18.2B: Reproductive Isolation

Reproductive isolation, through mechanical, behavioral, and physiological barriers, is an important component of speciation.

Learning Objectives

• Explain how reproductive isolation can result in speciation

Key Points

• Reproductive isolation can be either prezygotic (barriers that prevent fertilization) or postzygotic (barriers that occur after zygote formation such as organisms that die as embryos or those that are born sterile).

• Some species may be prevented from mating with each other by the incompatibility of their anatomical mating structures, or a resulting offspring may be prevented by the incompatibility of their gametes.

• Postzygotic barriers include the creation of hybrid individuals that do not survive past the embryonic stages (hybrid inviability) or the creation of a hybrid that is sterile and unable to produce offspring (hybrid sterility).

• Temporal isolation can result in species that are physically similar and may even live in the same habitat, but if their breeding schedules do not overlap then interbreeding will never occur.

• Behavioral isolation, in which the behaviors involved in mating are so unique as to prevent mating, is a prezygotic barrier that can cause two otherwise-compatible species to be uninterested in mating with each other.

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Key Terms

- **reproductive isolation**: a collection of mechanisms, behaviors, and physiological processes that prevent two different species that mate from producing offspring, or which ensure that any offspring produced is not fertile
- **temporal isolation**: factors that prevent potentially fertile individuals from meeting that reproducively isolate the members of distinct species
- **behavioral isolation**: the presence or absence of a specific behavior that prevents reproduction between two species from taking place
- **prezygotic barrier**: a mechanism that blocks reproduction from taking place by preventing fertilization
- **postzygotic barrier**: a mechanism that blocks reproduction after fertilization and zygote formation
- **hybrid inviability**: a situation in which a mating between two individuals creates a hybrid that does not survive past the embryonic stages
- **hybrid sterility**: a situation in which a mating between two individuals creates a hybrid that is sterile

Reproductive Isolation

Given enough time, the genetic and phenotypic divergence between populations will affect characters that influence reproduction: if individuals of the two populations were to be brought together, mating would be improbable, but if mating did occur, offspring would be non-viable or infertile. Many types of diverging characters may affect reproductive isolation, the ability to interbreed, of the two populations. Reproductive isolation is a collection of mechanisms, behaviors, and physiological processes that prevent the members of two different species that cross or mate from producing offspring, or which ensure that any offspring that may be produced is not fertile.

Scientists classify reproductive isolation in two groups: prezygotic barriers and postzygotic barriers. Recall that a zygote is a fertilized egg: the first cell of the development of an organism that reproduces sexually. Therefore, a prezygotic barrier is a mechanism that blocks reproduction from taking place; this includes barriers that prevent fertilization when organisms attempt reproduction. A postzygotic barrier occurs after zygote formation; this includes organisms that don’t survive the embryonic stage and those that are born sterile.

Some types of prezygotic barriers prevent reproduction entirely. Many organisms only reproduce at certain times of the year, often just annually. Differences in breeding schedules, called temporal isolation, can act as a form of reproductive isolation. For example, two species of frogs inhabit the same area, but one reproduces from January to March, whereas the other reproduces from March to May.

![Temporal isolation](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/18%3A_E...)

**Figure 1**: Temporal isolation: These two related frog species exhibit temporal reproductive isolation. (a) Rana aurora breeds earlier in the year than (b) Rana boylii.
In some cases, populations of a species move to a new habitat and take up residence in a place that no longer overlaps with other populations of the same species; this is called habitat isolation. Reproduction with the parent species ceases and a new group exists that is now reproductively and genetically independent. For example, a cricket population that was divided after a flood could no longer interact with each other. Over time, the forces of natural selection, mutation, and genetic drift will likely result in the divergence of the two groups.

![Habitat isolation](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/18%3A_E...

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Figure \(\PageIndex{1}\): **Reproductive isolation in plants**: Some flowers have evolved to attract certain pollinators. The (a) wide foxglove flower is adapted for pollination by bees, while the (b) long, tube-shaped trumpet creeper flower is adapted for pollination by humming birds.

When fertilization takes place and a zygote forms, postzygotic barriers can prevent reproduction. Hybrid individuals in many cases cannot form normally in the womb and simply do not survive past the embryonic stages; this is called hybrid inviability. In another postzygotic situation, reproduction leads to the birth and growth of a hybrid that is sterile and unable to reproduce offspring of their own; this is called hybrid sterility.