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D-Band Biology
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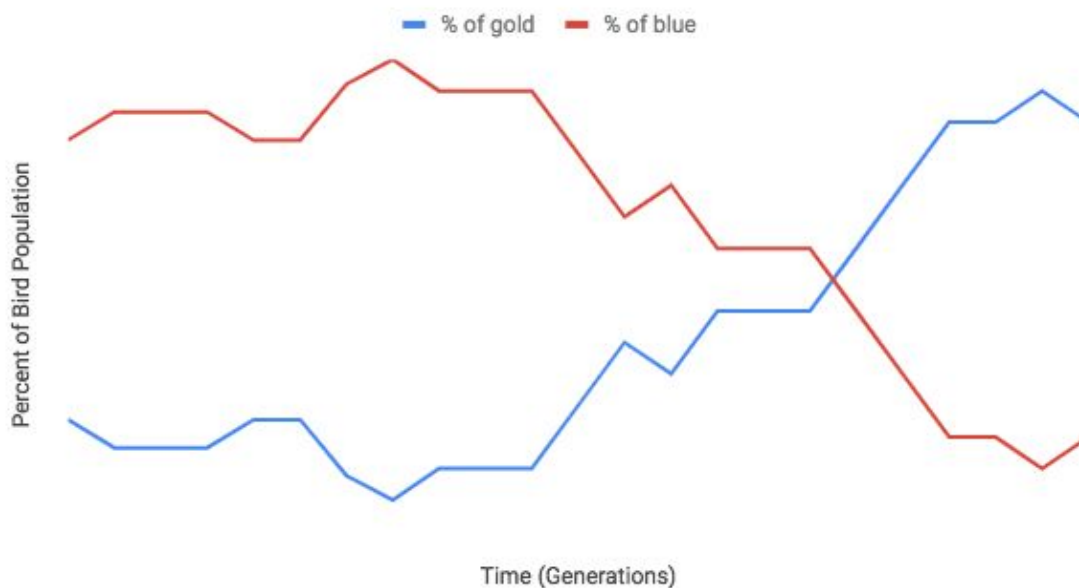
Bird Lab Final Lab Report CER-Did the Bird Population Evolve?

Claim: The bird population evolved from majority blue colored fork beaked birds to become gold colored spoon beaked birds.

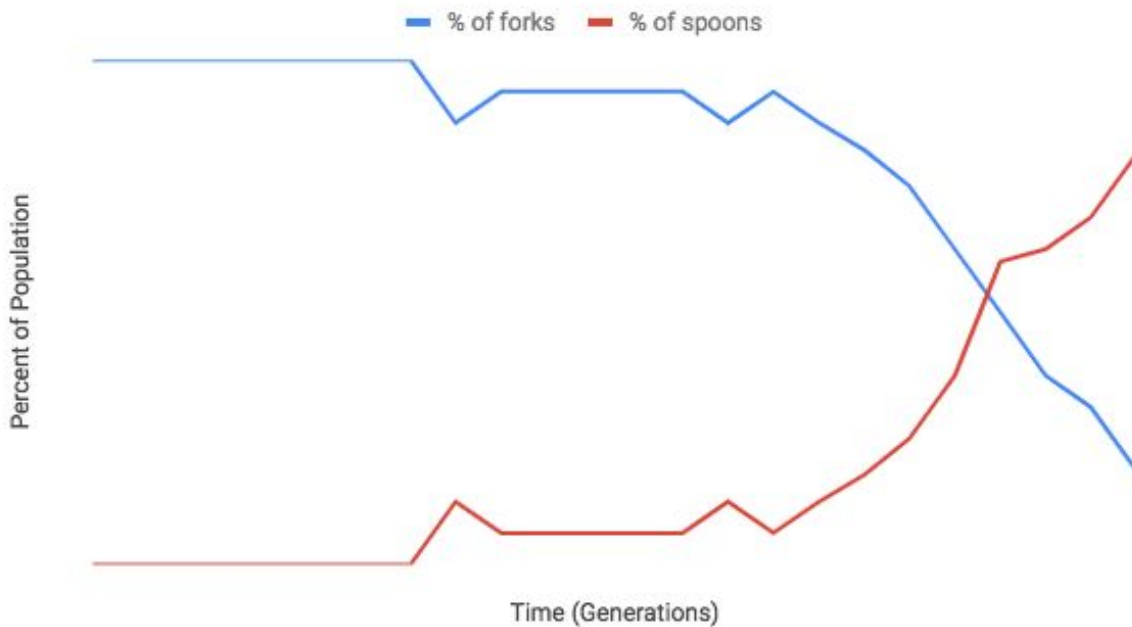
Evidence: In the bird lab experiment we began with 22.2% of the birds being gold, with 4 gold birds and 14 blue birds (D-Band Bird Lab Data Sheet). All of the birds in the initial population had fork beaks (D-Band Bird Lab Data Sheet). Over the entirety of the experiment, which lasted 24 generations, the percentage of birds that were gold greatly increased. After the 24th generation, the population finished with 87.5% of the bird population being gold colored (D-Band Bird Lab Data Sheet). During the experiment, the number of spoons also increased from 0% in generation 1 to about 81% in the 24th generation after spoons were introduced to the population as a random mutation during generation 9 (D-Band Bird Lab Data Sheet). The bird population underwent a drought between generations 16 and 17 (D-Band Bird Lab Data Sheet). The first graph displayed below demonstrates the change between the percentage of the population that was gold (represented by the blue line) in comparison to the percent of the population that was blue (represented by the red line). The second graph represents the change in the percentage of forks (represented by the blue line) in comparison to the change in spoons (represented by the blue line). To see the full data table of the experiment see Appendix 1. As displayed by the graphs, the experiment began with a majority of birds being blue as well as having fork beaks. After 24 generations the population has changed to become majority gold

