POSSIBLE QUALITATIVE DIFFERENCES IN INDIVIDUALS FROM COLONIES OF HALISIDOTA ARGENTATA, PACK.

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Introduction

The silver-spotted tiger moth, Halisidota argentata Pack. (Figs. 1, 2, 3), which feeds mainly on Douglas fir, Pseudotsuga menziesii (Mirb.) Franco (Fig. 6), is not considered a serious pest in British Columbia. Natural control has usually prevented populations from increasing to destructive proportions. However, it is a potentially dangerous defoliator and its numbers reached the infestation level on southern Vancouver Island in 1954 (Silver, 1958).

Wellington (1957, 1960) showed that qualitative differences within a population of western tent caterpillar, Malacosoma pluviale (Dyar), could be identified from the shape and size of the tents constructed by the larvae, and that the more active females appeared to be responsible for the production of the more active colonies. Four types of larvae were classified based on differences in behavior, rate of development and viability, and the proportions of different types of individuals within the colonies were determined. Wellington (1964) provided evidence that inactive moths oviposit near their birthplaces, whereas more active ones travel farther and have a higher proportion of vigorous individuals among their progeny. Halisidota argentata is also a colonial feeder. Its colonies are found at all crown levels on Douglas fir, extending from within one or two feet of the ground on open grown trees, to the top. The experiment reported here was made to determine whether there are qualitative differences in Halisidota argentata similar to those found in Malacosoma pluviale. The hypothesis was that Halisidota argentata colonies located at the tops of the trees would be the product of stronger, more active moths capable of flying greater distances to oviposit, while those "low" on trees would be less vigorous and the number and quality of their progeny inferior in terms of the percentage of eggs that hatched and larval viability.

Methods

With the aid of a "Skyworker", seven colonies were collected from "high" positions, 30-45 ft above the ground. Seven colonies were also taken from "low" positions, less than 12 1/2 ft from the ground. All colonies were collected from Douglas fir on the Saanich Peninsula of southern Vancouver Island in March, 1968, when the larvae were in the fourth and fifth instar (Figs. 4, 5). The insects were reared at 68-72 F and 50% relative humidity under a photo period of 12 hr light and 12 hr darkness. Each colony was placed in a separate rearing cage 9 1/2 x 14 x 3 inches with screening on one side and a removable plexiglass plate on the other. The foliage, kept fresh by immersing the stem in water (Fig. 7), was changed twice weekly. Colonies were checked daily for cocoons which were transferred to individual labelled cartons. All female pupae were removed from cocoons nine days after spinning and weighed on a precision torsion balance.

When adults emerged, they were mated within their own colonies. For mating, each pair of adults was placed in a screen-topped jar containing a twig of foliage on which the eggs were usually laid. The eggs laid by both the mated and unmated females were counted. After death, all females were dissected and the number of unlaid eggs recorded.

Eggs from mated females were left in the mating containers until larvae emerged. These larvae were then tested for viability to the end of the second instar.

Results

The female pupae collected from the low colonies were significantly heavier than those from high colonies (Table I). There was little difference in pupal mortality and the adult sex ratio showed no significant difference (Table II). Males spent approximately one day longer in the pupal stage than the females, but the pupal duration for low and high colonies was not significantly different (Table III).

Egg counts showed that six mated females from low colonies and six mated females from high colonies did not lay any eggs. Low colonies had significantly higher total eggs and also a greater number of unlaid eggs in unmated females. The number of eggs laid, however, was not significantly different in the two groups (Table IV).

Although differences are slight, low colonies resulted in fewer eggs being laid, a lower percent hatch and slightly inferior larval survival (Tables V and VI).

Adult longevity data for all mated adults indicated that males lived about two days longer than females and that males and females from high colonies lived slightly longer than those from low colonies (Table VII).

Discussion

In most aspects, there was no significant difference in the two groups. The data, under these experimental conditions, show no differences in high colonies being more vigorous than low colonies. The trend, however, was that the high group deposited more eggs and had a higher percent hatch and slightly better progeny survival. The low group had a significantly higher number of unlaid eggs and a higher mean pupal weight. When the extremes from each group were examined, one collected at six feet and one at 45 feet, the same trend was evident but to a greater degree, as shown below.

Low and high Colonies	% difference in pupal weights	% difference in total no. of eggs	% difference in no. of eggs laid	% difference in no. of eggs hatched
Groups	6.40	.39	4.31	6.55
Extremes	28.62	42.67	14.43	13.39

This suggests that more significant results might have been obtained if colonies had been more rigidly stratified and the high colonies had been collected from greater tree heights. This could be done in the future. If so, other worthwhile areas for comparisons might be fat analyses and tests of flight vigor.

Acknowledgements

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References

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Wellington, W. G. 1957. Individual differences as a factor in population dynamics: the development of a problem. Can. J. Zool. 35: 293-323.

