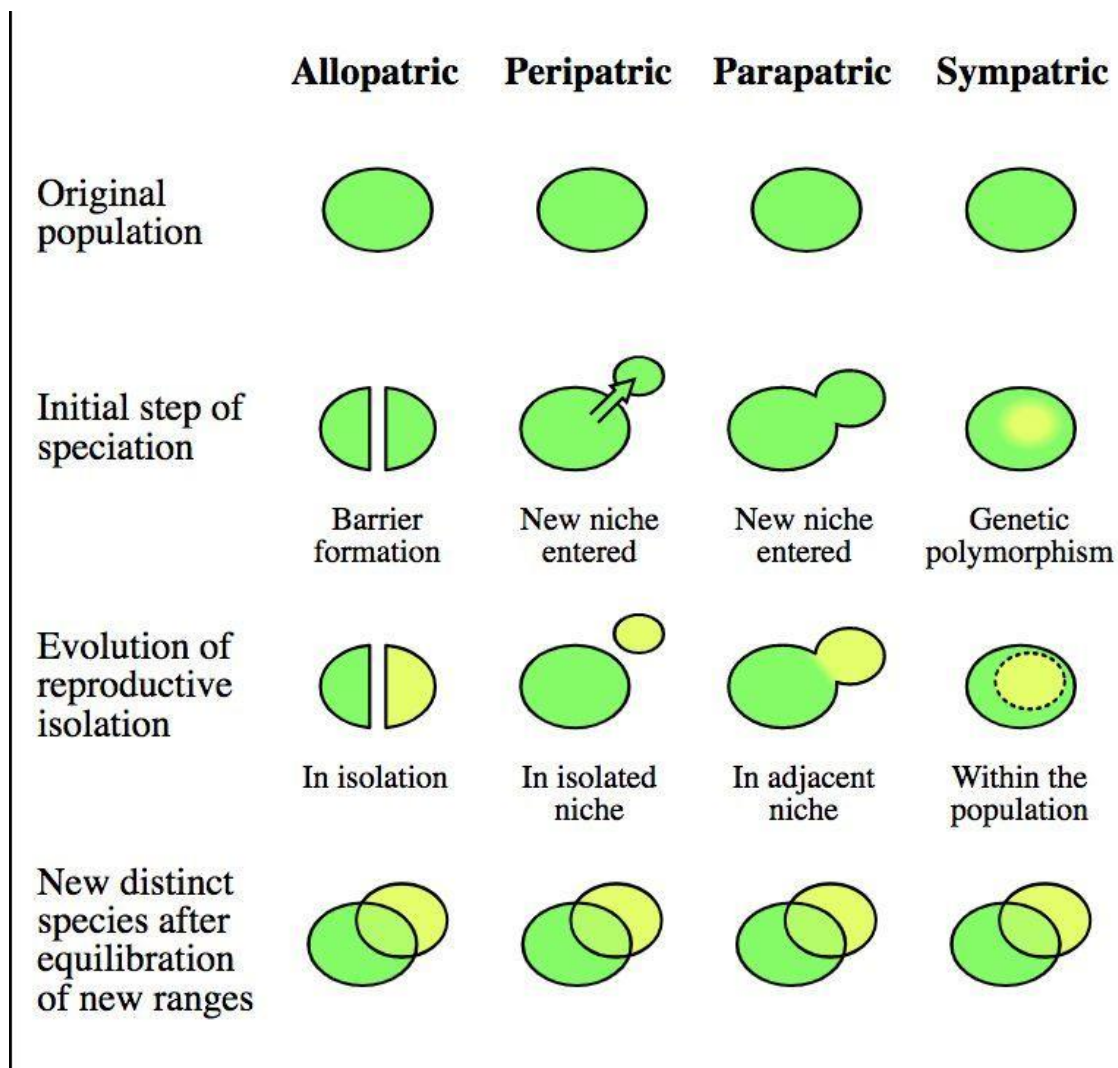


Speciation

Definition Of Species: Species can be defined as a group of potentially breeding actual Mendelian population consisting of similar individuals capable of exchanging genes or interbreeding, that are very similar to each other, which are reproductively isolated from other such groups. The species is the principal natural taxonomic unit, ranking below a genus and denoted by a Latin binomial, e.g. *Homo sapiens*.

