

PUPAL ANOMALY OF *RHYACIONIA NEOMEXICANA*
(OLETHREUTIDAE)

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The southwestern pine tip moth, *Rhyacionia neomexicana* (Dyar) (Lepidoptera: Olethreutidae) is a destructive pest of young ponderosa pine, *Pinus ponderosa* Lawson. The biology of this insect has been outlined by Jennings (1972). Larvae feed in upper crown terminal and lateral shoots. Late-instar larvae descend the tree boles and pupate in cocoons attached to root collars of host trees. Cocoons are found at an average depth of 2.6 cm beneath the surface of the soil. The pupal stage, which lasts from July–March, is the overwintering stage of the tip moth.

On 10 November 1971, *R. neomexicana* pupae were dug from root collars of plantation ponderosa pines on the Piedra Ranger District, San Juan National Forest, Archuleta County, Colorado. They were subsequently examined under a dissecting microscope and sexed by position and configuration of the genital pore (Jennings, 1974). One female pupa was found with an abnormally segmented abdomen (Fig. 1b).

Previous reports of lepidopterous pupal anomalies are rare. Lindquist (1964, 1966) reported aberrant olethreutid larvae with extra prolegs. Examples of hysterotely, where structures usually found in an earlier stage appear in a later one, are described by Cockayne (1927) for a tineid pupa and by Haggett (1954) for an arctiid pupa. None of these cases is similar to the *R. neomexicana* pupal anomaly.

Rhyacionia neomexicana pupae overwinter after the moth is fully developed. In this stage they are readily identified by the presence of two black lines in the outer one-third of each forewing, visible through the wing covers of the pupal integument. The pupal abdomen is yellowish brown, with the head, thorax, and wing covers dark brown. There are 10 abdominal segments, although some fusion of the posterior-most segments makes them difficult to distinguish (Fig. 1a). Dorsally, spines are arranged in rows on the abdominal segments. Spines are completely absent on the 1st abdominal segment, while segments 2–7

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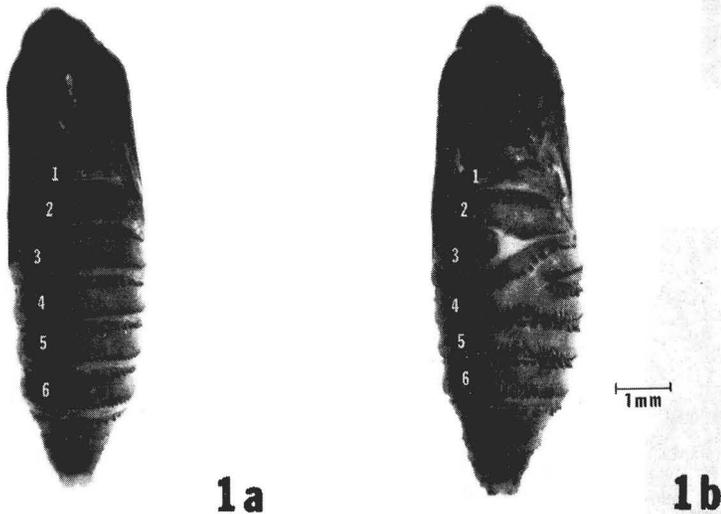


Fig. 1. Pupae of *Rhyacionia neomexicana*: (a) typical female pupa, (b) aberrant female pupa.

each have a cephalic and a caudal row of spines. The cephalic row is usually larger and more prominent than the caudal. The 8th and 9th abdominal segments usually have only a single row of spines. Setae are present on the cremaster, a prolongation of the 10th abdominal segment. Length of female *R. neomexicana* pupae ranges from 6.7–9.8 mm.

The aberrant *R. neomexicana* pupa is 8.3 mm long. Laterally and ventrally the exposed abdominal segments appear normal. Dorsally, the 1st abdominal segment shows no malformation (Fig. 1b). The 2nd segment is enlarged at and to the right of the dorsomeson. The cephalic row of spines on segment 2 is straight while the caudal row is deflected posteriorly. To the left of the dorsomeson, the 3rd abdominal segment is reduced and incomplete. The cephalic and caudal rows of spines on this reduced portion of segment 3 appear to be normal. To the right of the dorsomeson and in the position of the 3rd abdominal segment, an aberrant segment is fused to the 4th abdominal segment. Fusion with the 4th segment is complete near the level of the dorsomeson. A cephalic row of spines angles posteriorly to the left across the dorsomeson and into the region of the 4th segment. The caudal row of spines of this aberrant segment also projects posteriorly but does not reach the level of the mid-dorsal line before joining the 4th segment. To the right

of the dorsomeson and in the position of the 4th segment, a cephalic row of spines is reduced to about one-third the segment width. The caudal row of segment 4 is intact. Spination appears normal on the remaining abdominal segments.

According to Pedder (1965), Balazuc (1948) separated abnormalities of segmentation in Coleoptera into five categories: polymery, symphysomery, helicomery, hemimery, and hemiatrophy. Following this classification, the aberrant *R. neomexicana* pupa displays at least two categories: symphysomery, a partial fusion of two segments, and hemiatrophy, a reduction in part of the sclerites.

What caused this pupal anomaly can only be hypothesized. Pedder (1965), working with pseudoscorpions, concluded that tergal aberrations probably arise post-embryonically during the process of molting. It is conceivable that a mechanical injury during the larval stage could possibly result in an anomaly in the pupal stage similar to the one described here, but the possibility of a genetic aberration cannot be ruled out.

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