

Study questions for exam one

1. How many species are there currently on earth? What are some of the problems with estimating the number of species?
2. What form does the species-area curve usually take? How have species-area relationships been used to estimate rates of extinction? What does this approach suggest about the number of species that will be lost as habitat is lost?
3. What methods did Pimm et al describe to estimate current extinction rates? Methods to estimate the normal 'background' extinction rate? How do conservative estimates of the current extinction rate compare to the background rate?
4. How has the world's human population grown over recent centuries? How can a population grow faster than an exponential rate? For full credit, explain Condorcet's equations for human population growth, verbally, algebraically and graphically.
5. How long will a population take to double, if it is growing exponentially at a rate of 1.7% per year ($r = 0.017$)?

6. Define "species". For full credit, provide more than one definition and explain the complexities that different definitions of species wrestle with. How does the application of different definitions affect conservation planning (consider Peterson & Navarro)?
7. Describe, step-by-step, the process by which allopatric speciation works. Be sure to explain each of the major factors that determine whether or not speciation will occur when a single population becomes two allopatric populations.
8. Explain mechanisms of reproductive isolation, with an example of a pre-zygotic and a post-zygotic isolating mechanism. Which type of isolation is reinforced once allopatric populations become sympatric? Why?
9. Explain the roles of population size, natural selection and dispersal in maintaining or eliminating genetic variation in a population.
10. Explain the roles of population size, natural selection and dispersal in causing two populations to genetically diverge or remain similar.

11. Explain phenotypic and cladistic classification. What is the major strength of cladistic classification? What is its major weakness?
12. What is a derived homology? What kind of group does a shared derived homology define?

13. Define "ESU". Explain Crandall et al.'s 'crosshair' method of analyzing whether or not a population is an ESU. What problems with prior definitions were Crandall et al trying to correct? Relate these issues to the Department of the Interior's DPS policy.
14. Give an example of a case study for which there has been debate, based on genetic evidence about hybridization, as to whether or not a certain taxonomic group should be protected. Based on the debate, what do YOU think?
15. Algebraically define each of the three fixation indices or F-statistics. In words, what does each one measure?

16. How would F_{st} be used with mitochondrial and microsatellite DNA to apply Crandall et al's crosshair analysis of ESUs?
17. What is inbreeding? How do F stats measure inbreeding? How do F stats (F_{is} , F_{it} and F_{st}) relate to the value of F from pedigree analysis? What is inbreeding depression? How is it measured? What do recent reviews suggest about the effects of inbreeding in the wild?