**Population regulation - density-dependent and independent factors….**

In low-diversity, physically stressed ecosystems, populations tend to be regulated by physical components such as weather, water currents, chemical limiting factors, pollution etc.

In high-diversity ecosystems, or in those not physically stressed, populations tend to be biologically controlled.

In all ecosystems there is a strong tendency for all populations to evolve through natural selection towards self regulation even though this is difficult to achieve under extrinsic stress. Any factor, whether limiting or favourable (negative or positive) to a population, is of two types:-

1. **Density-independent**, if the effect or action is independent of the size of the population. Climatic factors often act in a density-independent manner.
2. **Density-dependent**, if the effect on the population is a function of density. Biotic factors such as competition, parasites, pathogens etc often act in a density-dependent manner.

***Density-dependent factors*:** Density-dependent factors are generally biotic. Some common examples of density-dependent factors include:

1. ***Competition within the population****.* When a population reaches a high density, there are more individuals trying to use the same quantity of resources. This can lead to competition for food, water, shelter, mates, light, and other resources needed for survival and reproduction.
2. ***Predation****.* Higher-density populations may attract predators who wouldn’t bother with a sparser population. When these predators eat individuals from the population, they decrease its numbers but may increase their own. This can produce interesting, cyclical patterns, as we'll see below.
3. ***Disease and parasites****.* Disease is more likely to break out and result in deaths when more individuals are living together in the same place. Parasites are also more likely to spread under these conditions.
4. ***Waste accumulation****.* High population densities can lead to the accumulation of harmful waste products that kill individuals or impair reproduction, reducing the population’s growth.

***Density-independent factors*:** Density-independent factors affect the per capita growth rate independent of how dense the population is. These are chemical or physical factors (abiotic) and affect the whole population in a similar way. Density-independent limiting factors often take the form of natural disasters such as fire, severe weather conditions, pollution and human interference such as deforestation.

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