

from larvae or from eggs will know how effective the parasites often are. In the northern woods, under average conditions, these insects cause an immense annual mortality among such pests as the fall webworm, forest tent caterpillar, and spruce budmoth. Under particularly favorable conditions these parasites may so supplement the work of other factors in control as to all but eliminate such an injurious insect as the forest tent caterpillar from an area as large as New Brunswick.

Thus the actual killing value of insect parasites is fully as great as that of any of the various factors making for numerical reduction of injurious forest insects. It may be noted, moreover, that the parasites, and, to a lesser extent, the predacious insects, are distinguished by having a regulative value in control. When the forest tent caterpillar, for instance, is scarce in a district it is usually true that the percentage of parasitism is low; when such a caterpillar increases so, as a rule, does the percentage of parasitism. Thus the tendency of these organisms is to keep their food supply neither exceedingly scarce nor overly plentiful.

A Disturbed Balance

With this kaleidoscopic and necessarily sketchy review of the more important restraining influences upon insect activity in the woods, we have a clue to the causes of insect outbreaks. Outbreaks result when for some reason one or more of these restraining influences have not come into play. Probably more often than not, the prime cause of an outbreak is a lack of insect parasites before the insect host concerned is noticeably abundant. When an abundant insect is suddenly eliminated by climatic vagaries, or epidemic diseases, or what not, over a comparatively large area such as Prince Edward Island, the parasites are also eliminated from the same area, that is, they perish of starvation. If into such a parasite-free area a few moths be subsequently blown, their progeny in a few years' time may produce an outbreak.

With a consideration of the nature of an insect outbreak in mind it is now possible perhaps to answer the question as to whether or not anything can be done in a practical way to control, or better still to prevent, insect outbreaks. Man is impotent to manipulate the vagaries of weather or to do very much in the way of starting epidemic diseases. He can, however, and should to the utmost of his ability encourage and protect insectivorous birds.

Distributing Parasites

Moreover, through a knowledge of the insect parasites and insect predators of given destructive species throughout their geographical range, he may in many cases discover that certain of these parasitic or predatory species present in one part of the insect host's range are lacking in another. By collecting, transporting and colonizing such species, he may help to check or may even prevent outbreaks. Such operations must of course be based upon careful study. The Dominion Entomological Service has an unusually clear-cut case of this kind under consideration at present. The forest tent caterpillar which ranges from coast to coast through the Canadian forest regions is at present comparatively uncommon in most of this range. At Sylvan Lake, Alberta, however, an outbreak of the insect has been in progress for some three years. Upon investigation it was discovered that none of the insect parasites effecting this forest pest in other parts of the country were operating there. It is proposed that certain of these parasites, known to be abundant on the lower end of Vancouver Island, be colonized at Sylvan Lake.

WOOD MEAL MANUFACTURE

The production of wood meal as a foodstuff will soon be realized. A factory for this purpose is connected with the eastern army headquarters at Souvaki; there are two factories using **Steffen's** method, and another being built. The War Committee for Cattle Food Substitutes controls the use of this meal.—German official report.