**Essay Question 1**

In the first experiment, when the **Genotype Relative Fitness** of the **red fish (RR genotype)** and **white fish (rr genotype)** was set to zero, leaving only the **speckled fish (Rr genotype)** with a **fitness** of one, a large decrease in the **population** was observed. This occurred because only **speckled fish** could reproduce, and with a limited number of surviving fish, the **birth rate** could not keep up with the **death rate**, causing the **population** to decline sharply.

When the **fitness** of **red fish (RR genotype)** was restored to one and **speckled fish (Rr genotype)** reduced to 0.5, the **population** began to regrow rapidly, eventually exceeding the previous **population** size. This growth was driven by the **higher birth rate** resulting from the increased **fitness** of the **red fish**, allowing them to reproduce in larger numbers. However, once the **fitness** of all fish was restored to one, the **population** experienced a slight decrease, stabilizing as natural competition and environmental limits regulated the **birth rate** and **death rate**. This experiment demonstrated how changes in **fitness** directly influence the **proportion** of different genotypes and the overall **population** size.

### **Essay Question 2**

The fish populations in the **upper-lake** and **lower-lake** eventually became two separate **species** due to changes in their **mating rituals** and environmental conditions. Initially, the fish in both lakes interbred, but after the river dried up, **microevolution** occurred in each lake. In the **upper-lake**, fish maintained their large size and traditional **mating rituals**, while in the **lower-lake**, fish evolved to become smaller, darker, and developed a more aggressive mating behavior.

After thousands of generations, when the river reconnected, the fish from both lakes did not interbreed. This reproductive isolation led to **speciation**, where two genetically distinct groups emerged. This is an example of **macroevolution**, where long-term changes lead to the formation of new **species**. The behavioral and physical differences prevented mating, further solidifying their separation. This simulation demonstrates how **microevolution**, caused by environmental factors, can lead to **macroevolution** through **speciation**.

### **Essay Question 3**

**Comparison 1:** Dogs & Wolves are ~1st cousins.  
**Comparison 2:** Humans & Chimpanzees are ~6th cousins.  
**Comparison 3:** Birds & Dinosaurs are ~9th cousins.