

integrating populations of *Limenitis arthemis* and *astyanax* butterflies. *Evolution* 22: 699-718.

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

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*Schinia intrabilis* Smith (1893, p. 331) feeds in the larval stage on the blossoms of the Arrowweed, *Pluchea sericea* (Nutt.) Cov. The arrowweed is a willow-like composite that occurs abundantly around seeps and along river banks in the deserts of southern California. During the early blossoming period of its food plant, *Schinia intrabilis* is not a rare insect in appropriate desert habitats.

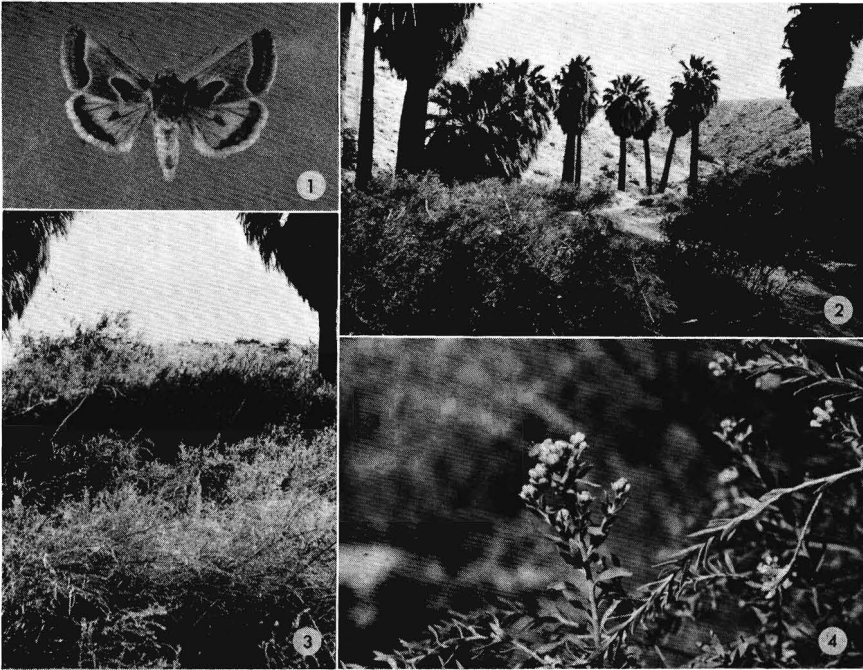
According to Munz (1963), the Arrowweed is distributed from southern California eastward to Texas, but I have examined *intrabilis* only from as far east as Yuma and Ehrenberg, Arizona. The species is univoltine and the period of adult activity is co-ordinated in any area with the single annual blossoming period of the Arrowweed. Specimens in the Canadian National Collection from the deserts of southern California were taken on dates between the middle of March and the end of April.

### Behaviour

*Schinia intrabilis* is evidently a species of exclusively or preponderantly nocturnal habits. In moist areas in which eggs and young larvae could be recovered without difficulty from Arrowweed heads, no adult activity was noted during daylight hours.

Eggs are deposited in the Arrowweed head at a stage when the sepals of the bud have drawn apart at the top sufficiently to expose the florets. Females do not and probably cannot oviposit in the tough, leathery, unopened buds. The egg is inserted among the florets from the top of the head.

Three captive females deposited a mean of 83 eggs, and the maximum



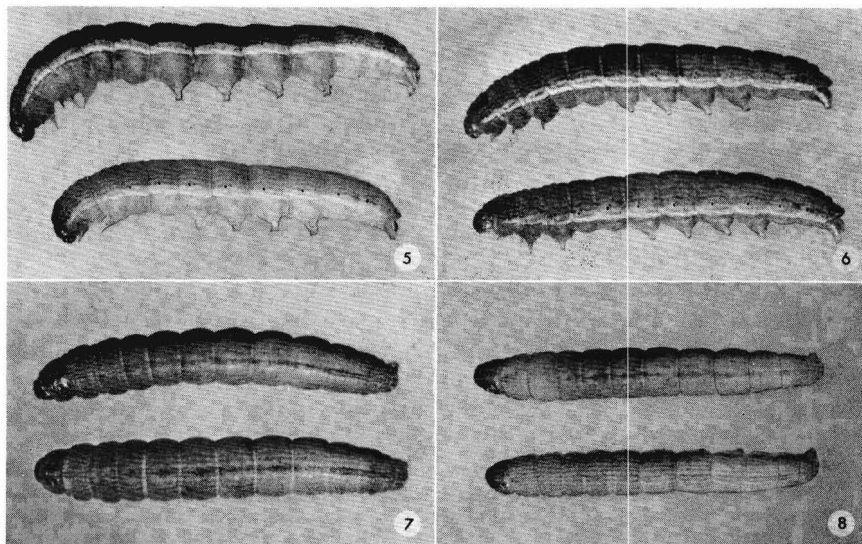
Figs. 1-4. *Schinia intrabilis* Smith, its habitat and food plant. 1, Adult, Twenty-nine Palms, Calif. 2, Willis Palms, near Indio, Calif. 3, 4, *Pluchea sericea* (Nutt.) Cov.

deposited by a single female was 132. Eggs maintained at room temperature hatched on the third and fourth days after deposition.

