Worksheet for PopCycle Tutorial

The numbered questions on this sheet correspond to the numbered questions in the PopCycle tutorial. You can use this sheet to record your results as you go.

Genes in populations

1. Keep clicking on the gene pool until you have made 100 zygotes. Then click on the Done button. The bars on the graph should turn green. Record the number of zygotes of each genotype:

   AA: Aa: aa:

2. We are going to imagine that all of the zygotes survive to become juveniles. Make sure that the survival rates are set to 1.0 for all three genotypes. Then click on the Done button. There should be no surprises. Record the number of juveniles of each genotype:

   AA: Aa: aa:

3. We are also going to imagine that the juveniles become adults without any urchins moving into or out of the population. Make sure the number of migrants is set to zero for all three genotypes. Then click on the done button. Again, no surprises. Record the number of adults of each genotype:

   AA: Aa: aa:

4. Finally, we are going to imagine that when the adults make gametes for the new gene pool, they do so without any mutations that might turn copies of allele *A* into *a* or vice versa. Make sure that the mutation rates are both set to zero—then wait.

   Before you click the Done button, predict what the new allele frequencies are going to be. Imagine that each of your adults makes 10 gametes for the new gene pool. Fill in the table below:

   The _____ *AA* adults make a total of _____ *A* gametes and _____ *a* gametes.

   The _____ *Aa* adults make a total of _____ *A* gametes and _____ *a* gametes.

   The _____ *aa* adults make a total of _____ *A* gametes and _____ *a* gametes.

   What is the total number of gametes in the new gene pool? _____

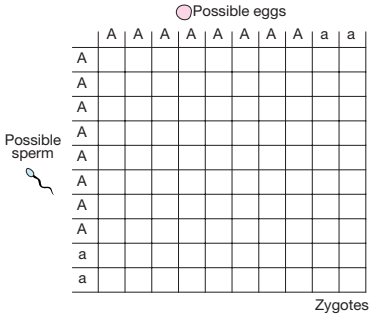
   What is the total number of gametes carrying allele *A*? _____

   What is the frequency of allele *A* in the new gene pool? _____

   Now click on the Done button to see the frequency of *A* in the new gene pool. Were you right? If not, try to figure out why.

5. Recall that in our original gene pool the frequency of allele *A* was 0.8. Has it changed in the new gene pool? If so, why?

6. Should we have expected the frequency of allele *A* to change from one generation to the next? Fill in the zygotes in the Punnett Square below:



   How many zygotes of each genotype do you expect?:

   AA: Aa: aa:

Genes in populations with selection

9. Reset PopCycle, set the frequency of allele *A* to 0.8, and click on the Ideal button. Now, before clicking done to make the zygotes grow into juveniles, change the survival rates. Leave the rate for *AA* at 1.0, but set the rate for *Aa* to 0.5, and the rate for *aa* to 0.0. As you change the rates, you will see the juvenile graph change to show what is going to happen. When you have the rates set, click Done. Record the number of juveniles of each genotype:

   AA: Aa: aa:

10. Make sure the number of migrants is zero for all genotypes, then click Done. Make sure the mutation rates are set to zero, but before you click Done, predict what's going to happen:

    The _____ *AA* adults make a total of _____ *A* gametes and _____ *a* gametes.

    The _____ *Aa* adults make a total of _____ *A* gametes and _____ *a* gametes.

    The _____ *aa* adults make a total of _____ *A* gametes and _____ *a* gametes.

    What is the total number of gametes in the new gene pool? _____

    What is the total number of gametes carrying allele *A*? _____

    What is the frequency of allele *A* in the new gene pool? _____

    Now click on the Done button to see the frequency of *A* in the new gene pool. Were you right? Has the frequency of allele *A* changed from its starting value of 0.8? Why or why not?