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BIOLOGY AND DESCRIPTION OF THE LARVA OF *DICYMOLOMIA METALLIFERALIS*: A CASE-BEARING GLAPHYRIINE (PYRALIDAE)

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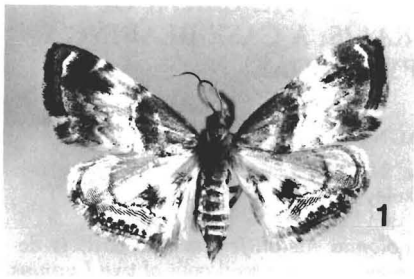
ABSTRACT. The larval biology of *Dicymolomia metalliferalis* (Packard) is described. Larvae were collected from partially opened, necrotic seed pods of two *Lupinus* L. species and reared to adults. Larvae fed from within purse-like cases constructed of silk and detrital tissues. This constitutes the first record of the case-bearing habit for the glaphyriine genus, *Dicymolomia* Zeller. The larva is described and compared with that of *D. julianalis* (Walker).

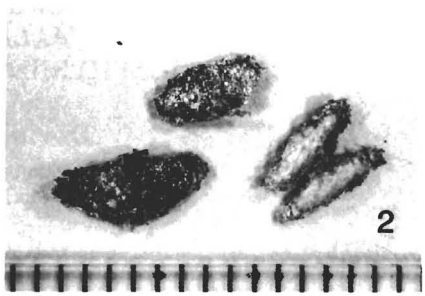
Dicymolomia metalliferalis (Packard) is a day-flying pyralid found from southern Vancouver Island south to San Diego (Munroe, 1972). Although adults (Fig. 1) may be locally common, the early stages of this moth were previously unknown. During the course of a faunal survey of the Lepidoptera associated with *Lupinus* L. species, I reared *D. metalliferalis* from partially opened, decaying seed pods of two perennial *Lupinus* species.

Larvae were recovered from the seed pods of the previous spring's seed set. In most of the inflorescences surveyed, greater than 95% of the seed pods had fully dehisced, releasing all their seeds. However, a fraction of the seed pods had failed to open completely; these partially intact pods were split open and examined for lepidopteran larvae. Over 400 seed pods of *Lupinus arboreus* Sims (ca. 150), *L. chamissonis* Eschs. (ca. 80), *L. albifrons* Benth. (ca. 150), and *L. latifolius* J. G. Agardh (ca. 20) were examined; *D. metalliferalis* larvae were recovered from the latter two species: CA, Marin Co., Nicasio Reservoir, 26-I-1980, ex *L. albifrons*; Contra Costa Co., Tilden Park, nr. Inspiration Point, 2-II-1980, ex *L. latifolius*; and Contra Costa Co., Briones Reservoir, 17-I-1982 and 12-II-1983, ex *L. albifrons*.

The partially intact seed pods from which larvae were recovered invariably showed signs of insect feeding damage. Many of the occupied pods were partially held together by the silk of braconid cocoons which presumably resulted from the parasitism of seed-feeding Lepidoptera. Other seed pods hosting *Dicymolomia* larvae had been attacked by *Apion* Herbst, a common seed-feeding curculionid that occurred in all *Lupinus* species studied. No larvae were collected from intact seed pods; presumably, *Dicymolomia* larvae entered damaged seed pods secondarily.

Most of the larvae were collected in purse-like cases (Fig. 2), but several larvae were recovered from chambers of sparse silk formed in





FIGS. 1 & 2. **1,** *Dicymolomia metalliferalis,* Briones Reservoir, Contra Costa Co., CA. **2,** early instar cases, lower right case opened. Scale in mm.

cavities of the partially intact fruits. However, soon after being brought indoors, these larvae constructed cases. After one week all larvae were observed feeding from within cases where they remained to maturity. Larvae were reared on necrotic seed pod tissues or on a combination of pod fragments and wheat germ.

Cases were constructed of silk with miscellaneous inclusions. One field-collected, overwintering case (length: 0.48 mm) contained portions of a seed coat, seed pod tomentum, larval frass, and an earlier instar head capsule. The case of a mature laboratory-reared larva (length: 1.3 cm) included numerous leaf fragments and wheat germ. Several of the field-collected cases had at least two species of fungi growing on them, and associated mites which presumably were feeding on the fungi. Neither the fungi nor the mites appeared to have had a detrimental effect on the larvae. Larval cases were constructed with an opening at each end.