colored as well as having spoon beaks. Evolution is defined as descent with modification over multiple generations (PBS). Natural selection is a type of evolution, which is defined as differential survival and reproduction (Khan Academy). Natural selection can shift the distribution of phenotypes in different ways, one of which being directional selection (Khan Academy). Directional selection occurs when one extreme phenotype is more fit than all the other phenotypes and shifts the curve of the data towards the favorable phenotype (Khan Academy). Artificial selection is another type of selection which is defined as the intentional reproduction of individuals in a population that have desirable traits (Annenberg Learner).

Gold Birds and Blue Birds in Percent vs Time in Generations



Percent of Forks and Spoons vs. Time in Generations



Reasoning: We know evolution occurs in the Bird Lab because of the two types of selection that shifted the primary demographic of the bird population from blue, fork beaked birds to gold, spoon beaked birds (D-Band Bird Lab Data Sheet). The first type of selection that occurs is related to the change in color when the population shifts from being primarily blue, to becoming primarily gold (D-Band Bird Lab Data Sheet). This shift is caused by artificial selection, as in our experiment having the gold color was a desirable trait, and people wanted to have two gold alleles (Annenberg Learner). Having a gold colored bird was more desirable, so people were more likely to mate with others that at least one gold allele (D-Band Bird Lab Data Sheet). The artificial interference in the mating process caused people to cheat and draw two gold alleles more often, causing the situation to be affected by artificial selection (Annenberg Learner). As the number of gold increased participants still wanted to be completely gold, so further artificial selection caused the majority of the population to have the more desired trait of being gold

colored (D-Band Bird Lab Data Sheet). The artificial selection caused the majority of the population to be gold by the time the last generation of the experiment had been reached, and the change in the population matches the definition of evolution (PBS). The beak type of the population also underwent evolution, but this trait experienced natural selection (Khan Academy). The population shifted from having completely fork beaks to heavily favoring spoon beaks over the course of the experiment, which was caused by the environmental pressure exerted on the population via the drought that took place between generations 16 and 17 (D-Band Bird Lab Data Sheet). The number of spoons is increasing at a slow rate after their introduction in generation 9 until the drought occurs and the increase of spoons becomes much greater (Percent of Forks and Spoons vs. Time in Generations Graph). In the experiment, two mates fed together by scooping water from one large beaker into their own separate individual beakers (D-Band Bird Lab). Once the drought was instated the lowest feeders each round “died off” and their new set of alleles was decided by the top feeder and their mating partner (D-Band Bird Lab). The top feeders were often spoons and the lowest feeders were forks because spoons were much more effective at scooping water (D-Band Bird Lab Data Sheet). This meant that with the fork beaked birds dying out, the top feeders, often spoon beaked, mated for them, therefore causing the spoon beaked birds to mate more often (D-Band Bird Lab Data Sheet). Having spoon beaks was optimal for survival as they were more effective for feeding and were therefore more desirable for individuals of the population (Khan Academy). The natural selection was directional, as the overall distribution of the beaks was shifted towards the spoon beak side (Khan Academy). The change in the beak distribution in the Bird Lab was due to directional natural selection, and as natural selection is a type of evolution, the Bird Lab

therefore was an example of evolution and the bird population evolved (Khan Academy). The two types of evolution that the bird population underwent were both different ways to evolve, and the bird population undergoing both artificial selection and natural selection clearly prove that the population underwent evolution.

Appendix 1:

Bird Lab Data Table:

GENERATION	# of gold	# of blue	TOTAL	# of forks	# of spoons	TOTAL
1	4	14	18	18	0	18
2	3	15	18	18	0	18
3	3	15	18	18	0	18
4	3	15	18	18	0	18
5	4	14	18	18	0	18
6	4	14	18	18	0	18
7	2	16	18	18	0	18
8	1	15	16	16	0	16
9	2	14	16	14	2	16
10	2	14	16	15	1	16
11	2	14	16	15	1	16
12	4	12	16	15	1	16
13	6	10	16	15	1	16
14	5	11	16	15	1	16
15	7	9	16	14	2	16
16	7	9	16	15	1	16
17	7	9	16	14	2	16
18	9	7	16	13	3	16
19	11	5	16	12	4	16
20	13	3	16	10	6	16
21	13	3	16	8	8	16
22	14	2	16	6	10	16
23	13	3	16	5	11	16
24	14	2	16	3	13	16

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