THE NATURAL CONTROL OF INSECTS IN PINEWOODS

I. FACTORS INFLUENCING THE INTENSITY OF PREDATION BY SONGBIRDS

by

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I. INTRODUCTION

This paper is a contribution to the study of the natural control of animal populations. It deals with the role played by birds in regulating insect numbers.

Although it is obvious that the size of natural populations of animals is regulated, the mechanism of this process is poorly understood. It is evident that abnormally high densities in some way or another cause mortality and emigration to exceed reproduction and immigration. The reverse effect is found when the density falls exceptionally low. Hence, one or more of the factors just mentioned must vary in relation to population density, but precise information about this relation is still very scanty and there is a great need for detailed investigations.

Thus, a first approach to the problem is to measure the rates of mortality, emigration, reproduction and immigration at different densities, and to investigate the mechanisms involved. The mortality factor is complicated because it is the result of a number of different agents. Each of these may have a different relation to population density, and consequently needs to be studied separately. Moreover, the possibility of their interaction must be considered.

Such an analysis should be followed by a more synthetic approach. If all factors involved had been measured, it would be possible to give an exact quantitative description of the whole regulatory system. This, of course, is still far from being realised for populations under natural conditions. Some important questions, however, may be asked beforehand. For instance, it is known that the density of one species is often stabilised at different levels in different habitats. Further, the range of fluctuations is very different for different species and also for the same species in different habitats. These phenomena have important ecological implications. Hence, the question of their causation deserves every attention. The answer may increase our insight into the organisation of communities.

With these general views in mind, we studied the influence of birds on the populations of insects in pinewoods. As VARLEY (1953) has pointed out, woodland insects are favourable objects for the study of natural control, especially because human interference with their habitat is only slight. Moreover, forestry entomologists have accumulated much information about the life histories of tree insects and their parasites. Finally, work on pest control has yielded many data on the trends of population densities from year to year.

In spite of the occurrence of outbreaks, the populations of woodland insects show "restricted fluctuation" (LACK, 1954, see ch. II), which is the effect of a regulating mechanism. As they normally live in very