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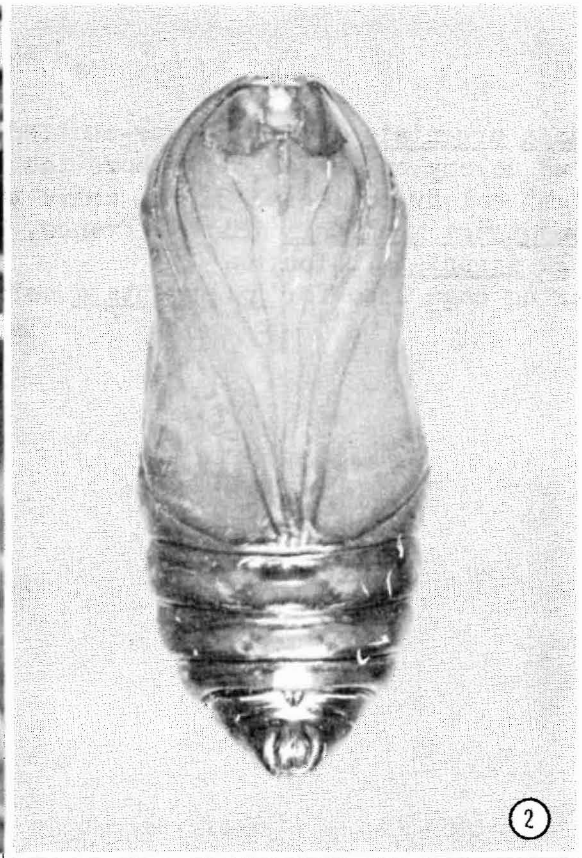
Plate 1

<u>Halisidota argentata</u> Pack., silver-spotted tiger moth.
1. larvae; 2. pupa removed from cocoon; 3. adult and eggs


1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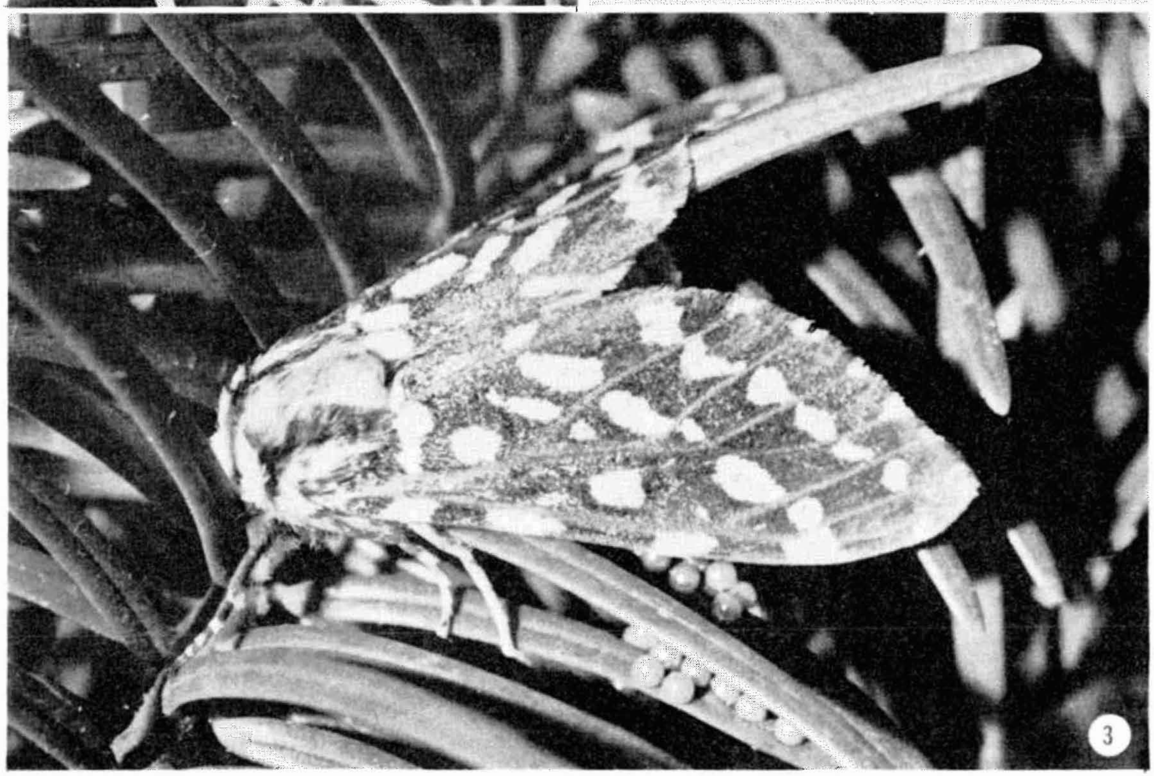
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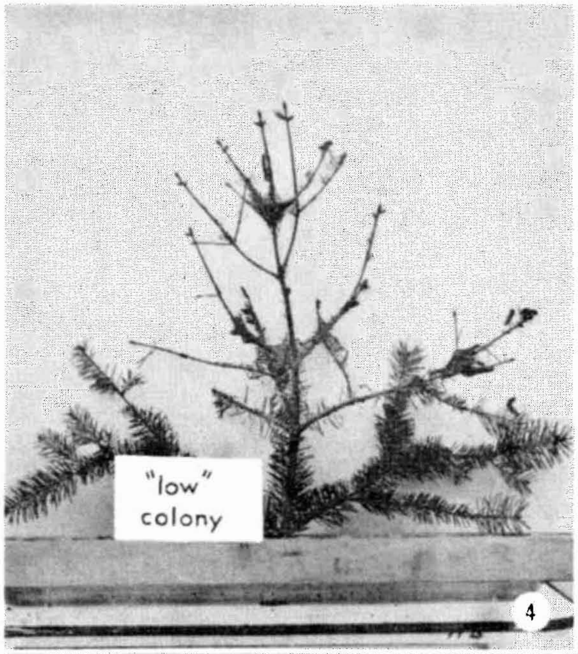
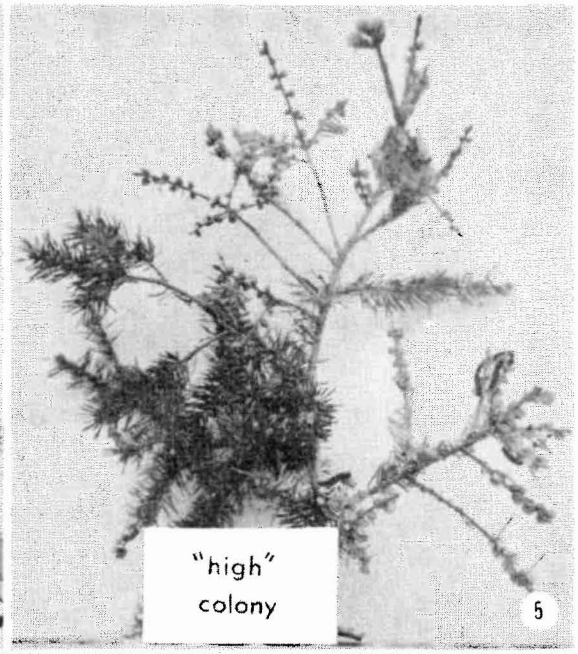
Plate 2

