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Life History and Some Habits of a Larch Moth, *Paralobesia Palliolana* (Lepidoptera: Tortricidae), in Michigan

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LIFE HISTORY AND SOME HABITS OF A LARCH MOTH, *PARALOBESIA PALLIOLANA* (LEPIDOPTERA: TORTRICIDAE), IN MICHIGAN

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Insect injured shoot tips were discovered in the fall of 1971 on larch (*Larix* spp.) in a mixed larch provenance planting in Shiawassee County, Michigan. Tortricid larvae collected later from them were reared to maturity and identified[3] as *Paralobesia palliolana* (McDunnough 1938). McDunnough (1938) described this species as *Polychrosis palliolana* from insects taken in flight but without definitely associated hosts. The holotype he designated was collected at Milford, Nova Scotia; other specimens he examined were from Quebec and Ottawa, Canada.

Little is known about the life histories and habits of most species of *Paralobesia* except the grape berry moth, *P. viteana* (Clem.), which is a destructive pest of grape culture. Here reported is the life history and some of the habits of *P. palliolana* in Shiawassee County, Michigan. We also collected this insect from larch in Cass County, Michigan. It feeds on eastern larch (*Larix laricina* (Du Roi) K. Koch) and several varieties of Japanese larch (*L. leptolepis* (Sieb. and Zuc.)).

METHODS

Insect collections were made from several varieties of larch during this study. The study was initiated on June 29, 1972 and ended June 27, 1973. Most specimens were collected at 1- to 3-day intervals, except when the insect was dormant; a few specimens were collected at 3- to 5-day intervals in the early spring and late autumn. In all, there were 53 collections containing about 450 insects representing all stages.

Egg and larval collections consisted of several branches or shoots taken from various locations on the trees. The branches and shoots were examined in the laboratory at Michigan State University for the various stages. Specimens of damage were sandwiched between adhesive-coated plastic sheets for future reference. Pupal collections consisted of several bags full of needle litter from beneath each tree. The litter was examined in the laboratory and pupae and cast pupal skins were removed.

At least once weekly, a portion of the insect specimens from the collections were set aside and reared in the laboratory at Michigan State University. Eggs, larvae, and pupae were reared in petri dishes and examined daily for behavior and development, and for monitoring field activities. Fresh larch shoots were supplied every few days. Larval head capsules were measured from freshly preserved specimens and those cast by the reared larvae.

Pupae collected in autumn were sealed in petri dishes containing some litter and overwintered in a garage in East Lansing, Michigan. The pupae were returned to the laboratory on April 1, and the first adult emerged on May 6, 1973; the first adults in the field emerged two weeks later. Adult moths reared in this way or captured in the field were placed in battery jars with freshly cut larch shoots to observe behavior and oviposition.

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[3]Adult moths (5 specimens) identified by W. E. Miller, Principal Insect Ecologist, North Central Forest Experiment Station, St. Paul, Minnesota 55101. Identification included comparison with the holotype.

LIFE HISTORY AND HABITS

Paralobesia palliolana was bivoltine in Shiawassee County, Michigan, during the period of this study (Fig. 1).

Field collections and rearings of over 50 eggs indicated that first generation eggs were laid shortly after mid-May and second generation ones about mid-July. Eggs were deposited on the upper surfaces of the new needle growth located anywhere on the new shoots. Most were deposited singly but up to four were found on one needle. The eggs were typically tortricoid-flattened, ovoid, and yellowish to nearly transparent. Ten eggs measured 0.85 mm (range 0.71-0.96 mm) long by 0.49 mm (range 0.47-0.52 mm) wide.

A frequency histogram of larval head capsule width measurements indicated five larval instars. The mean and range (in mm) for 350 measurements were:

Instar	No. Head Capsules	Mean Width and S.E.*	Range
1st	55	0.198 ± .001	0.18-.22
2nd	55	0.277 ± .001	0.25-.30
3rd	70	0.401 ± .002	0.37-.44
4th	93	0.557 ± .002	0.51-.60
5th	77	0.759 ± .003	0.69-.81

* Standard error.

The first four instars were similar in morphology but varied somewhat from shades of light yellow to brown with a black head capsule. Usually each instar was slightly darker than the preceding one. The fifth or last instar was pale to dark green with an orange-red head capsule. Larval length varied from 3.0 mm to nearly 4.0 mm at maturity.

Larvae of the first generation appeared in late May and the second in late July. The first instar larva mined the larch needle and cast its head capsule in the larval mine. The second

