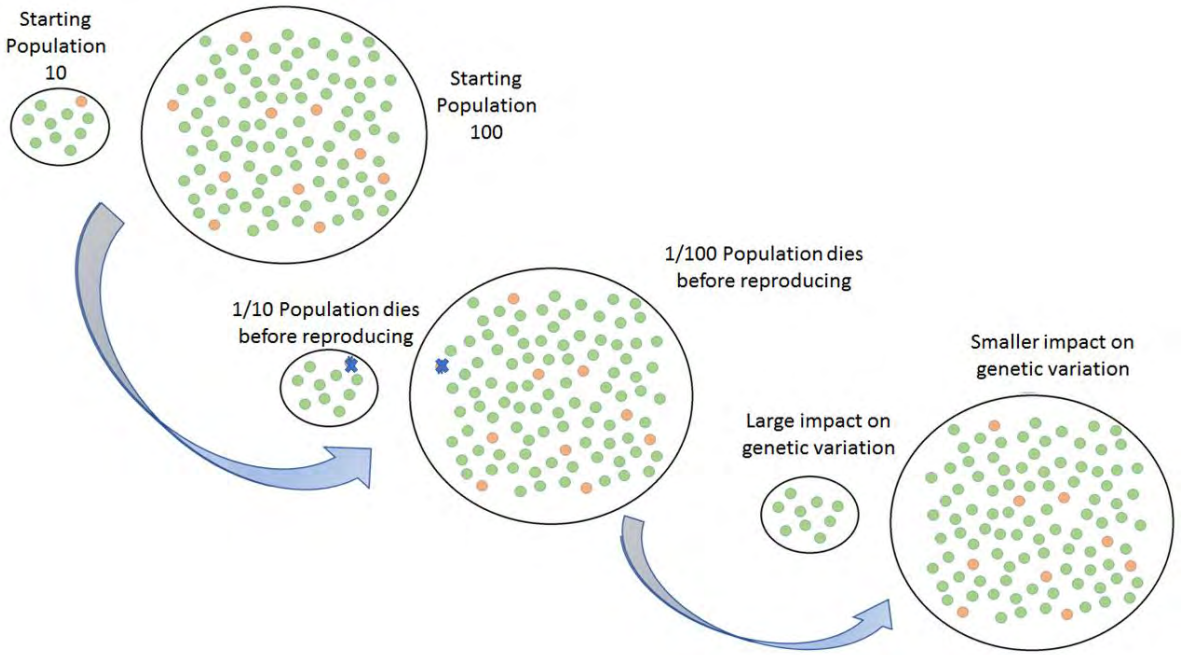

Figure 11.9 Genetic drift has less of an impact on a large population vs. a small population. (credit: Elizabeth O'Grady)

Genetic drift can also be magnified by natural or human-caused events, such as a disaster that randomly kills a large portion of the population. The result of this type of event is known as the **bottleneck effect** (Figure 11.10). After the event, the survivors now represent the whole population, and their genetic makeup is the population's gene pool. This genetic makeup may be very different from the pre-disaster population. In order for a disaster to be categorized as a bottleneck effect and genetic drift, it must be one that kills for reasons unrelated to the organism's traits, such as a hurricane or lava flow. A mass killing caused by unusually cold temperatures at night is likely to affect individuals differently depending on the alleles they possess that confer cold tolerance. The result of such an event would be natural selection, not a bottleneck effect.

