

AN OUTBREAK OF NYMPHALIS CALIFORNICA NEAR LAKE ALMANOR, CALIFORNIA

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On July 10, 1951, an outbreak of caterpillars of the California tortoise-shell butterfly (*Nymphalis californica* (Boisduval)) was noted near Lake Almanor in the vicinity of Prattville, Plumas County, California.

The chief shrubs of the coniferous forest at 4500 feet elevation are manzanita (*Arctostaphylos patula* Greene) bitter cherry (*Prunus emarginata* (Douglas) Walpers), squaw carpet (*Ceanothus prostratus* Benth), and mountain whitethorn (*C. cordulatus* Kellogg), but the caterpillars ate only leaves of the last-named species. Their feeding and defecating produced a continuous crackling sound in the brushfields.

The outbreak covered hundreds of acres but was localized in discontinuous patches which varied in size from few to many shrubs. By the time the caterpillars pupated, which was between July 10 and 14, nearly all the whitethorn of the infested areas had been defoliated. A month later these same shrubs were again fully clothed with leaves.

Caterpillars about to pupate deserted the defoliated whitethorn, migrated across ground, and ascended plants which gave shade and cover. The greatest concentration of chrysalids occurred on the underside of boughs of white fir, but manzanita, willow, cherry, ponderosa pine, Douglas fir, and incense cedar also were utilized. Some caterpillars pupated at ground level; others climbed to a height of ten or more feet.

Caterpillars migrating across ground were attacked by giant carpenter ants (*Camponotus levigatus* (F. Smith)) and golden-mantled ground squirrels (*Citellus lateralis* (Say)). With little effort the squirrels captured any desired number of larvae, and study of the stomach contents of trapped specimens revealed that caterpillars were then the main food.

Not being arboreal, the squirrels took few chrysalids. On the

¹ My records are from an investigation into the influence of rodents on reforestation conducted by the Department of Zoology of the University of California at Davis, in cooperation with the California Forest and Range Experiment Station of the United States Forest Service.

other hand, chipmunks (*Eutamias amoenus* (Allen), *speciosus* (Allen), *townsendii* (Bachman), and *quadrimaculatus* (Gray)) seemingly did not relish the hairy caterpillars, and they searched instead in the trees and bushes for chrysalids. *E. amoenus* ate practically nothing else. Doubtless other kinds of rodents, such as the nocturnal white-footed mice, also ate *N. californica* stages, but no study was made of their feeding habits.

Sometimes a chipmunk would be attracted by a pendulant chrysalid thrashing wildly from side to side and audibly striking an adjacent leaf or twig. In one instance, I noted a small wasp clinging to a swinging chrysalid. In spite of the violence of the movements, it was not dislodged. Parasitism by wasps could not have been heavy, for at least 80 per cent of some 50 pupae that I collected survived to maturity, and many of those that died had been damaged in transit.

When I returned to Lake Almanor on August 14, the butterflies had emerged and gone. None was to be seen. Presumably they had migrated to the northeast into Lassen National Park and surrounding areas.

According to the Park Naturalist, Mr. P. E. Schulz, the invasion of the park was one of the heaviest on record. He noted the first swarm on July 26, but the greatest number of butterflies did not appear until early August. One ranger saw a tremendous concentration of them flying up the nearly vertical face of Brokeoff Mountain, streaming over the ridge some two to four feet above the top, and cascading down the opposite side. The insects seemed to drift with the air currents. On August 19, I saw innumerable butterflies ascending the barren east slope of Mount Lassen and swirling about the summit at an elevation of over ten thousand feet. A severe hailstorm that afternoon killed or drove them away. Storer (1933 *Pan-Pacific Entomologist*, 9(2):67-68) recorded myriads of butterflies of this species streaming up the east slope of Mount Lassen on July 30, 1931.

At Lake Almanor in 1951 there was no further occurrence of caterpillars, at least until mid-September when I left the region. In regard to predation it should be noted that rodents which ate caterpillars and chrysalids were numerous; yet they did not prevent a major outbreak of the butterflies. I observed no predation by birds. In 1911, Bryant (*Condor*, 13(6):195-208) found that the Brewer blackbird destroyed a significant number of butterflies.



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