

EEB 2208 (Introduction to Conservation Biology)

Homework 2: Lecture 4

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

1. Alaska. **B**
2. Madagascar. **A**
3. The South American Andes. **A**
4. Easter Island. **B**
5. The ocean between Australia and SE Asia. **A**

This question is an example of what I mean when I say I want you to learn to apply general principles rather than just memorizing stuff. Based on the general principles discussed in lecture you should be able to work out that 1 and 4 are probably not hotspots even though I did not mention either in class (the reasons are that they occur at a high latitude and are a small, remote island, respectively). I specifically talked about 3 and 5 in class, so they should have been easy. 2 is perhaps the hardest one. I did not talk about it in class, although it does appear on the hotspot map that I showed you. Even if you did not notice it, the fact that Madagascar lies in the tropics should make you realize that it is 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 lots of species is still likely).

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

6. Richness increases with increasing latitude. **B**
7. Richness is highest in the tropics. **A**
8. Richness is higher on islands than on the mainland. **B**
9. Richness is highest at high elevations. **B**
10. 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. Also, note that by writing "generally true" in the question, I am not trying to "trick" you into thinking something other than the correct answer (I have much better things to do with my time!); I am simply acknowledging that there are occasional exceptions to these widespread patterns.

Which of the following statements about the species that remain to be described by scientists are true? (3 points)

11. About half of all species on Earth have been described. **B**
12. Species that remain to be described are all found in the tropics. **B**
13. New species continue to be described in the United States. **A**
14. New species of mammals continue to be described. **A**
15. Most species that remain to be described are plants. **B**

The first question in this set is an example of how I test knowledge of numerical facts. Currently, the vast majority (probably >85%) of species are undescribed. I wouldn't expect you to know that exact number, and there is also a lot of uncertainty. I would, however, expect you to know that it is the majority of all species, and certainly more than half. 12 and 13 are designed to test whether you know something about the geographic distribution of undescribed species – specifically that they are not all in the tropics (though most are) and that new species are being discovered even in developed countries with a lot of

taxonomists. Similarly, 14 and 15 are testing what you know about which types of species are poorly known – I'd expect you to know that there are new discoveries in all groups (even well-studied ones like mammals), but that the majority are insects (fungi, bacteria, and a couple of other groups also have a lot of undescribed species, but – based on current knowledge – many fewer than insects; and plants are generally pretty well known).

PART 2:

16. Define the following terms. Also, give an example for (a), and explain how (b) is relevant to conservation biology (4 points).

a) Extrapolation beyond the data – See notes to Lecture 2. An example would be that momentous sprint I described.

b) Canopy fogging – See text book reading and Lecture 4. This technique has been used to determine how many canopy insect species there are in a small area, and what proportion of them are undescribed. This information has been used to help estimate how many species there are on Earth.

17. When I discussed biodiversity patterns, I indicated that the lecture was extremely narrow in its focus. Why did I say this, and what was missing from the lecture? (3 points)

One point for recognizing that the lecture was narrow in its focus because I talked almost exclusively about species richness. For the other two points, I would expect you to identify at least 4 (half a point each) other aspects of biodiversity discussed in the third lecture (species evenness, beta-diversity, genetic variation, population structure, species interactions, community/habitat diversity, etc. etc.)

18. Species richness “hotspots” have been suggested as a way to help conservation planners prioritize which areas to protect. Give three reasons why this approach is not ideal (3 points).

Limitations of the hotspot approach include: (1) areas of high species richness do not always line up across species groups (Prendergast et al. study), (2) areas of high species richness do not always overlap with areas containing the greatest number of threatened species or the greatest number of endemic species (Orme et al. study), (3) many species of conservation interest do not occur in any kind of hot spot (e.g., polar bears), (4) some unique ecosystems lack both rare species and lots of species, but are still worthy of protection (e.g., salt marshes, saline lakes). Other responses might be given points if they are well supported and clearly explained (and accurate) – e.g., I could see myself accepting an answer based on the fact that, since most species have not been described, it is impossible to be sure that hotspot assessments truly reflect biodiversity patterns.