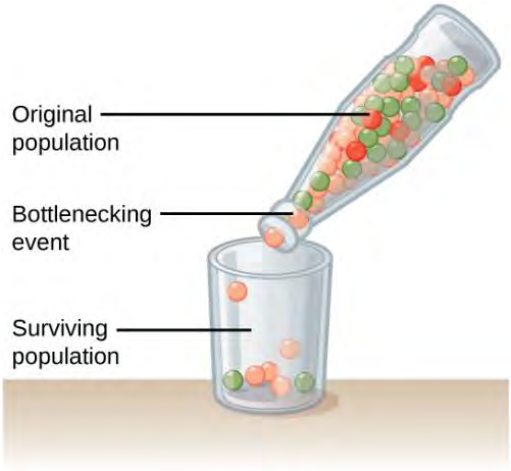

Figure 11.10 A chance event or catastrophe can reduce the genetic variability within a population. (credit: Fowler et al. / Concepts of Biology OpenStax)

Populations might also experience genetic drift if a portion of a population leaves to start a new population in a new location, or if a population gets divided by a physical barrier of some kind. In these situations, the genetic makeup of those individuals is unlikely to be representative of the original population's gene pool. This results in a founder effect. A **founder effect** occurs when there is a change or reduction in genetic variation in the new smaller population as compared to that of the original larger population (Figure 11.11). The founder effect is believed to have been a key factor in the genetic history of the Afrikaner community. The Afrikaner community is a South African ethnic group that descend from Dutch settlers. A small group of primarily Dutch settlers was first thought to have arrived in the Cape of Good Hope in the 17th century. The descendants of this small Dutch group, called the Afrikaner population, have unique mutations that are rare in most other African populations. The original Dutch colonists that settled in South Africa were only a small sample of the total Dutch population; however, just by chance, those that arrived had a higher-than-normal proportion of these rare faulty alleles. As a result, the population expresses unusually high incidences of Huntington disease (HD) and Fanconi anemia (FA), a genetic disorder known to cause bone marrow and congenital abnormalities, and even cancer.[4]

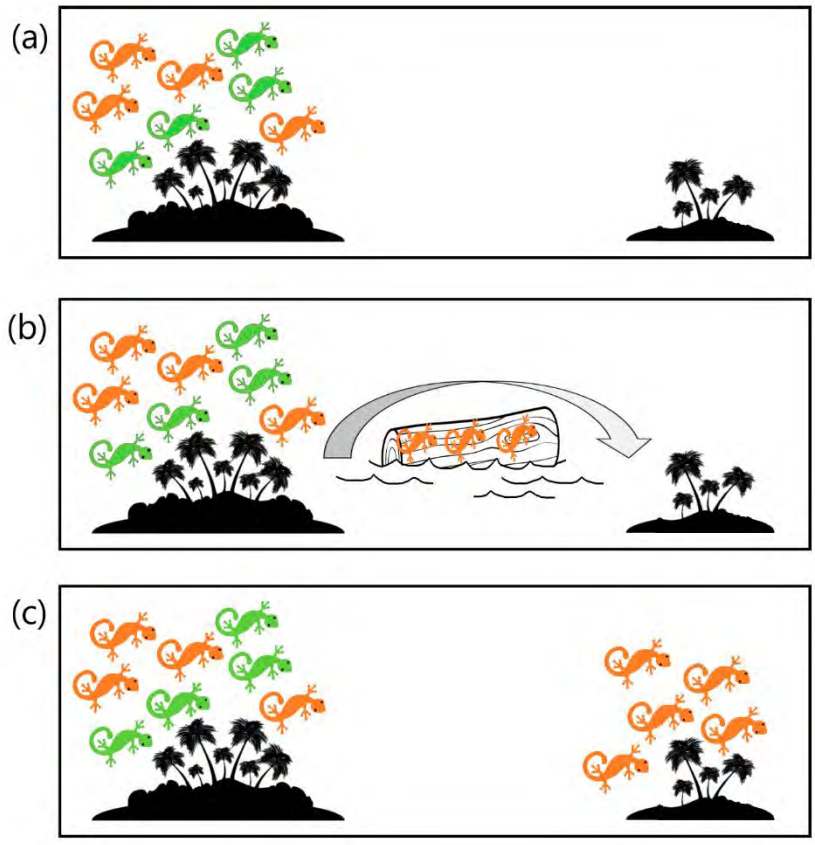

Figure 11.11 Due to the founder effect, the genetic makeup of new populations may be different than the original population. (a) A population of geckos with both green and orange variants is found on an island. (b) A branch with several orange geckos on it is knocked down in a storm and floats to a neighboring island. (c) Those geckos reproduce, founding a new population on the second island. Because all the founder geckos were orange, this population only consists of orange geckos. (credit: Jason Cashmore)

CONCEPTS IN ACTION – Visit this site to learn more about genetic drift and run simulations of allele changes caused by drift.