The newly hatched larva bores into an adjacent floret and tunnels down through it toward the receptacle. The second and subsequent instars feed preponderantly on the developing seeds. Usually by the third stadium, the larva quits the first head and enters a second. Both third- and fourth-stadium larvae attack the heads from the top, and the half grown larvae must curl up within the individual head to remain concealed while feeding. Toward the end of the fourth stadium and during the fifth, the larva feeds on the heads from a position on the stem; it usually attacks the head by boring a hole through the side just above the heavy sepals that surround the base. At the cessation of feeding the larva makes its way to the surface of the ground and tunnels into the soil to pupate.

#### Descriptions of Stages

The following descriptions of immature stages were based on the progeny of seven females taken in the Indio area of southern California. The



Figs. 5-8. *Schinia intrabilis* Smith, ultimate-stadium larvae. 5, 6, Left lateral; 7, 8, dorsal.

durations of stadia listed are those obtained from rearings maintained at room temperature. Rearing techniques employed were the same as those outlined by Hardwick (1958). The estimate of variation, following the means for various values, is the standard deviation.

**Adult** (Fig. 1). Head and thorax light olivaceous fawn. Abdomen paler, cream or creamy-grey. Forewing fawn or fawn-grey, often with an olivaceous suffusion. Transverse anterior line white, angling outward from trailing margin, then curving sharply inward and terminating not on costal margin but at base of wing. Basal space fawn or fawn-grey. Transverse posterior line white, angling inward from costa near apex to a point below reniform spot then curving outwardly to meet trailing margin near outer angle. Median space variably suffused with white or pale grey and thus usually paler than basal and subterminal spaces. Orbicular and claviform spots absent; reniform evident as a dark, ill-defined shade. Subterminal line cream, regular, close to outer margin of wing and parallel to it. Fringe and narrow terminal space concolorous with subterminal space. *Hind wing* white with a brown outer-marginal band and a large brown discal spot; a pale median streak in outer-marginal band. Inner margin of wing often suffused with brown. Fringe white with a yellowish or brownish basal line. *Underside* of forewing shining cream with a large dark-brown reniform spot and a light-brown submarginal band. Hind wing white, with or without brown spots on disc and near anal angle.

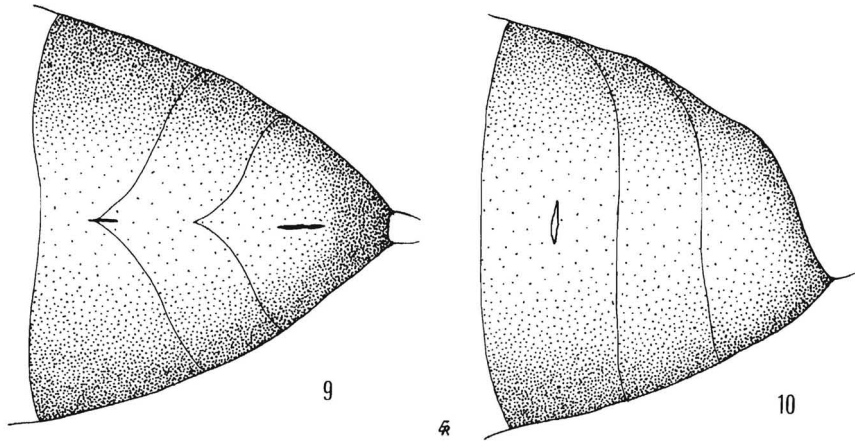
*Expanse*:  $23.5 \pm 1.3$  mm (47 specimens).

**Egg**. Very pale yellow when deposited, and exhibiting little colour change until a few hours before hatching when head capsule becomes visible through chorion.

*Dimensions of egg*: length,  $0.872 \pm 0.025$  mm; diameter,  $0.510 \pm 0.042$  mm (25 eggs).

*Incubation period*:  $3.5 \pm 0.5$  days (104 eggs).

**First-Stadium Larva**. Head medium to dark smoky-brown. Prothoracic and suranal



Figs. 9, 10. *Schinia intrabilis* Smith, apical abdominal segments of pupa. 9, Ventral; 10, right lateral.

shields concolorous with head or somewhat paler. Trunk white, cream, or pale grey. Spiracles with light- to medium-brown rims. Legs medium smoky-brown.