Definition : Speciation, the formation of new and distinct **species** in the course of evolution. **Speciation** involves the splitting of a **single** evolutionary lineage into two or more genetically independent lineages.

Modes Of Speciation : There are four modes of speciation 1. **Allopatric** , 2. **Sympatric**, 3. **Peripatric** , 4. **Parapatric** speciation

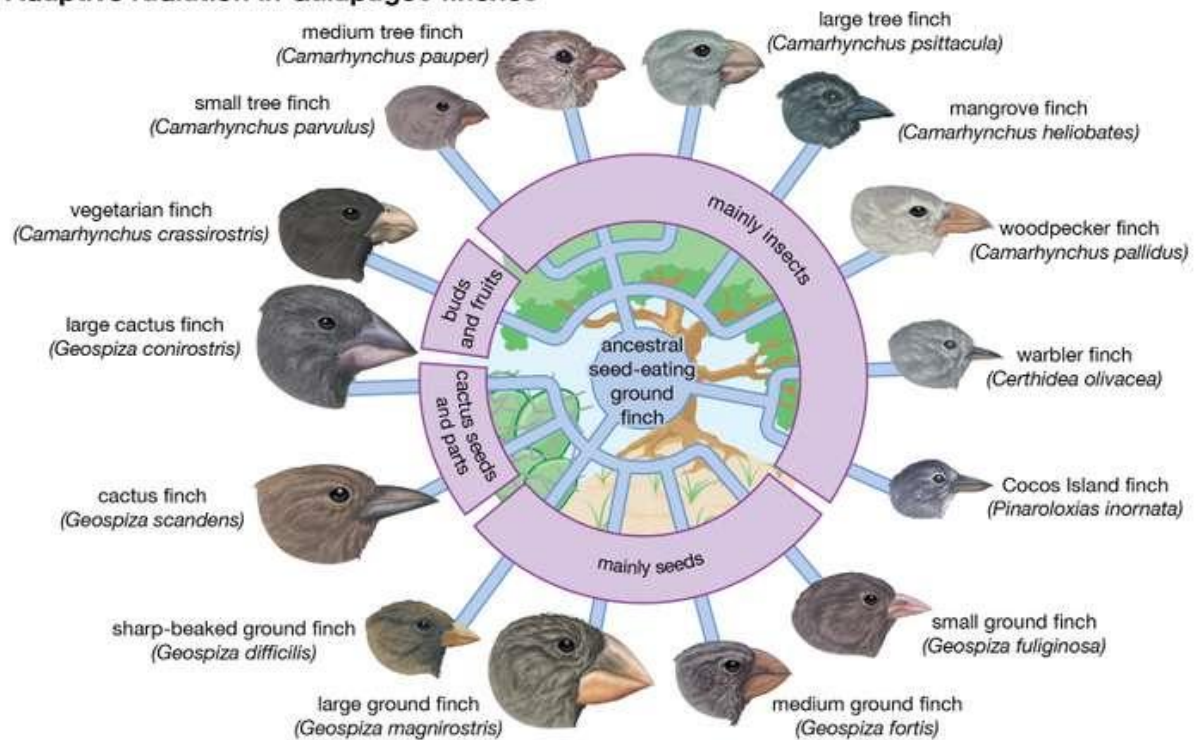


Allopatric Speciation

(from Ancient Greek ἄλλος, *allos*, meaning "other", and πατρίς, *patris*, "fatherland"),

Geographic isolation most often occurs with populations that are completely separated (**allopatry**) by a physical barrier, such as a **mountain** range, **river**, or **desert**. The separated populations adapt to their own unique **environments**, becoming so genetically different from one another that members of one population cannot breed with members of the other. Examples of allopatric speciation abound, and the process is considered the dominant form of speciation in organisms that engage in sexual **reproduction**. **Darwin's finches** on the **Galapagos Islands**, which may have speciated allopatrically because of **volcanic eruptions** that divided populations, is a famous example.

