

**Department: Zoology**  
**Course name: Ecology and Applied Zoology**  
**Course code: EDU249**

### Population

#### **Population regulation**

Population size is regulated by two limiting factors. These factors are called

(1) Density Dependent (2) Density independent Factors

In population ecology, limiting factors are factors in the environment that control various aspects of a population. Some limiting factors come into play depending on the density of the population, and others are unrelated to the population density. The latter are referred to as density-independent factors. Density dependent limiting factors are related to living organisms while density-independent limiting factors are related to the environment.

#### **Density Dependent Limiting Factors**

Density dependent limiting factors cause the per capita (per individual) growth rate of a population to change as the population gets larger. Limiting factors that are density dependent usually cause the per capita growth rate to decrease, acting as a negative feedback loop to control the size of the population. The maximum number of individuals that can live in an area based on the density dependent limiting factors is called the carrying capacity.

#### **(a) Competition**

Individuals in a population are always competing for limited resources like food, mates, shelter, and water. As the population size increases, the competition becomes more intense causing some individuals to die over time, not mate, etc. This feedback makes a correction by reducing the population size to a level that can be supported by the environment. Sparrows

fighting with one another for shelter and wall lizards chasing each other to catch an insect are common examples in our houses. Competition are of two types

(i) Intraspecific: Occurs between the individuals of same species.

(ii) Interspecific: Occurs between the individuals of different species.

### **(b) Predation**

Areas with high populations attract predators that kill and eat individuals, helping to keep the population under control. By feeding on these individuals, predators may end up increasing their own numbers, resulting in natural cyclical changes in populations. Predators cannot survive without the prey. Predation keeps the predator and prey population more or less balanced. Increased prey population will support more predators which will cause reduction in prey population. The predator population is always smaller than prey population because predators are larger in size and slow rate of breeding while prey has higher reproductive potential. Consequently the prey population is not completely eliminated. Without predation prey population may cross the carrying capacity of the environment and face death due to starvation.

### **(c) Diseases, Parasites, and Accumulation of Waste**

Diseases and parasites have more opportunities to spread and infect individuals in larger populations, such as through contaminated water supplies. Almost every living organism is the host of one or more parasites. The pathogenic parasites causes diseases in the hosts. Also, waste can accumulate quickly in large populations and this leads to death from disease and parasites and can also impair reproduction, reducing the size of the population.

### **Density Independent Limiting Factors**

Limiting factors that fall into this category affect the per capita growth rate independent of the population density. These factors don't make continual corrections to keep the population size under control because the strength of their effectiveness is not rooted in the number of individuals present. Density independent limiting factors cause abrupt and erratic shifts in population size. Small populations are particularly at risk of being wiped out by density independent limiting factors.

The category of density independent limiting factors includes fires, natural disasters (earthquakes, floods, tornados), and the effects of pollution. The chances of dying from any of these limiting factors don't depend on how many individuals are in the population. In addition, individuals may not die directly from the limiting factor but from the effects of it such as from the loss of habitat or a primary food source resulting from a flash flood.

Density independent limiting factors also cause population sizes to increase. For example, the water from a flash flood increases the growth of vegetation, thereby providing more food for primary consumers in the ecosystem.