Halisidota argentata Pack., silver-spotted tiger moth.

4. "low" colony collected 6 ft above the ground.
5. "high" colony collected 34½ ft above the ground.
6. Pseudotsuga menziesii (Mirb.) Franco, Douglas fir - collection site of H. argentata colonies.
7. Rearing cage used for H. argentata colonies.


"low"
colony
4


"high"
colony
5


6


7

Table I

Mean pupal weights for *H. argentata*

from low and high colonies

Colony location	No. of female pupae	Mean weight (mg)	Standard error	Value of "t"
Low	94	603.21	± 7.83	*3.202
High	96	566.99	± 8.23	

* Significant t .01

Table II

Pupal survival and adult sex ratio in *H. argentata* from low and high colonies

Colony location	No. of pupae ♂	♀	Total	Pupal survival	Adult sex ratio ♂ : ♀
Low	94	73	167	95%	1.0 : 1.3
High	90	69	201*	92%	1.0 : 1.0

* 8 pupae parasitized; not included

Table III

Pupal duration for *H. argentata* from low and high colonies

Colony location	No. of days (females)	Standard error	No. of days (males)	Standard error
Low	29.64	± 0.27	30.65	± 0.20
High	29.03	± 0.43	30.64	± 0.41

Table IV

Egg counts from <u>Halisidota argentata</u>

from low and high colonies

Colony location	No. of females	Mean no. of eggs laid	Standard error	Mean no. of unlaid eggs	Standard error	Mean total eggs	Standard error
			Mated females				
low	69	188.01	± 23.16	265.44	± 24.98	453.45	± 11.73
high	71	206.76	± 24.48	244.94	± 24.03	451.70	± 11.21
			Unmated females				
low	21	33.24	± 11.33	473.05	± 21.40	506.29	± 21.12
high	21	45.43	± 20.30	402.86*	± 25.59	448.29*	± 19.26

* Significant t .05

Table V

Hatching of eggs laid by mated *Halisidota argentata* from low and high colonies

Colony location	No. mated females that laid eggs	Mean no. of eggs laid	Mean no. of eggs hatched	% hatched
Low	63	205.92	108.25	53
High	65	225.85	133.49	59

Table VI

Survival of 1st and 2nd instar *Halisidota argentata* larvae

produced by parents from low and high colonies

Colony location	No. of 1st instar larvae	No. dead in 1st instar	% dead in 1st instar	No. of 2nd instar larvae	No. dead in 2nd instar	% dead in 2nd instar
Low	6820	406	5.95	6414	320	4.99
High	8677	490	5.65	8187	279	3.41

Table VII

Adult longevity of mated male and female

Halisidota argentata from low and high colonies

Colony location	No. of mated females	Mean no. of days	No. of mated males	Mean no. of days
Low	69	7.68	68	9.98
High	71	8.54	71	10.58