Adaptive radiation in Galapagos finches



2. Sympatric Speciation

("Sym" for similar)

A controversial alternative to allopatric speciation is sympatric speciation, in which reproductive isolation occurs within a single population without geographic isolation. In general, when populations are physically separated, some reproductive isolation arises. How genetic divergence can happen within a population of individuals that are continually interacting with one another is usually difficult to explain. Examples of sympatric speciation are often disputed because they must show convincing evidence of species descending from the same ancestral species, the reproductive isolation of the group, and of allopatry not causing the speciation.

Nevertheless, sympatric speciation has been shown to have occurred in apple maggot flies (*Rhagoletis pomonella*), a parasitic insect that laid its eggs in the fruit of wild hawthorns (*Crataegus*) until one subset of the population began to lay its eggs in the fruit of domesticated apple trees (*Malus domestica*) that grew in the same area. That small group of apple maggot flies selected a different host species from the rest of its kind, and its offspring became accustomed to domesticated apples and later laid their own eggs in them, thereby cementing the shift in host.

Sympatric selection might also result from a combination of sexual selection and ecological factors. Studies of African cichlid fishes in Lake Nyasa and other lakes in the East African Rift System record so-called species flocks (individuals of the same species that “flock” together in one large assemblage) that have arisen in ecologically uniform lakes. Such a condition substantially reduces the chances of allopatry being the cause of speciation, and it may result in groups of females within a population developing a strong affinity for males with different extreme phenotypic traits, such as scale markings and limbs that differ in size from average individuals. Other studies suggest that sympatry among cichlid fishes also occurs in rivers feeding the East African Rift System lakes, as well as in Nicaragua’s crater lakes.



Peripatric Speciation

In peripatric speciation, a subform of allopatric speciation, new species are formed in isolated, smaller peripheral populations that are prevented from exchanging genes with the main population. It is related to the concept of a **founder effect**, since small populations often undergo **bottlenecks**. Genetic drift is often proposed to play a significant role in peripatric speciation.

Case studies include Mayr's investigation of bird fauna; the Australian bird *Petroica multicolor*, and reproductive isolation in populations of *Drosophila* subject to population bottlenecks.

Parapatric Speciation

In parapatric speciation, there is only partial separation of the zones of two diverging populations afforded by geography; individuals of each species may come in contact or cross habitats from time to time, but reduced fitness of the **heterozygote** leads to selection for behaviours or mechanisms that prevent their **interbreeding**. Parapatric speciation is modelled on continuous variation within a "single," connected habitat acting as a source of natural selection rather than the effects of isolation of habitats produced in peripatric and allopatric speciation.

Parapatric speciation may be associated with differential landscape-dependent **selection**. Even if there is a **gene flow** between two populations, strong differential selection may impede assimilation and different species may eventually develop. Habitat differences may be

more important in the development of reproductive isolation than the isolation time. Caucasian rock lizards *Darevskia rudis*, *D. valentini* and *D. portschinskii* all hybridize with each other in their hybrid zone; however, hybridization is stronger between *D. portschinskii* and *D. rudis*, which separated earlier but live in similar habitats than between *D. valentini* and two other species, which separated later but live in climatically different habitats.

Ecologists refer to parapatric and peripatric speciation in terms of ecological niches. A niche must be available in order for a new species to be successful. Ring species such as *Larus* gulls have been claimed to illustrate speciation in progress, though the situation may be more complex. The grass *Anthoxanthum odoratum* may be starting parapatric speciation in areas of mine contamination.