CANADA

Timber Talks

Department of Fisheries and Forestry

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INSECT PROTECTION BY COLOR CHANGES No. 57

Animals and insects have various means of protecting and maintaining their populations. One is to change color to make them less conspicuous in their natural habitats. Pupae of the pine butterfly, which seriously defoliated ponderosa pine near Okanagan Landing, B. C., were green, greenish-black or black. Such coloration differences have been attributed to parasitism and to sex.

To obtain an understanding of the basis for pupal coloration, larvae were collected at the site of the outbreak and reared in the laboratory. Relationships between pupal coloration and sex of emergent adults, incidence of parasites, availability of food and differences in light and background color during larval development were studied. The tests were done in screen-topped sealers or incubation cabinets with incandescent illumination, at temperatures ranging from 20 to 25° C. Larvae used for the nutrition study were fed ponderosa pine needles at daily or weekly intervals; in other experiments larvae were fed daily, and in the prepupal stage placed on foliage of either the current growth year, the previous year or on defoliated twigs. Artificial backgrounds were provided by the use of open-topped white or black paper boxes.

A relationship was not found between pupal coloration and sex of the adults nor were dark pupae always parasitized. Pupation often occurred on defoliated twigs and the pupae were usually heavily pigmented. This suggested that a limited food supply during larval development might trigger pigment formation at pupation. Within a common background, however, differences were not evident in the color of pupae from well-fed or underfed larvae. Pupae from those which had been placed on foliage of the current growth year had the least pigmentation and those placed on the dark defoliated twigs the greatest. This trend was substantiated when white and black artificial backgrounds were used. Laboratory tests conducted in partial and complete darkness suggested that the development of pigmentation is light sensitive.

Green pupae on twigs and blackish pupae on new foliage are rarely encountered in the field. It is conceivable that green pupae on twigs are those whose light sensitive stage occurred during darkness, and that pupation must rarely occur at night. Alternatively, pupae that contrast sharply with their background may have been eliminated by predators. A relationship between the interaction of light and background conditions, and the provision of protective coloration during a vulnerable stage of development seems apparent.

REPORT: Factors Influencing Pupal Coloration in Neophasia menapia F. & F. W. John S. Downton and D. A. Ross, Forest Research Laboratory, Vernon, B. C.