TECHNIQUES FOR REDUCING MORTALITY WHEN REARING LARVAE OF CECROPIA MOTH (SATURNIIDAE)

T. R. PRIDDLE
Calgary, Alberta, Canada

Considerable difficulty has been experienced in the past in rearing larvae of *Hyalophora cecropia* (Linneaus) in confinement. Dr. J. M. Cameron, head of the Insect Pathology Research Institute at Sault Ste. Marie, Ontario, observed (personal communication) that larvae are extremely sensitive to handling and often die after being moved to new food. Mortality was reduced by allowing larvae to crawl to new food by themselves, but losses were still excessive. Dr. Cameron suggested larvae be caged on growing vegetation, but this requires considerable equipment. Villiard (1964) achieved 95% success in rearing larvae caged outside compared to only 60% when reared indoors. He noted that larvae reared indoors produced smaller adults.

Rearing of 182 larvae from eggs laid by one female was attempted in 1963. While mortality occurred at all stages of development some critical periods were evident. Mortality peaks were associated with first- and last-instar larvae and during molting and pupating. Mortality of first-instar larvae was highest during the first three days after hatching, then gradually tapered off. Larvae appeared to have increasing difficulty with successive molts, the mortality rising each time. In later stages it was observed that the outer skin usually adhered firmly to all but the first four or five segments and in most cases remained unbroken. After a few hours the skin hardened and sometimes cracked or flaked in an irregular pattern. Before the final instar and immediately following an abortive attempt to molt, several larvae were able to push their feet and prolegs through the old skin and resume feeding, but none survived.

Last-instar larvae suffered the heaviest mortality. The earliest abnormal symptom was a brownish mottling just beneath the surface of the skin which increased in area and intensity as pupation approached. Several days after the mottling appeared a brownish fluid discharged from the anus and formed a heavy crust. The frass became damp and greenish in color. In another day or two, larvae appeared to be grossly distended when viewed from above but were, in fact, simply "flattened out." Locomotion and muscular coordination became difficult. Feeding eventually ceased entirely and the larvae succumbed after lingering for as long as three weeks.

Pupating larvae also had difficulty completing their molt. Cocoons

were evaluated on the basis of weight and the light ones were opened after a month or so. Again there was the evidence of the stretching of the skin over the first few segments, but not sufficient to break it. Dehydration apparently had set in very quickly, causing the marked loss of weight. Secondary fungus infection invariably occurred, probably hastening the process. Virus disease was suspected and one of the affected specimens was sent to the Insect Pathology Research Institute at Sault Ste. Marie, but no virus infection could be detected.

During the 1963 rearing, the larvae had been housed in a single cardboard box and were considerably overcrowded. Moreover, the room in which they were placed became excessively hot. In 1964 a cooler room was provided, and more boxes were used with fewer larvae in each box. The Manitoba maple supplied for food was kept fresher by placing it in water, although *Cecropia* larvae seemed to show little preference for fresh food when it was provided, frequently clinging to a fresh leaf while crunching away at a dehydrated remnant of an earlier feeding.

Young larvae in the 1963 rearings had been removed from the old food with a small piece of paper deftly slid under them. They were then dropped onto the new food by lightly tapping the paper. In later stages they were allowed to crawl to the new food unless they had attached themselves to the covering net, in which case they were plucked off by hand. Following Dr. Cameron's advice, it was decided that the bulk of the larvae would not be handled at all during subsequent rearings.

In May of 1964 Mr. C. E. Brown of the Calgary Forest Entomology and Pathology Laboratory supplied me with eight cocoons. A particularly large male was mated with three females and a fourth female was mated with a different male. Approximately 700 eggs were obtained and most of them produced larvae. It seemed probable that careful observation during rearing would provide the key to reduced mortality. Consequently, the larvae were scrutinized by both my wife and myself for several hours each day.

The effects of handling were studied on a sample of about 50 larvae. Those that dislodged readily suffered little damage, but those removed with difficulty were invariably injured. When placed on the new food they raised the posterior segments and frequently clung to the food only with the thoracic legs. Feeding ceased at once and all died within 24 hours, most of them still maintaining the unnatural posture. When forced removal was stopped, mortality declined immediately and no losses were incurred in young larvae after the third day.

On the fifth day following emergence of the larvae my wife noted that

when supplied with their morning food they tended to congregate around the stems, particularly at the cut end. The larvae appeared to be attracted either by the water in which the stems had been immersed, or the sap, or possibly both. The groups dispersed after 10 or 15 minutes and commenced feeding on the leaves. Small droplets of water were placed on the leaves to study the reactions of larvae. They were immediately attracted to the droplets which were promptly siphoned up. Moreover, the speed with which the droplets disappeared was quite as astonishing as the insatiable capacity of the larvae. From this point on the food was liberally sprinkled with water (chlorinated) once a day at the morning feeding. At the time of writing, with pupation almost completed, none of the mortality symptoms previously described have appeared. While the cycle is not complete, nearly all of the larvae finished their growth in a very healthy condition.

The problem of handling becomes less important after the first two weeks following hatching and well-grown larvae can be handled without any adverse effect. My six-year-old daughter successfully reared 18 out of 19 larvae using the methods outlined except that in later stages they were handled quite vigorously several times a day to ensure "that they behave themselves properly, eat all their food, and don't fight with each other."

My own losses, starting with 400 larvae selected at about the seventh day, have been held to less than 3% and this small mortality is attributed to overcrowding and freak accidents. Nearly all larvae came through in a healthy, fully fed, clear-skinned condition.

Results indicate that *Hyalophora cecropia* larvae can be reared successfully indoors, using improvised rearing equipment, providing that the following two requirements are met:

1. No handling of first- and second-instar larvae.
2. Supply adequate water at least once every 24 hours by sprinkling the leaves of the food plant.

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Literature Cited

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