Pupation occurred within the larval cases. Laboratory-reared adults emerged between 15 May and 25 June (N = 3). However, most of the records for field-collected adults occur later in the summer: CA, Berkeley, 23-VI to 10-IX (12 records, CIS collection).

The larval description is based on six late instar larvae collected at Briones Reservoir, Contra Costa Co., CA, on 17-I-1982 (1) and 12-II-1983 (5). Larvae were distended in hot water and then transferred to 70% EtOH. One larva was cleared in 10% KOH and stained with chlorosol black to facilitate the examination of smaller setae. Measurements refer to a mature fully distended larva. Setal nomenclature follows Hinton (1946).

DISCUSSION

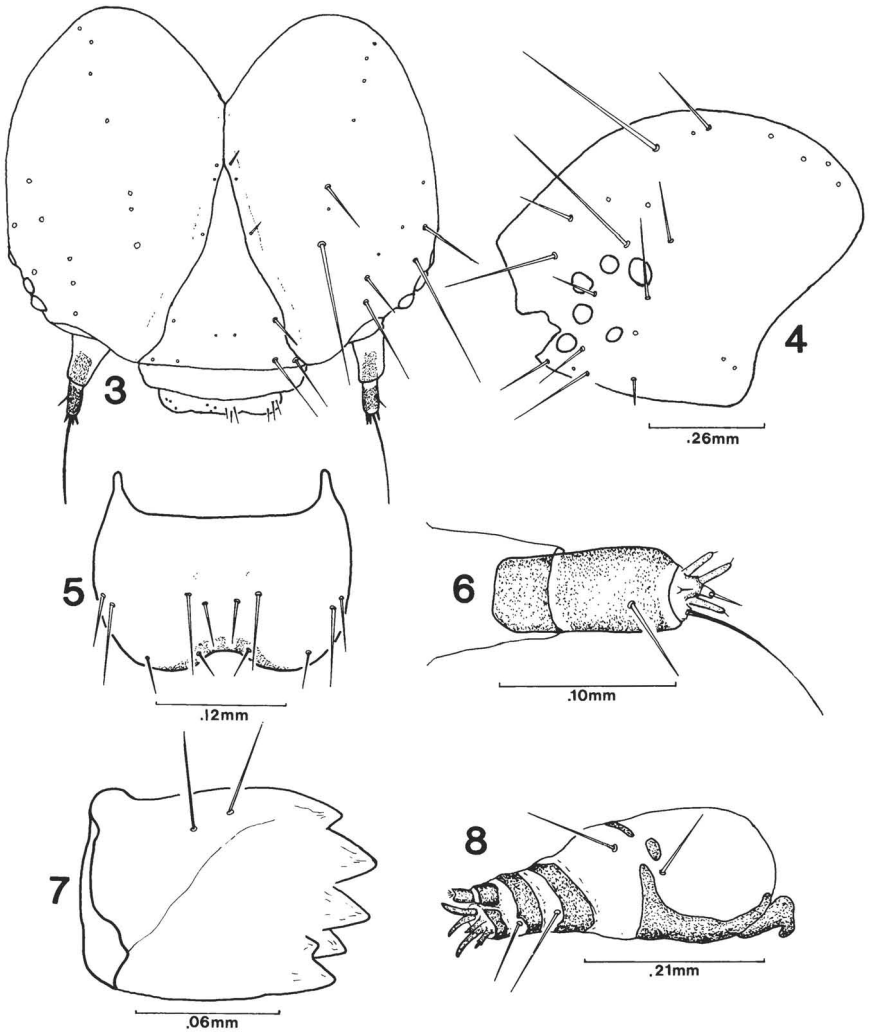
Six species of *Dicymolomia* are reported for North America north of Mexico (Munroe, 1972). Larvae of the genus have not been de-

scribed or figured in detail. However, Forbes (1932) included a setal map of *D. julianalis* (Walker) for segments T1, T2, A2, and A7–9. Larvae of *D. metalliferalis* are readily separable from those of *D. julianalis*. The mesothorax of *D. julianalis* has a large sclerotized shield extending from just anterodorsad of D1 to the dorsal midline, which is absent in *D. metalliferalis*. In *D. metalliferalis* L1 and L2 on T2-A8 and the SV setae on A2–7 are not included on the same pinaculum as in *D. julianalis*. Forbes did not illustrate an SD2 seta in *D. julianalis*, which is present but minute in *D. metalliferalis*.

