EEB 2208 (Introduction to Conservation Biology)

Sample Test Answer: Lectures 1-5

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. Hopefully, these notes will give you a sense of what I am trying to find out about your knowledge when I ask a question in a particular way.

Which of the following things have been suggested as reasons why conservation is important? (5 points)

1. People like nature. **A**
2. Biodiversity is a source of building materials. **A**
3. Human health can benefit from biological diversity. **A**
4. Ecosystems provide important services to humans. **A**
5. If too many species go extinct there might be an ecological catastrophe, like that on Easter Island. **A**

This question tests whether you understand the wide range of arguments that have been put forth in support of biodiversity protection. Note that it is possible for all answers in a set of five to be correct (or incorrect).

Based on what I have told you in lectures, which of these places are likely to be species richness hotspots?

6. Alaska. **B**
7. Madagascar. **A**
8. The South American Andes. **A**
9. Easter Island. **B**
10. The ocean between Australia and SE Asia. **A**

Based on the general principles discussed in lecture you should be able to work out that 6 and 9 are probably not hotspots because they occur at a high latitude and are a small, remote island, respectively. I specifically talked about 8 and 10 in class. 7 is the hard one – it appears on the hopspot map that I showed you, but even if you did not notice it, the fact that Madagascar lies in the tropics should makes you realize that it likely to be a hotspot (it is an island, but a very big one with a lot of scope for speciation, and not terribly remote, so that shouldn't matter).

Which of the following disciplines play an important role in conservation biology?

11. Genetics. **A**
12. Political science. **A**
13. Geography. **A**
14. Economics. **A**
15. Environmental activism. **B**

This question tests two things. First, that you recognize that conservation biology is a multidisciplinary subject drawing on a wide range of fields: 11-14 are all things I mentioned explicitly in the first lecture (and implicitly several times since) so their inclusion here should be straightforward. The second thing I wanted to test is that you know that conservation biology is very distinct from activism of any kind. The science conducted in conservation biology can certainly be used in activism, but it is distinct and can also be misused by activists.

Using only Figure 3 in Hahs et al. (in the exam I would give you the figure and the legend) determine which of the following statements is correct?

16. The oldest cities have the highest extinction rates. **B**
17. Extinction debt is lowest for Type III cities. **B**
18. The number of extinctions is lowest for Type III cities. **B**
19. Extensive transformation after 1600 causes relatively high extinction rates. **A**
20. The youngest cities have highly variable extinction rates. **A**

This set of questions is designed to test your ability to interpret graphs. Questions 16, 19 and 20 can be answered simply by looking at the scatter of points. The figure provides no information about extinction debt, so 17 is incorrect. Similarly, the number of extinctions is not plotted (y = extinction rate), so there is no way to confirm that 18 is correct.

Using data collected from vets, researchers have studied the mortality rate of cats that have fallen from buildings to see whether the height of the fall influences the chance that the cat will die. Surprisingly, they found that cats that fall from floors 1-5 were more likely to die than those that fell from higher up (floors 6-32). Why was this? (5 points)

21. Falling from high up gives the cats time to position themselves so that they land safely. **B**
22. The data are biased. **A**
23. A mean is being compared to a median. **B**
24. Fewer cats fall from high floors than low floors. **B**
25. Vets don't see most of the cats that fall from higher floors. **A**

Note that the correct answers here are two ways of saying the same thing – the first a general statement, the second a specific one. The point of this question is to test whether you can recognize both the specific issue that relates to this data set and the general point. Note too, that it is possible that 24 could be true, but it cannot explain the pattern in the data because mortality rates were used (i.e., a rate corrects for the number of cases). Theoretically, 21 could be true, but there is no evidence to support that conclusion.

Which of the following statements about species richness are generally true? (5 points)

26. Richness increases with increasing latitude. **B**
27. Richness is highest in the tropics. **A**
28. Richness is higher on islands than on the mainland. **B**
29. Richness is highest at high elevations. **B**
30. Richness is highest in hotspots. **A**

The answers here are simply things you need to learn. But, most of them should make sense even if you haven't been in class. By writing "generally true" in the question, I am not trying to "trick" you into thinking something other than the correct answer, I am simply acknowledging that there are occasional exceptions to these widespread patterns.

