

SPECIATION

Speciation is the phenomenon wherein one or multiple new species emerge from an existing species. This significant occurrence transpires when the gene pool of a population becomes detached from other populations of the parent species, leading to the halt of gene flow. Speciation can manifest through two primary modes contingent on the geographical association between the new species and its ancestral species.

1. Allopatric Speciation

Allopatric speciation occurs when a population, previously contiguous in range, becomes divided into two or more geographically isolated populations, ultimately leading to the formation of new species. This separation can occur through the fragmentation of the original population due to geographical barriers like glaciers, land bridges (e.g., the Isthmus of Panama), oceans, or mountains. Alternatively, a small group of individuals may colonize a new habitat that is geographically distant from the original range. Notable examples of allopatric speciation include Darwin's finches on the Galapagos Islands and the Australian marsupials that underwent radiative speciation.

2. Sympatric Speciation

In sympatric speciation, a subpopulation becomes reproductively isolated within its parent population without geographical isolation. This phenomenon leads to the formation of new species within a single population. Sympatric speciation is often associated with polyploidy, where there is an abnormal multiplication of the normal chromosome number. This can occur when chromosomes fail to segregate during meiosis or replicate without undergoing mitosis.

3. Biological Species Concept

The biological species concept, initially proposed by Buffon (1753) and later formulated by Mayr (1942), defines a biological species as a sexually interbreeding or potentially interbreeding group of individuals that is reproductively isolated from other species. This isolation prevents genetic exchange between species, thereby distinguishing them. Typically, species are distinguished not only by morphological traits but also by reproductive isolation. However, sibling species are those that are morphologically similar but reproductively isolated, such as *Drosophila pseudoobscura* and *D. pessimists*. The biological species concept primarily relies on the absence of cross-fertilization between members of distinct species.