

such exponential increases at one time, followed by equally rapid declines within the lake, followed by equally rapid declines.

15.4 POPULATION DISPERSION

Populations have a tendency to disperse, or spread out in all directions, until some barrier is reached. Accordingly, population dispersion is the movement of individuals into or out of the population area. It takes three forms: **emigration**—one-way outward movement; **immigration**—one-way inward movement; and **migration**—periodic departure and return. Dispersion supplements natality and mortality in shaping population, growth and return to density, and also it plays a significant role in the distribution of plants and animals even in the areas previously unoccupied by the members of the population. Most types of population dispersion occur due to a number of reasons such as for obtaining food, avoiding predators, preventing overcrowding, result of action of wind and water, environmental factors as light and temperature, breeding behaviour, physiological reasons as secretion of some hormone or for interchange of genetic material between populations.

Emigration

Emigration under natural conditions occurs when there is overcrowding in the migratory locust, lemming, grouse, snowy owl, snowshoe rabbit, Arctic fox, gray squirrel and occasionally in other species. This is generally regarded as an adaptive behaviour that regulates the population on a particular site and prevents over-exploitation of the habitat. Further, it leads to occupation

new areas elsewhere. By dispersing into new localities, there is opportunity gained for interbreeding with other populations leading to more genetic heterozygosity and adaptability. It is, of course, population pressure that is responsible in large part for the dispersal of young and extension of ranges into new areas. Under normal conditions adult animals, especially among the higher vertebrates, are well established on their territories and the young are forced to seek homes elsewhere. Among insects, there is a relation between emigration and inherited behaviour tendencies. Individual tent caterpillars, both larvae and adults, differ markedly in the extent to which they show activity even within same colony. In the development of populations of excessive size, spread of infestations of the insect into new regions is largely by the more active individuals. The outbreak finally terminates when the proportion of sluggish individuals comes to predominate in the population (Wellington, 1966). Continuous emigrations are rare and when they occur, result in **depopulation**. Equilibrium of populations is maintained in such circumstances by enhancing the reproductive ability as well as by decreased mortality among the populations.

Immigration

Immigration leads to a rise in population level, causing an **overpopulation** which may lead to an increase beyond the carrying capacity. These immigrations result in increased mortality among the immigrants or decreased reproductive capacity of the individuals. Both emigration and immigration are initiated by weather and other abiotic and biotic environmental factors.

Migration

Migration is a peculiar kind of population dispersion which involves the mass movement of entire population. This can occur only in mobile organisms and best developed in insects such as desert locust, *Schistocerca gregaria*, migratory locust, *Locusta migratoria*, butterfly, *Danaus plexippus* and in the migratory dragonflies, *Libellula quadrimaculata* and *Pantala flavescentis*; in fishes as salmons and eels, in birds and in certain mammals. Most two-way migratory movements are rhythmic processes of population and regular periodicity is a common feature. Very often, environmental periodicities control these migratory movements, as for example day and night rhythms, lunar periods, tides and changing seasons. The monarch butterflies, *Danaus plexippus*, travel very long distances and their migrations are found to be pathed every year through their same conventional routes, and their migratory movements are initiated by the oncoming winter and the return trip being influenced by spring.

In most cases, migration of population may occur for food, shelter, or reproduction. Better utilisation of uninhabited or hitherto untouched habitats and their resources are the greatest benefits derived from the migratory movements. However, during migration of population, mortality of numerous individuals may occur due to different ecological hazards such as temperature fluctuations, scarcity of food, predation, etc. Anyhow, migration has certain benefits for populations—as it enables wider dispersion of populations; it avoids intraspecific competition for food, shelter or any other means.