D. julianalis exhibits a diverse range of larval substrates: larvae are recorded from *Astragalus canadensis* L. and *Cirsium lecontei* Torrey and Gray; as internal feeders in cat-tails (*Typhus*) and cactus stems (*Opuntia*); from senescent cotton bolls (*Gossypium*); and as predators on the eggs and larvae of bagworms, *Thyridopteryx ephemeraeformis* (Haworth) (Munroe, 1972). Although *D. metalliferalis* larvae have been reared from only two lupine species, circumstantial evidence suggests that this moth may utilize an array of larval substrates. Larvae were recovered in rather low densities relative to numbers of adults flying at the collection sites. Furthermore, *D. metalliferalis* adults may be collected in localities with little or no lupine. The decomposed nature of the occupied pods suggests that larvae feed generally on detrital tissues. Lastly, one overwintering larva was reared to maturity on a mixture of seed pod fragments and wheat germ.

Two other species of microlepidoptera were commonly associated with partially intact, necrotic *Lupinus* seed pods. Several fully grown overwintering larvae of *Argyrotaenia citrana* (Fern.) (Tortricidae) were collected inside seed pods; larvae pupated soon after their collection with no indication as to having fed on the seed pods. A member of an undetermined gelechiine genus was frequently collected in the seed pods of *L. arboreus*, *L. albifrons*, and *L. latifolius*. Laboratory-reared larvae were observed to feed on the necrotic tissues of the fruit pericarp beneath sheets of silk. The larvae were smokey-red in color with pale longitudinal stripes.

The case-bearing habit is of general occurrence in several primitive lepidopteran taxa: in the later instars of Incurvarioidea, e.g., Adelinae and Incurvariinae; in the Tinoidea, e.g., Tineidae and Psychidae; and in the Gelechioidea, e.g., Coleophoridae and some Oecophoridae (Common, 1970). Case-bearing is of sporadic occurrence in the Tortricoidea, e.g., *Clysiana acrographa* (Turn.) (Common, 1970) and Pyraloidea, e.g., Nymphulinae and Glaphyriinae. Within the Glaphyriinae, case-bearing has been reported for two genera: *Stegea* Munroe and *Lipocosma* Lederer (Forbes, 1932; Munroe, 1972). Hence, *Dicymolomia* is the third of 15 North American glaphyriine genera for

