Chapter 5-7: Genetic Drift

The total number of genes in a population, also called the gene pool, can undergo changes that lead to variations in the physical characteristics of a population. One of the forces that changes the gene pool and leads to evolutionary change is genetic drift.

When the gene frequencies of a population change, genetic drift has taken place. The evolution that accompanies genetic drift occurs most often in small, isolated populations, as we will show in this plate. Larger populations are less susceptible to the force of genetic drift. The changes brought about by genetic drift are not necessarily adaptive, because pure chance brings them about. Genetic drift may work to the detriment of a population, rendering it more poorly adapted to its environment.

In this plate, we examine how genetic drift can change the gene pool of a population, and note how the rate of genetic drift is much greater for a smaller population than a larger one.

As you look over the plate, you will note that we are presenting two populations of fish in separate lakes. One population is relatively large, and the other is relatively small. We see three events in the history of the populations: the original populations in the first diagram, a removal of genes from the populations in the second diagram, and the result of the genetic drift in the third diagram. Only two colors should be used for this plate. We recommend red for the darker fish and yellow for the lighter fish.

We begin our study of genetic drift by noting the two populations of fish. In the first lake, we see a small population of fish with two **red fish (A)** and four **yellow fish (B)**. In this case, the ratio of dark fish to light fish is 2:4. This ratio may be expressed as 0.5.

Looking at the second lake, we see a much larger population of fish. In this case, there are eight red fish (A) and sixteen yellow fish (B). The ratio of red to yellow fish is 8:16, or 0.5, the same as it was in the first lake. Thus, the ratio of red genes to yellow genes is the same in the two lakes.

Having established the gene pools of the two populations of fish, we will now see how a chance event affects each population. The random event removes a certain number of genes from each population. Focus your attention on the second diagram of the plate.

In the second diagram, we see that a fisherman has come to each lake. In each case, the fisherman has caught a red fish (A). This random event changes the characteristics of the gene pools of each lake and may change the evolutionary direction of the population.

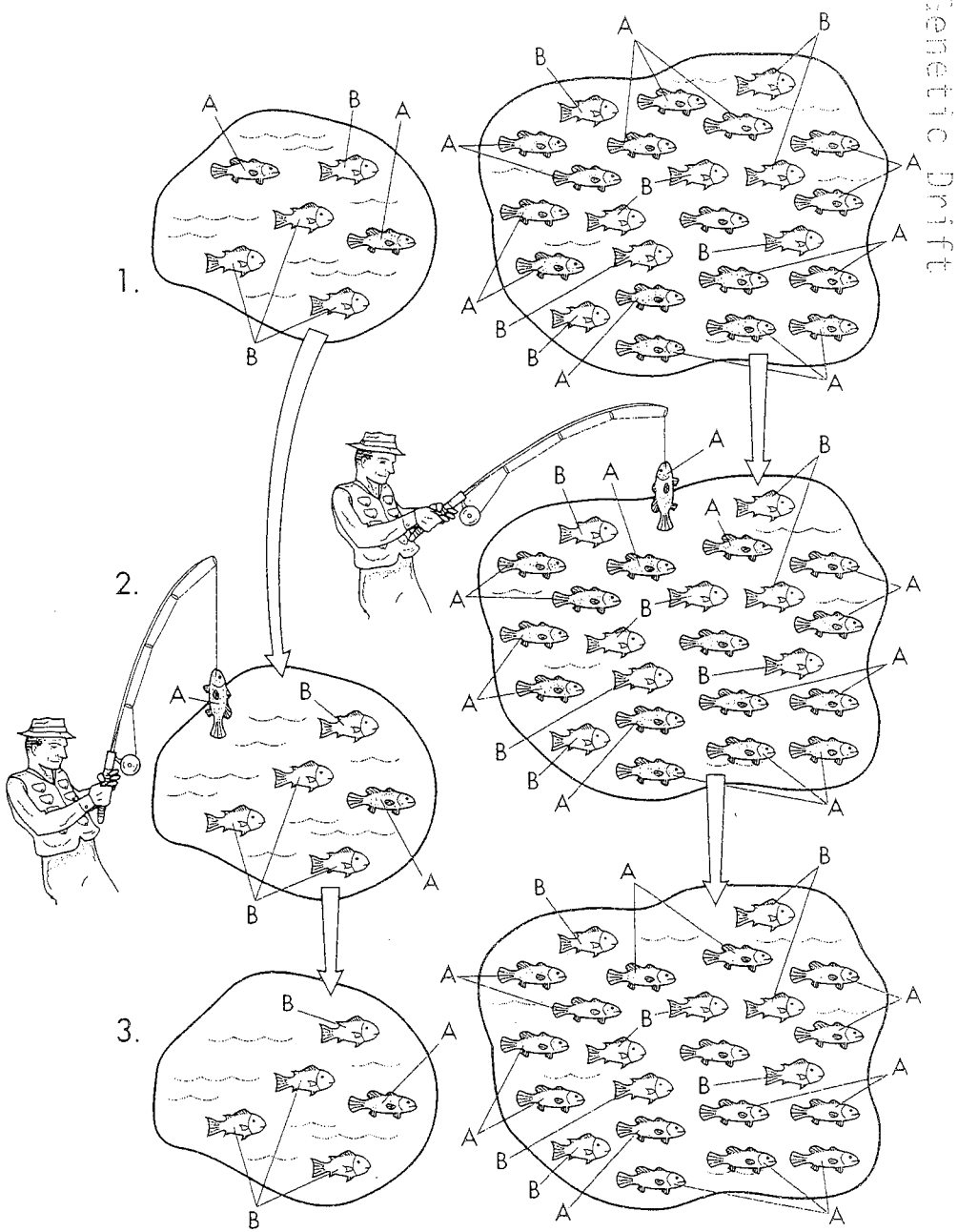
In the third diagram, we see the effects of the random event. Because red genes have been removed from the populations, changes in the gene pools occur.

The loss of one fish in diagram 2 has resulted in changes in both populations. In the small population, there is now one red fish and four yellow fish, in a ratio of 1:4, or 0.25. Thus, the ratio of red to yellow genes has dropped from 0.5 to 0.25.

In the larger fish population, there are now seven red fish (A) and sixteen yellow fish (B). The ratio of red to yellow genes is now 7:16 or 0.4375. The ratio of genes has therefore dropped from 0.5 in the original population, to 0.4375. You can easily see that the ratio of the genes in the large population was affected much less by this chance occurrence than was the small population.

Notice that genetic drift has produced an alteration in the gene pool of the population but has not affected the population's chance for survival. Indeed, if a predator comes along that is attracted to red fish, the predator may snap up the remaining red fish from the smaller population, and the red genes will disappear entirely. The remaining population will then contain only yellow genes and will have undergone an evolutionary change. By contrast, the larger population is less likely to lose its red genes because the predator is less likely to consume all the red fish in the population. Thus, variability is less likely to be completely lost in the larger population.

Genetic Drift
- ○ Red Fish .....A
- ○ Yellow Fish.....B



5.7 Genetic Drift

a. The total number of genes in a population:
b. When gene frequencies of a population change, this has taken place:
c. Genetic drift occurs more often in this type of population:
d. The changes brought about by genetic drift are not adaptive, because this has brought them about:
e. Is the initial gene frequency the same in both the small & large population lakes?
f. The fisherman fishing is a ____ event.
g. Which population was affected more by the chance occurrence?
h. Did the alteration necessarily affect the population's chance for survival?