

Supplemental Material

CBE—Life Sciences Education

Price *et al.*

Appendix 2. The Genetic Drift Inventory 1.0

A small island is home to a unique population of land snails. This population was founded by 10 individuals that floated to the island on a log, and it has been isolated from the large mainland population ever since. The mainland population has consistently had about 10,000 individuals in it through time. The island population reached 1000 individuals after several generations, and then stayed at this size through time.

A. A team of researchers compared the genetic variation of the mainland and the isolated island populations for a few generations after colonization. Would a biologist agree or disagree with the following statements?

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| 1. | Genetic drift is more pronounced in the island population than the mainland population in these first few generations. | A. Agree | B. Disagree |
| 2. | The biologists observed genetic drift but not evolution. | A. Agree | B. Disagree |
| 3. | The island population likely has fewer alleles—that is versions of genes—than the mainland population. | A. Agree | B. Disagree |
| 4. | Some harmful traits may have become more common in the island population than the mainland population. | A. Agree | B. Disagree |

B. After forty generations, biologists measured the genetic variation of the isolated island snail population again. They concluded that the population of snails on the island had remained isolated and that genetic drift had occurred.

Would a biologist agree or disagree with the following statements about *the processes that contributed, at least in part, to genetic drift in the population of island snails?*

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| 5. | The fact that snails needed to adjust to the environment contributed to genetic drift. | A. Agree | B. Disagree |
| 6. | The fact that individuals that were best suited to the environment had a higher rate of survival contributed to genetic drift. | A. Agree | B. Disagree |
| 7. | Random survival of different individuals could not have contributed to genetic drift because random processes are unpredictable. | A. Agree | B. Disagree |

C. Would a biologist agree or disagree with the following statements about what occurred after forty generations in the isolated island population?

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| 8. | The island population may have adapted to conditions on the island through genetic drift. | A. Agree | B. Disagree |
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A biologist raised 100 populations of flies in a lab. At the beginning of the experiment, each population had 16 flies: 8 with plain wings and 8 with striped wings. These 16 flies reproduced to form the first generation of offspring. In each of the 100 populations, the biologist randomly chose 16 of the offspring as breeders for the next generation. She repeated this process for 20 generations. At the end of the experiment, half of the populations contained only plain-winged flies, and the other half contained only striped-wing flies. Wing pattern is a genetically controlled trait that does not affect how well flies survive or reproduce.

D. Would a biologist agree or disagree with the following statements about the experimental results?

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| 9. | The experiment did not control for all the variables, so the environments were different enough that natural selection contributed to the changes in the frequency of the two wing types in these populations. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 10. | The small number of individuals reproducing each generation contributed to the rapid changes in the frequency of the two wing types in these populations. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 11. | The populations were isolated from each other so genetic drift could not have caused the results. | <i>A. Agree</i> | <i>B. Disagree</i> |

A population of 1000 dung beetles was split into five populations when irrigation canals were built through their habitat. The five new populations were called the Northern, Southern, Eastern, Western, and Central populations. Each new population consisted of about 200 individuals. The five populations continued to evolve, and no migration occurred among populations. One hundred generations later, each population still has about 200 individuals, and a biologist investigates them.

E. What would a biologist expect to see in the five populations after 100 generations if the environment did not change for any of the populations?

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| 12. | Differences among the five populations probably occurred when populations adapted to specific environments because most evolution results in adaptation. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 13. | Each population would probably have fewer alleles—that is, versions of genes—than it would have had 100 generations ago. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 14. | Each population would probably gain new mutations through genetic drift. | <i>A. Agree</i> | <i>B. Disagree</i> |

F. Would a biologist agree or disagree with the following statements?

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| 15. | In the smaller populations of 200 individuals, the processes leading to genetic drift could have a stronger influence on a gene than natural selection. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 16. | Chance survival of some individuals occurred in some generations, but not every generation. | <i>A. Agree</i> | <i>B. Disagree</i> |

G. All species of dung beetles lay their eggs in balls of dung. Long legs allow the beetles to create better dung balls, which improves reproductive success. Long legs were common before the canals were built. However, after the populations were separated, long legs became less common in the most southern population. Would the biologist agree or disagree with the following explanations for the decrease in the proportion of long-legged individuals in the Southern population?

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| 17. | An increase in the proportion of beetles with short legs occurred because natural selection favored individuals with shorter legs. | <i>A. Agree</i> | <i>B. Disagree</i> |
| 18. | Since there was no migration there could be no genetic drift. | <i>A. Agree</i> | <i>B. Disagree</i> |

A disorder that causes nearsightedness is caused by a genetic mutation. Nearsightedness was harmful to people living on a small island because they relied on sight to interpret their surroundings. In the 1600s, a huge storm killed many of the people on the island. Before the storm, 0.1% of the people had this disorder. Of the 50 people who survived the storm, 2% were nearsighted. Within a few generations, 10% of the islanders were nearsighted.

H. Would a biologist agree or disagree with the following statement about the high rate of nearsightedness in the islanders after the storm?

19. The high rate was caused by new mutations that resulted in genetic drift. *A. Agree* *B. Disagree*

I. A biologist concludes that the change in frequency of nearsighted individuals could be evidence of genetic drift. Would she agree or disagree with the following statements?

20. Nearsightedness must have become more common through natural selection. *A. Agree* *B. Disagree*

21. Nearsightedness must have become more common through people migrating from neighboring islands. *A. Agree* *B. Disagree*

22. Nearsightedness must have become more common through new mutations. *A. Agree* *B. Disagree*