Gene Flow

Another important evolutionary force is **gene flow**, or the flow of alleles into and out of a population resulting from the **migration** of individuals or their gametes (Figure 11.12). While some populations are fairly stable, others experience more flux. Many plants, for example, send their seeds far and wide, by using the wind or in the digestive tracts of animals. These seeds may introduce new alleles common in the source population to a new population in which they are rare.

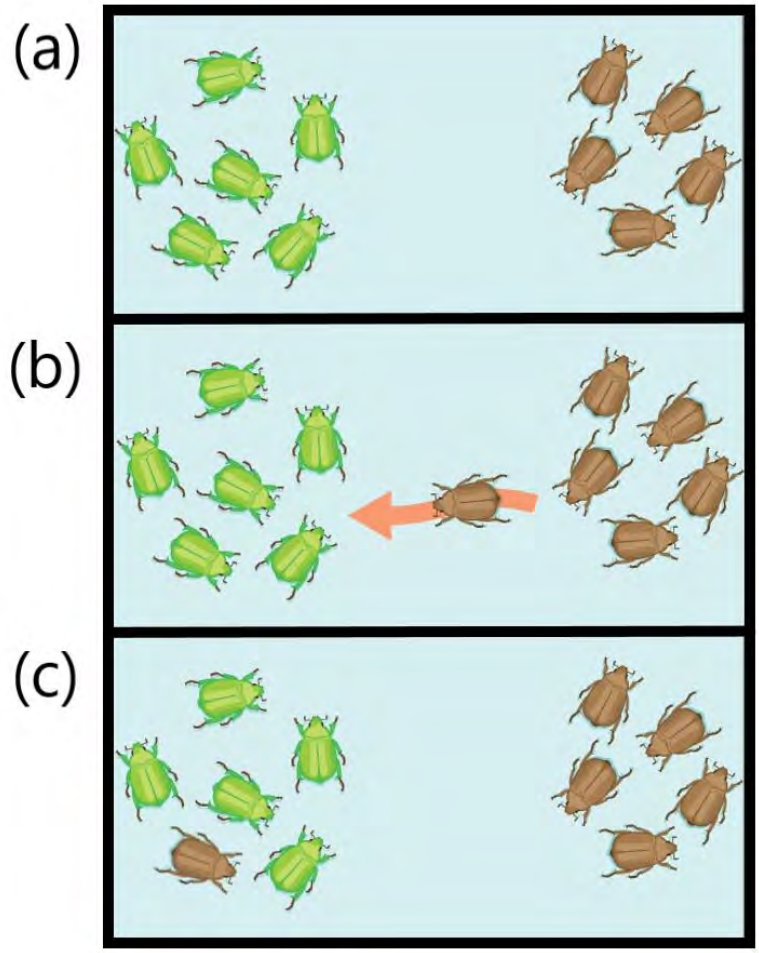

Figure 11.12 Gene flow can occur when an individual travels from one geographic location to another and joins a different population of the species. (a) In the example shown here, there are two populations of a beetle. One population has 100% green alleles and the other has 100% brown alleles. (b) Some beetles migrate from the brown population to the green population. (c) The genetic makeup of the brown population is unchanged, but the other population now has mostly green alleles with some brown alleles. (credit: Modified by Jason Cashmore original work by Fowler et al. / Concepts of Biology OpenStax)

Footnotes

- 4 A. J. Tipping et al., "Molecular and Genealogical Evidence for a Founder Effect in Fanconi Anemia Families of the Afrikaner Population of South Africa," *PNAS* 98, no. 10 (2001): 5734-5739, doi: 10.1073/pnas.091402398.