What might be carrying capacity of sheep (35-1)?
(1,700,000 +/- 100,000 -- read scale correctly)

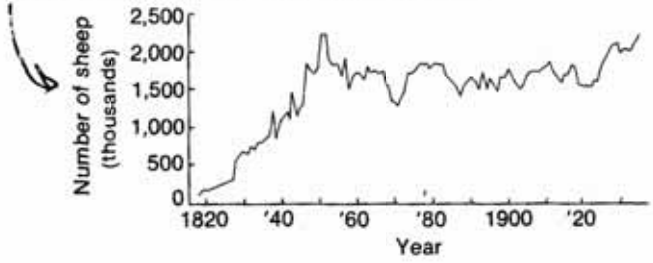

Figure 35-1. Number of sheep on the island of Tasmania since their introduction in the early 1800's (after Davidson 1938).

The size of natural populations is rarely constant.

Because the birth and death processes that determine population growth are sensitive to changes in the environment, population fluctuations directly follow variation in the environment. The frequency and magnitude of fluctuations in natural populations depend both on the variability of the environment and the life span of the individuals in the population. For example, after sheep became established on Tasmania, their population varied irregularly between 1,230,000 and 2,250,000 individuals over nearly a century (Figure 35-1). Short-lived organisms are more sensitive to short-term fluctuations in the environment and their populations can fluctuate dramatically (Figure 35-2). Sheep live for several years, so at any given time the population is composed of individuals whose births occurred over a long period, thereby evening out the effects of short-term fluctuations in the environment on population size. The lifespan of the single-celled algae that constitute the phytoplankton of a lake, however, is measured in days; the turnover rate of algal populations is therefore extremely rapid, making the populations vulnerable to the vagaries of short-term environmental fluctuations.

Not all species' populations respond to the same environmental factors, even though they may be otherwise similar ecologically. For example, fluctuations in the numbers of four species of moths, whose larvae all feed upon pine needles, were followed for sixty years in a managed pine forest

Offer explanation for what regulates population of Panolis (35-3).
(Competition with other three species may keep down numbers, suggesting Panolis doesn't compete as effectively. Peak periods of Panolis generally coincide with minimums of other three, especially more abundant Dendrolimus and Bupalus. This differs somewhat from what described in the text.)

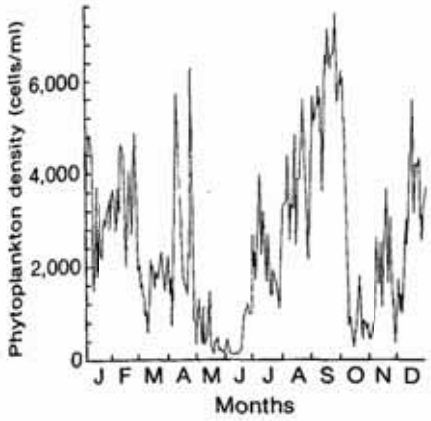

Figure 35-2. Variation in the number of phytoplankton in samples of water from Lake Erie during 1962 (after Davis 1964).

in Germany (Figure 35-3). The populations were sampled by counting the number of pupae (or hibernating larvae in *Dendrolimus*) per square meter of forest floor. The populations fluctuated by factors of one thousand and even as much as ten thousand, over a few years. Furthermore, the peaks and troughs of the four species' populations did not coincide closely, suggesting that even though the populations fed on the same resource in the same forest, they were controlled by independent factors. The lack of correlation among the population trends virtually eliminates weather and food supply as major factors in population control, leaving open the possibility that specialized predators or parasites may have been involved.

In seasonal environments, reproduction is restricted to that portion of

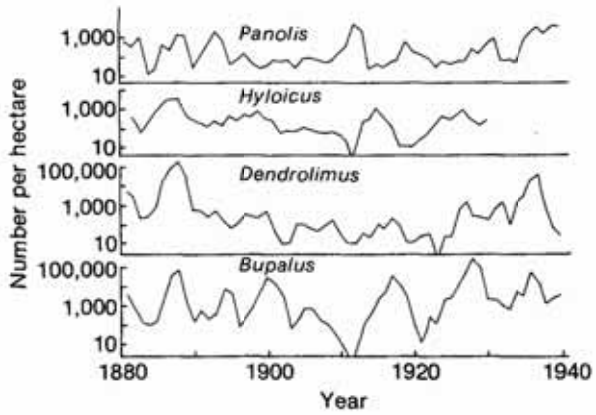

Figure 35-3. Fluctuations in the numbers of pupae of moth species (hibernating larvae in *Dendrolimus*) in a managed pine forest in Germany over 60 consecutive midwinter counts (after Varley 1949).