Berkeley. 1681 p.

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#### LIFE HISTORY NOTES ON *CALLOSAMIA SECURIFERA* (SATURNIIDAE)

On 29 August 1970, three 2nd instar larvae and nine eggshells of *Callosamia securifera* (Massen) were found on a low shrubby example of its foodplant, *Magnolia virginiana* L. (Sweet Bay). The larvae were found approximately eight miles north of McClellanville, Charleston County, South Carolina. The area is typical of coastal South Carolina, with many of the swampy pine forests where *M. virginiana* is common. The