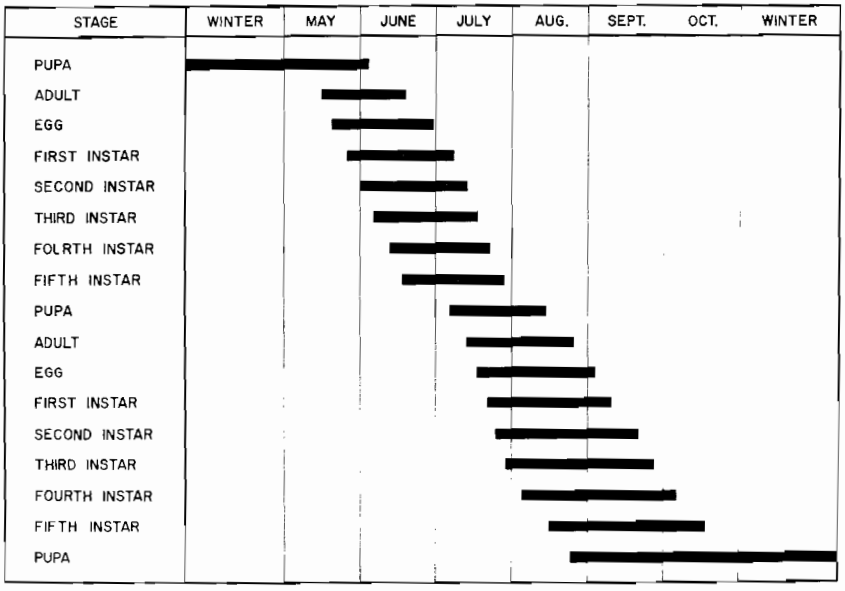

Fig. 1. Seasonal development of *P. palliolana* on *Larix* spp. in Shiawassee County, Michigan.

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instar larva chewed out one side of the mined needle, exposing the mine and leaving a trough-like excavation. Third, fourth, and fifth instar larvae are free feeders that live in a protective structure or nest comprised of skeletonized and partially consumed needles. The nest is covered with considerable webbing embedded with frass, debris, and cast head capsules. Of nearly 200 nests examined, most had 1 larva but as many as 5 were found in a single nest. First generation larvae constructed the nest at the shoot tip (Fig. 2A), whereas 40 to 50% of the second generation larvae preferred the side of the shoot (Fig. 2B).

The fifth instar larva prepared for pupation by dropping to the ground on a silken thread and spinning a light silken cocoon in the needle litter. Larvae of the first generation began pupating in early July, and those of the second generation near the end of August. Second generation pupae overwinter.

Sixteen field collections, including some sweep netting for adults, from the onset of pupation until mid-October yielded no adults in the field indicating there were just two distinct broods and no partial third brood. Careful and persistent field observations in the spring indicated that the first adults emerged in the field in mid-May and were abundant by the end of May. The small mottled adults fully described by McDunnough (1938) spend much of their time resting on the lower branches during the day unless disturbed.

DISCUSSION

Some of the habits of the well known grape berry moth, *P. viteana* (Clem.), are similar to *P. palliolana*. Studies on the grape berry moth in Ohio indicate that the larvae of this species live in a nest too, but it is made from a bunch of webbed grapes instead of leaves. The life cycle of the grape berry moth is somewhat more variable in duration but part of that may be due to differences in geographical location. Its pupa also overwinters on the ground in a cocoon in the leaf debris. The moths of both are fairly inactive during daylight and tend to rest in the shade.

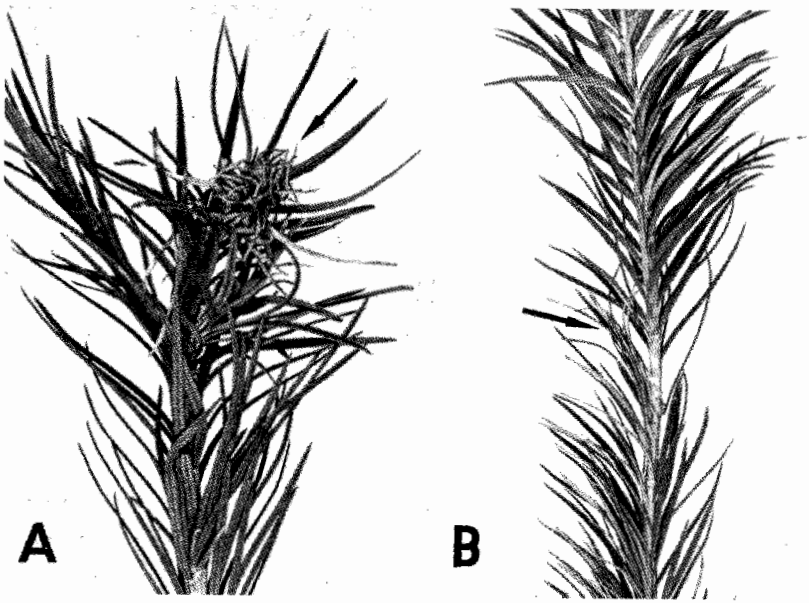

Fig. 2. Fully developed nests of *P. palliolana*: A. first generation nest on tip of shoot; B. second generation nest on side of shoot.

Goodwin (1916) reports 2 broods of the grape berry moth in northern Ohio, and Dozier and Butler (1929) note that a partial to nearly complete third brood occurs near Delaware, Ohio. In this study, however, *P. palliolana* was distinctly 2 brooded. Yet, two adult moths emerged in the laboratory in early September from pupae that formed 10 days earlier. These were from lab reared larvae and probably emerged due to the warmer laboratory conditions. This suggests that a partial third generation could develop in some years or localities where the warm season is prolonged. This may rarely occur in Michigan but could be possible in warmer areas of Illinois, Ohio, Pennsylvania, or West Virginia where scattered larch stands occur (Little 1971).

One fascinating aspect of this insect is the ease with which it can be reared in the laboratory–even under adverse conditions. Several larvae developed on dry foliage and some completed full development on foliage sandwiched between two layers of plastic sheeting. At several stages of the study, damage samples were sealed in this adhesive-coated plastic and eggs that were undetected eclosed and subsequently developed to adulthood. In another instance, a vial containing two eggs and three needles was misplaced. Later when found, it contained one-fifth and one-fourth instar larva with a few needle remants.

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