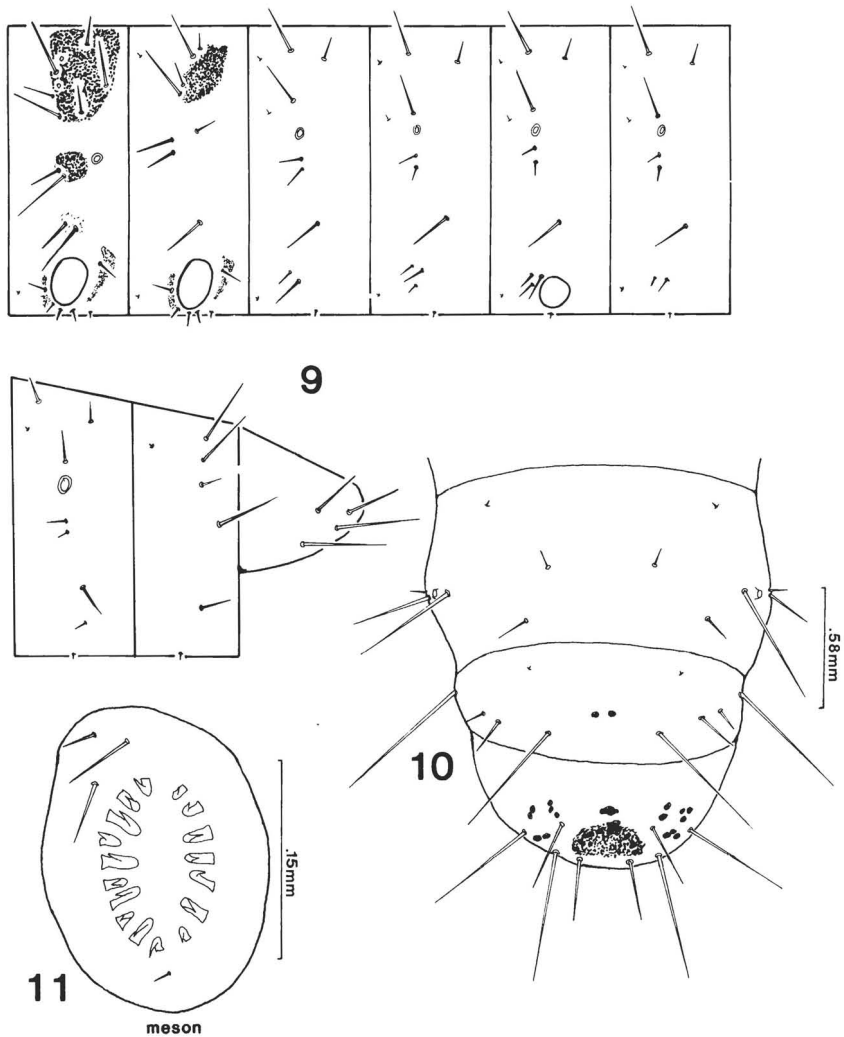


FIGS. 3–8. Head of *D. metalliferalis*. **3,** head capsule, dorsal view, width 0.93 mm. **4,** head capsule, lateral view. **5,** labrum. **6,** antenna. **7,** mandible, mesal view. **8,** maxilla.

which case-bearing is known. Detrivory appears to be especially common among case-bearing taxa relative to other Lepidoptera, e.g., at least some Adelinae, Tineidae, Oecophoridae, and *Dicymolomia*.

DESCRIPTION OF MATURE LARVA

General. Overall length 10.2 mm. Body salmon-orange, intersegmental regions unpigmented in living larvae, color fading to white in preserved material. Setulae indistinct,



FIGS. 9–11. Thorax and abdomen of *D. metalliferalis*. **9,** setal map of segments T1–2, A1–3, & A7–10. **10,** dorsal view of A8–10. **11,** crochets on A6.

visible at 100×. Pinacula indistinct. Spiracles flat, lightly pigmented; spiracles on T1 and A8 twice the diameter of those on A1–7.

Head. (Figs. 3, 4) 0.93 mm wide; frons extending ⅘ of the way to occipital foramen. Head capsule yellow-brown to red-brown. Six stemmata; S1, S2, S3, S4 and S6 equidistant, forming a semicircle; S5 below antennae; S1 almost twice the diameter of other stemmata. Labrum (Fig. 5) 1.25× as broad as long; anterior margin emarginate and heavily pigmented. Antenna (Fig. 6) 0.15 mm; scape lightly pigmented; scape and pedicel subequal in length. Mandible (Fig. 7) with five teeth, ventral tooth notched; molar process moderately developed. Maxilla (Fig. 8) 0.42 mm; stipes with an elongate sclerite along mesal

margin and small free sclerite at level of the spinneret; palpiger and palpus lightly sclerotized. Labium with a hook-like sclerite on either side of spinneret.

Thorax. Prothoracic shield brown; L1 and L2 on a darkened pinaculum; SV setae on lightly sclerotized pinaculum; 5 coxal setae. Meso- and metathorax with sclerite posteriorad of D and SD setae, smaller and paler on metathorax.

Abdomen. (Figs. 9, 10) D1 twice the length of D2 on A1–7; subequal on A8–9. SD1 large, directly above spiracle; SD2 minute. L1 and L2 approximate and in vertical row. A1 with two and A2 with three SV setae. A9 with a pair of subcuticular pigment spots near dorsal midline. A10 with 13 pairs of setae; anal plate irregular with numerous subcuticular pigment spots laterad of anal plate (Fig. 10). Crochets 16–28 in biordinal penellipse on A3–6 (Fig. 11), anterior crochets slightly larger; crochets 15–26 in a biordinal transverse band on A10.

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