*Head width:*  $0.262 \pm 0.009$  mm (15 larvae).

*Duration of stadium:*  $3.7 \pm 0.9$  days (33 larvae).

**Second-Stadium Larva.** Head light orange-brown, mottled dorsally with light to medium smoky-brown. Prothoracic shield fawn to light orange-brown, variably mottled and emarginated with chocolate-brown. Suranal shield approximating prothoracic shield in colour and similarly marked with brown. Trunk light greyish-cream to pale greenish-grey, usually with two pairs of dorsal and a pair of lateral white lines. Spiracles with dark-brown rims. Thoracic legs fawn to light orange-brown, variably suffused with smoky-brown.

*Head width:*  $0.446 \pm 0.034$  mm (25 larvae).

*Duration of stadium:*  $3.0 \pm 0.8$  days (33 larvae).

**Third-Stadium Larva.** Head warm cream mottled dorsally with light orange. Prothoracic shield fawn, mottled with white and brown and with a white median line. Suranal shield white, lightly mottled with pale brown. Trunk green with numerous longitudinal white lines. Mid-dorsal band light greyish-green, often with a white median line. Subdorsal area consisting of white marginal lines and a median greyish-green band; median band often with a diffuse white median line. Supraspiracular area greyish-green with a white median line. Spiracular band white. Ventral region light grey. Rims of spiracles and bases of setae dark brown or black. Thoracic legs pale fawn suffused with light smoky-brown.

*Head width:*  $0.70 \pm 0.03$  mm (18 larvae).

*Duration of stadium:*  $3.3 \pm 0.7$  days (33 larvae).

**Fourth-Stadium Larva.** Head cream, mottled dorsally with very pale fawn. Prothoracic shield light green with three longitudinal white lines. Suranal shield light green or light fawn variably marked with cream. Trunk greenish-grey at beginning of stadium, becoming leaf-green after feeding; trunk with numerous longitudinal lines of cream or pale grey. Mid-dorsal band green with a median longitudinal shade of cream or pale grey. Subdorsal area cream or pale grey with a pair of median longitudinal green lines. Supraspiracular area cream or pale grey margined by green lines and with a pair of green median lines. Spiracular band white with a discontinuous green median shade. Suprapodal area green, mottled with cream and lightly marked

with fawn. Mid-ventral area greyish-green. Spiracles with black rims. Thoracic legs straw-coloured, often tinged with green proximally, and occasionally lightly suffused with fawn.

*Head width:*  $1.10 \pm 0.03$  mm (25 larvae).

*Duration of stadium:*  $4.0 \pm 0.6$  days (33 larvae).

**Fifth-Stadium Larva** (Figs. 5–8). Larvae occurring in two colour phases, pale fawn and green. Head straw-coloured, faintly mottled with orange, and suffused with green in green specimens. Prothoracic shield pale orange or pale green; three narrow white longitudinal lines usually evident; shield marked with black around bases of setae. Suranal shield pale fawn or green, marked with white and with black setal bases. Trunk pale fawn or light green. Mid-dorsal band somewhat darker than remainder of dorsum. Subdorsal and supraspiracular areas undistinguished, mauve-grey with six or seven longitudinal lines of pale fawn or bright green; longitudinal lines often irregular and discontinuous. Spiracular band white with a median shade of fawn or green. Suprapodal area pale fawn or green, lightly marked with mauve-grey. Mid-ventral area pallid fawn or pale green. Thoracic legs pale fawn, suffused with green in green specimens.

*Head width:*  $1.75 \pm 0.08$  mm (7 larvae).

*Duration of stadium:*  $5.4 \pm 1.1$  days (33 larvae).

**Pupa** (Figs. 9, 10). Medium orange-brown, the appendages often suffused with green. Spiracles on a level with general surface of cuticle; spiracular sclerites weakly projecting. Anterior marginal areas of abdominal segments 5, 6 and 7, each with a rather wide band of prominent pitting. Proboscis terminating well anterior to apexes of wings. Apex of tenth abdominal segment broadly rounded and bearing two short, fine setae.

*Length from anterior end to posterior margin of fourth abdominal segment:*  $8.1 \pm 0.4$  mm (23 pupae).

#### ACKNOWLEDGMENTS

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#### NATURAL INTER-BREEDING OF CLOSE NYMPHALID GROUPS

On June 12, 1971 on the hilltops of Mother Cabrini Shrine in Jefferson County, Colorado, a freshly emerged female of *Melitaea pola arachne* Edwards was found in copulation with a male *Chlosyne gorgone carlota* Reakirt. The male was hanging and the female was flying. The time was 0920 and the legend was Joel Jablonski.

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