

Gummy Bear Evolution: Selection and Adaptation to Various HabitatsBlock schedule: 24-25 Sept, 2015

Individuals cannot evolve. Only populations can evolve, and there must be variation in the population. Without variation, there can be no evolution. Evolution at its most fundamental definition is a change in gene frequencies in populations from one generation to the next.

This simulation will demonstrate the forces, effects, and outcomes of selection, evolution and adaptation. You will use gummy bears and different colored environments. The project also teaches how to properly report experimental results in the format of a scientific publication.

Gummy bear natural history. The gummy bear, *Ursus gelatinus*, is a small bear, made up of primarily high fructose corn syrup. The body shape is distinctly Ursine, and averages approximately 10 mm long. There are 5 color types; red; orange, green, yellow, and watermelon (translucent or clear). Each color is determined by a single dominant gene. All gummy bears are female and give birth to a single offspring of the same color (i.e. they are parthenogenetic and reproduce by cloning themselves, just as aphids do). They are docile creatures, do not feed or leave scat, have no voice, and although they have legs they cannot move on their own. They have but one natural enemy; the Harding Charter Preparatory Student.

In this game, there are 6 bear habitats (green forest, red flower garden, orange grove, yellow sandy beach, dingy urban landscape, and tropical jungle). The habitat is a square of cloth on which the gummy bears live out their dull and mundane lives.

Directions:

1. Read through the entire directions before beginning!
2. Do not eat the gummy bears. They have been handled by many students and are unclean.
3. Divide yourselves into predator packs; 6 students per pack. Five of you will be "predators" and one of you will be recording data. Rotate taking data each time you move to a new habitat.
4. Make a working hypothesis for each color of gummy bear in each habitat type. What is your best guess as to what will happen to each gummy bear color type after 5 rounds of HCP student predation?
 - a. Your hypothesis must be in the form of a statement; written in complete sentence. For example; Black gummy bears will go extinct after 5 rounds of selection in the white arctic habitat.
5. Unfold a habitat on the table.
6. Be careful. The yellow and watermelon (clear/translucent) bears might be mistaken for each other if you rush through the experiment.

7. Place 10 gummy bears of each color (total of 50 bears) into a cup and mix them well by shaking.
8. Release the gummy bear population into the center of the habitat and scatter the bears around so they are not all bunched up in the middle. There is a lot of habitat for the bears and they will want to roam about it, if only they could; this is Generation 1. Record the number of each bear color type in the below table.
9. Close your eyes. One person will count down 5, 4, 3, 2, and 1 and say “prey”! When the “prey” command is given, open your eyes and immediately grab the first bear you see. Do this a total of 5 times. It is vital not to hesitate when grabbing the bear. You must grab the first bear you see. If you do not follow this instruction, you will bias the results of the experiment.
10. At the end of 5 prey events you should have $\frac{1}{2}$ of the original bears remaining; 25 bears left.
11. Add the preyed upon bears into the “killed cup”.
12. Count the number of remaining bears of each color. At this point the bears will reproduce; 1 to 1. Add the same number of remaining bears to the population. This means if there are 6 red bears remaining, you will add 6 red bears to the population. If there are 0 left of a color, you do nothing. That color type has gone extinct. Record a 0. Record the total number of bears on your data sheet. The population must be 50 before the next selection starts.
13. Place the gummy bear population no. 2 in a cup, mix, and release them as in Step 4.
14. You will do 5 rounds of predation, 5 generations of reproduction, and record the final number of bears on your data sheet.
15. Calculate the frequency (percentage) of each color type in the 6th generation.
 - a. $[\text{No. bears} \div 50] \times 100$
 - b. For example, 36 red bears and 14 yellow bears left;
 - i. Red $[36 \text{ bears} \div 50] \times 100 = 72\%$
 - ii. Yellow $[14 \text{ bears} \div 50] \times 100 = 28\%$
 - iii. Frequencies must total 100%
16. Complete the above process for another habitat. Each team must complete gummy bear selection in three habitats. One habitat must be the diverse tropical jungle. That means 3 different hypotheses!
17. Write a lab report in the form of scientific paper. Do not wait until the night before to write your report. Start today!! This is worth 20% of your grade! Due Monday 5 Oct.