How does the current rate of extinction compare to the background rate? (5 points)

31. They are about the same. **B**
32. It is about ten million times greater. **B**
33. It might be as much as ten thousand times greater. **A**
34. It is estimated to be about 100-1000 times greater. **A**
35. It is impossible to compare them. **B**

If I ask you about numbers presented in class, the questions will be something like those given here. E.g., I will expect you to know things approximately (i.e., to within an order or magnitude or so), but I won't expect you to know them exactly. Numbers 31, 32 and 34 test whether you know the actual rates of

extinction – getting these parts right tells me that you know the basic, most important, information. Number 33 tests whether you understand that there is uncertainty, and roughly what magnitude it has – getting this part right tells me that your knowledge is more sophisticated than just basic memorization. Number 35 tests whether you understand that, even though there is uncertainty, we can still draw useful conclusions – getting this part right in addition to the other parts, tells me that you really understand all of the important issues I talked about in the lecture.

Which of the following could be considered keystone species?

36. Wolves. **A**
37. Beavers. **A**
38. Puritan tiger beetles. **B**
39. Humans. **A**
40. Sea otters. **A**

This set focused on whether you know what a keystone species is. 36, 37, and 40 are all examples given in class and/or the textbook and should have been straightforward. 38 and 39 test whether you can apply your understanding of the concept to new situations. In a different lecture, I told you that Puritan tiger beetles are very rare and found in only a few very small places. From this you should be able to infer that they are very unlikely to be a keystone species. Similarly, the entire course is about the ways in which humans have had dramatic impacts on a wide range of organisms – which tells you that they play a keystone role.

Which of the following is a component of biological diversity?

41. Interactions among species. **A**
42. Species evenness. **A**
43. Species richness. **A**
44. DNA differences among humans. **A**
45. Different species assemblages. **A**

Here I am testing whether you understand the full range of things that constitute biological diversity. All of these items are things I discussed in lecture. I did not specifically mentioned human diversity, but 44 was included to ensure that you understand that humans are also a part of biodiversity.

Which of the following statements about extinction are correct?

46. Mass extinctions have been very common throughout geological time. **B**
47. Extinction rates were far higher during past mass extinctions than they are today. **B**
48. Extinction is a natural process. **A**
49. Extinction rates in marine species are much higher than for terrestrial species. **B**
50. Extinction rates in birds are very similar to all other groups. **B**

Parts 46-48 test basic knowledge of things I talked about in lecture. There have been only 5 mass extinctions in all of geological history, so they cannot be considered common, let alone very common (Note that when I asked this question on an exam a lot of people asked questions about the word "very", which they felt made the question "tricky". This surprised me, because I had purposefully included that word, thinking that it would remove any possible doubt and make the question easier. This case is a great example of people trying to read way more into a question than is appropriate!). Current rates of extinction are estimated to be similar to those during mass extinctions, and most extinctions happened before humans appeared on Earth. Parts 49 and 50 are harder (because exact extinction rates are not known) and test your ability to make reasonable inferences from the information presented in class. There is no reason to believe that extinction rates in the ocean are much higher than for terrestrial species – in fact, since past marine extinction rates are used as a proxy for the global background rate, it is

implicitly assumed that the rates are similar (though we do not know this for certain). On the other hand, endangerment rates do vary considerably among taxonomic groups and so it seems unreasonable to conclude that all groups have similar extinction rates (I also presented numbers for birds that differ from some other groups – e.g., fungi – but even without those, the right answer could have been inferred).

PART 2:

51. Define the following terms, and give an example of each (8 points).

a) Keystone species - See notes to Lecture 3 and text book. Note that an ecosystem engineer can be considered a keystone species, but the reverse is not necessarily true. See Q36-40 for examples.

b) Beta-diversity - See notes to Lecture 3 and text book. An example would be the change in species composition as you move from a woodland into an adjacent field. Note too that this is something I will talk about more when discussing how range size affects estimates of extinction rates in tropical rainforest (see Lecture 8 notes when they are posted).

c) Endemic species - See notes to Lecture 5. One example I have mentioned is the po'ouli (endemic to Hawaii); many others will come up as we proceed through the course.

d) Extinct in the wild - See notes to Lecture 5. One example I have mentioned is California condor, which was extinct in the wild for a while (but is not anymore).

52. Describe three ways in which conservation biology is similar to medicine (3 points).

See notes to Lecture 1.

53. Define the word "average" as completely as possible (3 points).

Here I would be looking for definitions of mean, mode and median.