**EEB 2208 (Introduction to Conservation Biology)**

**Sample Test Questions: Lectures 14-17**

In each case, the letter A indicates that the statement is correct, and a B indicates that it is not. I have included some notes (in red) to explain my thinking when designing each question.

**Why is it easier to set up a captive breeding program for plants than animals?**

1. Plants can persist with much smaller population sizes than animals. **B**
2. Plants generally require more specialized breeding conditions than do animals. **B**
3. Maintaining plants ex-situ usually requires less space than animals. **A**
4. Double-clutching is easier in plants than animals. **B**
5. Genetic drift is more severe in animals than in plants. **B**

There is no basis for considering Q1 or Q5 to be true. Q2 is also wrong in most cases – for the most part the opposite is true. Strictly speaking, double-clutching refers to organisms that lay eggs, but even if that were not the case, Q4 would not make sense because the advantage of double-clutching only applies to organisms that have parental care.

**The black-footed ferret is an endangered species that has been bred in captivity. A new release program is being designed to establish a new population in the wild. Which of the following recommendations would benefit the organizers of the release?**

6. Once the release has been done, stay well away from the release site at all times so as to not disturb the animals. **B**
7. Release as few individuals as possible to minimize the risk of something going wrong. **B**
8. Augment populations at regular intervals to simulate immigration. **A**
9. Avoid soft releases. **B**
10. Choose a release site near the periphery of the species' former range. **B**

Q6 is wrong because it would not allow you do to post-release monitoring. Q7 is wrong because larger populations have a better chance of success. Q9 is designed to test whether you know the difference between a soft release and a hard one.

**A group of researchers has created a demographic model to estimate the extinction risk for Sumatran rhinos. The model is designed to determine the probability that the current population of 275 animals will go extinct within the next 100 years. All of the data for the model come from a detailed, long term study of birth and death rates from the wild population. The researchers conducted 10,000 simulations, and found that the population went extinct in 150 of them. Which of the following statements are true?**

11. The model is deterministic. **B**
12. The model includes uncertainty in the population's trajectory. **A**
13. According to the model, the population has at least a 90% chance of persisting for 100 years. **A**
14. According to the model, environmental stochasticity is a major threat to the persistence of this population. **B**
15. The species is completely safe from extinction. **B**

Q11 has to be wrong because different simulations produced different results (i.e., some, but not all, resulted in extinctions). Q12 is correct for the same reason. Q13 tests whether you understand how to estimate extinction risk using a simulation model. Q14 is wrong because there is no information about the importance of different types of stochasticity. Q15 is wrong because some simulations (albeit very few) result in extinction – hence there is a very low chance of extinction, but the population is not completely safe.

**Which of the following statements about the effective population size are true?**

16. It is usually 2-3 times greater than the census population size. **B**
17. It is a theoretical measure of how many individuals contribute their genes to future generations. **A**
18. It is affected by the sex ratio, population size fluctuations, and reproductive variation. **A**
19. The smaller the effective population size the smaller the risk of inbreeding. **B**
20. It can be used to estimate the rate at which species richness declines. **B**

These questions just test basic knowledge about $N_e$– check the notes if you are not sure about why these answers are correct.

**Which of the following statements about the global reserve network are accurate?**

21. About 4% of the world's land surface is strictly protected. **A**
22. Marine reserves cover a greater area than terrestrial reserves. **B**
23. Although many of the world's species are not protected by reserves, almost all threatened species are protected. **B**
24. In the U.S., National Parks, National Wildlife Refuges and National Forest exist solely to protect biodiversity. **B**
25. Reserves in California are largely located in areas of high biodiversity. **B**

Q21 was designed to test whether you understood the distinction between a site being a reserve and it being strictly protected. Q22 tested whether you knew that marine ecosystems have received less protection than terrestrial ecosystems (even if you didn't remember the figure, you could have guessed this as I have mentioned the fact that we have tended to neglect ocean conservation numerous times during the course). The last three parts aimed to determine whether you knew that these commonly-held beliefs are not actually correct.

**Which of the following statements about sink habitats are true?**

26. Reproductive rates are always lower in sink habitat than in source habitat. **B**
27. Mortality rates are always higher in sink habitat than in source habitat. **B**
28. The population growth rate is always lower in sinks than in source habitat. **A**
29. The chance of a population going extinct in a patch of sink habitat can depend on the dynamics of populations in other habitat patches. **A**
30. Sink habitats have no conservation value. **B**

Q26 and 27 were hard, but they test whether you truly understand the source-sink concept: i.e., it is not the absolute birth and death rates that matter, but their relative values (i.e., the balance between births and deaths). Q28 has to be true because lambda > 1 in sources and <1 in sinks (based on their definitions).

**Which of the following statements about the equation, $H_{t+1} = (1 – 1/2N_e)H_t$, are true? (3 points)**

31. $N_e$ is the number of individuals in the population. **B**
32. $H_t$ is a measure of the amount of genetic variation in the population. **A**
33. $H_{t+1}$ is always smaller than $H_t$. **A**
34. The equation describes the effect of genetic drift on a population. **A**
35. The equation describes changes in genetic diversity in a population. **A**

The first two parts test whether you know what those terms are. Q33 tests whether you understand the main point I was making when describing the equation (i.e., the "big picture" part of that discussion). The last two parts test whether you understand both the general (Q35) and specific (Q34) processes that the equation describes – i.e., change in genetic diversity that is caused by drift.

**36. Give two reasons why conservation biologists consider genetic diversity to be important. (2 points)**

Reduced evolutionary potential
Inbreeding depression is more likely

**37. Give an example of each of the following. Examples <u>must be individual species</u>, rather than references to groups of species. (3 points)**

A species that has been the subject of a PVA: In class I presented examples for brown pelican and Hawaiian stilt, but any verifiable answer would do.

A species that has been the subject of a captive breeding program: Examples given in class included Panamanian golden frog, California condor, Père David's deer, gaur, whooping crane, African and Asian elephants, any of the plant species that we brought over from the greenhouse, *Powelliphanta augusta* (the New Zealand snail that had an unfortunate freezer accident – yeah, that was a tough one), Mauritius kestrel, gray wolf, Devil's hole pupfish, black-footed ferret, peregrine falcon and pink pigeon. Any other verifiable answer would have been accepted.

A species that has suffered from the effects of inbreeding: Examples given in class included Florida panther in the cons genetics lecture, and Indian elephant, zebra and giraffe earlier in the semester. Any other verifiable answer would have been accepted.

**38. Describe the advantages and disadvantages of using computer simulations to estimate the chance that a population will go extinct under different scenarios? (5 points)**

Various possible responses would be acceptable, but here are a few that would count:

Advantages: Can do "experiments" that are impossible in the real world. Can easily compare a wide range of different scenarios. Can replicate many times and quantify uncertainty.

Disadvantages: Need good data to ensure that models produce realistic/informative results. Data collected over long time periods is often necessary to describe environmental variation well. Need to understand biology of organism well enough to design model appropriately.