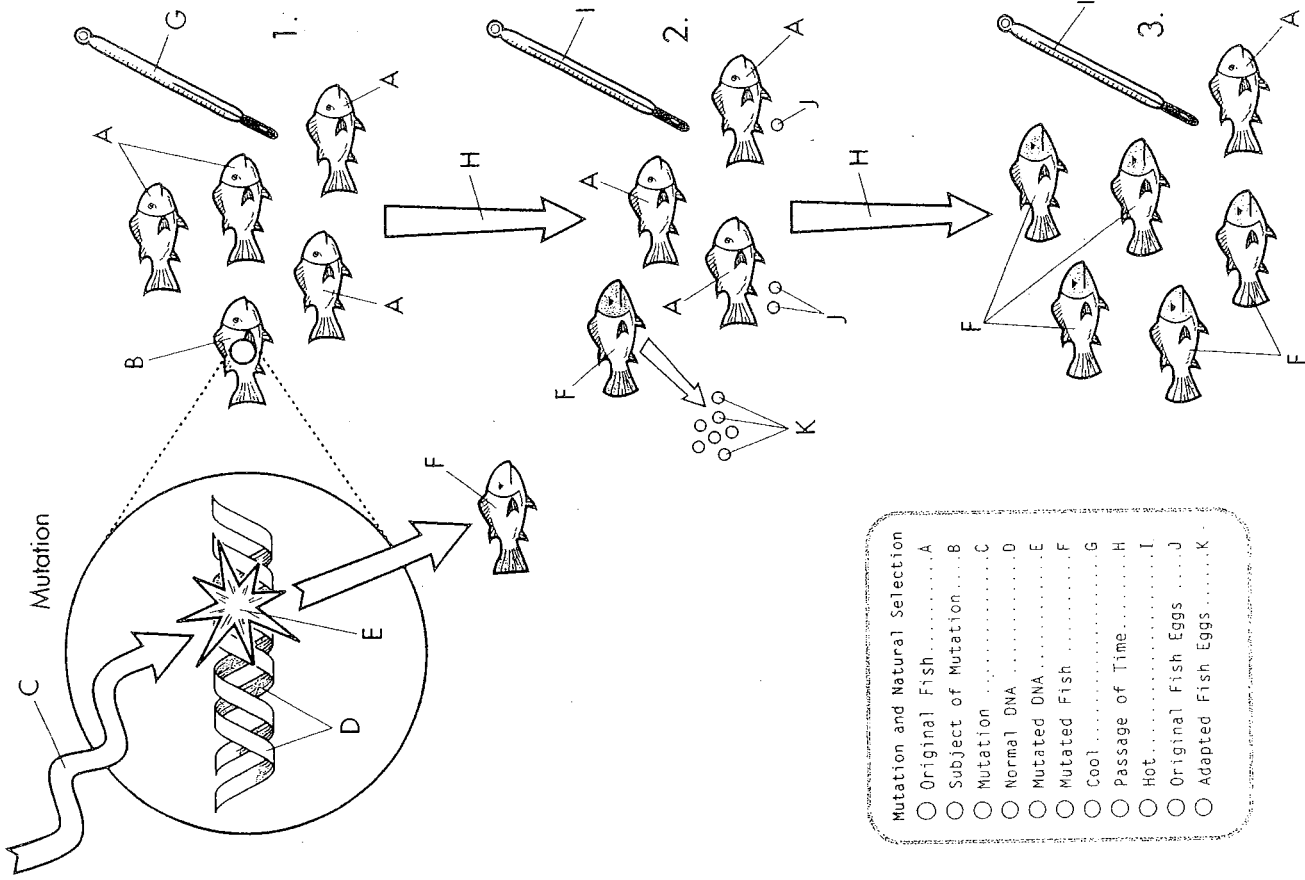


Mutation and Natural Selection



Chapter 5-8: Mutation and Natural Selection

Over long expanses of time, climatic shifts take place on the surface of Earth. Suppose that a long **passage of time (H)** has occurred. During this time, the temperature of the water has increased substantially and the water is now quite **hot (I)**. At this higher temperature, the original fish (A) produce their **eggs (J)**, but they produce fewer than the normal number because of the temperature change. Meanwhile, the mutated fish is well adapted to warmer temperatures. Part of its adaptation is that it can produce many more eggs than the original fish at the higher temperature. Thus it is fitter than the original fish and the environment has selected it out from the original population by favoring its reproduction.

At this point, we have seen how mutation and natural selection work. All selection will favor the organism that is best adapted to the environment. In this case, the mutated fish is better adapted to the hot water than the original fish. The mutated fish will produce more eggs than the original fish, and its offspring will be better adapted to the hot water than the original fish. This is the "survival of the fittest" phenomenon.

We begin with a large population of **original fish (A)**. These fish have lived for a long time in a body of water with a **cool temperature (G)**. The population is relatively stable, and all fish are of essentially the same type in the population. A dark color may be used to color them, but a light color should be used for the thermometer.

As diagram 1 indicates, a mutation occurs in the population. A mutation is an alteration in the DNA in an organism, which may or may not affect its characteristics. In this particular case, the mutation occurs in **one of the fish (B)** in the population. The mutation (C) can be caused by many factors, including an episode of ultraviolet light from the sun. Mutations occur within **strands of DNA (D)**, bringing about changes in the base sequence of a particular gene. They result in specific locations in DNA that are then considered **mutated (E)**. The fish that results is a **mutated fish (F)** with a new phenotype. In this case, the mutation is not lethal, so the fish will survive and remain in the population.

We have seen how a mutation brings about an alteration in the genes of one member of a population. Because the fish is alive and healthy, there is no apparent overall effect of the mutation on the population. However, that will change as the environment exerts a selective pressure, as we will see in the next few paragraphs. Continue your reading below as you continue to color.

Now the population experiences a brief passage of time (H). During this time, the **adapted fish eggs (K)** become new individuals, and the environment is now filled with adapted fish. Only one of the original fish (A) remains. The warmer water is the environment's selective pressure and the emergence of the adapted fish shows the result of the natural selection. In effect, this mutation has made the fish better prepared for the changing environment.

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5.8 Mutations & Natural Selection

- What three processes cause variation in the gene pool?
- Selective pressures are brought about by the:
- These individuals are removed:
- Alteration in DNA base sequence; may or may not affect the organisms; may be brought on by a number of factors:
- What selective advantage did the mutated fish have?