ZOOLOGY 502
Fundamental concepts and hot topics in ecology and evolution

2002-2003

Instructors:

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Course website: http://www.zoology.ubc.ca/~hellmann/zoo502.html

Course description:

Students are expected to enroll in Terms I and II.

This course is intended for beginning graduate students in any subfield of ecology and/or evolution. The course will focus on reading, discussing, and writing about the primary literature, from classic papers to cutting-edge research. In the first term, we focus on foundational papers in several areas (see pg. 2). Students will help determine the focus of the second term, in which we will explore modern developments from these fundamental concepts; possible topics include:

- phenotypic plasticity
- metapopulations
- microbial ecology
- evolution in small populations
- global change
- speciation
- diversity-stability
- macroecology
- quantitative genetics & genomics
- developments in population theory

A second component of the course is the weekly Ecology and Evolution Seminar in the Department of Zoology. We will discuss the work presented in the seminar and will often talk directly with the seminar speaker. In total, the course will emphasize the historical roots and pathways of discovery that define this discipline.

Course meetings:

Monday 8:30-10:30 (Hut B6, room 14A)
Presentation and discussion of assigned readings (pg. 2)
Wednesday 4:00-5:30 (Family and Nutrition Sciences Building, room 60)
Department of Zoology Ecology and Evolution Seminar
(see http://www.zoology.ubc.ca/seminars/ for schedule)
Friday 8:30-10:30 (Hut B6, room 14A)
Discussion of Wednesday seminar and a paper by the speaker for the following week (see course website for papers)

Requirements:

Term I

- Presentation of assigned readings; presenters assigned randomly on day of class
- Participation in discussion
- Participation in question-and-answer at Wednesday seminar
- Preparation of project for Term II

Term II

- As above for Term I
- Presentation and submission of term project; literature review, research proposal, grant application, or other upon permission

Term I readings:

* in Real, L., and J. H. Brown, eds. 1991. Foundations of Ecology: Classic Papers with Commentaries. University of Chicago Press, Chicago, IL. (^)
+ available online from course website.
^ on reserve in library.

Sept. 9 **Introduction**

Kingsland, S. E. 1991. Defining ecology as a science. Pages 1-13 *in* Foundations of Ecology. L. A. Real and J. H. Brown, eds. University of Chicago Press, Chicago, IL.*

Sept. 16 **Ecophysiology**

Porter, W. P., and D. M. Gates. 1969. Thermodynamic equilibria of animal with environment. Ecological Monographs 39: 245-270.*

Spotila, J. R., O. H. Soule, and D. M. Gates. 1972. The biophysical ecology of the alligator: heat energy budgets and climate spaces. Ecology 53: 1094-1102. +

Sept. 23 **Selection**

Kettlewell, H. B. D. 1955. Selection experiments on industrial melanism in the Lepidoptera. Heredity 9: 323-342.*

Grant, P. R. 1965. The adaptive significance of some size trends in island birds. Evolution 19: 355-367. +

Sept. 30 **Population dynamics**

Volterra, V. 1926. Fluctuations in the abundance of a species considered mathematically. Nature 118: 558-560.*

Davidson, J., and H. G. Andrewartha. 1948. The influence of rainfall, evaporation and atmospheric temperature on fluctuations in the size of a natural population of *Thrips imaginis* (Thysanoptera). Journal of Animal Ecology 17: 200-222.*

Extra: Leslie, P. H. 1945. On the use of matrices in certain population mathematics. Biometrika 33: 183-212.*

Oct. 7 **Coevolution**

Ehrlich, P. R., and P. H. Raven. 1964. Butterflies and plants: a study in coevolution. Evolution 18: 586-608.*

Janzen, D. H. 1966. Coevolution of mutualism between ants and acacias in Central America. Evolution 20: 249-275. +

Extra: Janzen, D. H. 1980. When is it coevolution? Evolution 34: 611-612. +

Oct. 21 **Island biogeography/dispersal**

MacArthur, R. H., and E. O. Wilson. 1967. The Theory of Island Biogeography. Princeton University Press. Princeton, NJ. Chapter 3. ^

Simberloff, D. S., and E. O. Wilson. 1969. Experimental zoogeography of islands: the colonization of empty islands. Ecology 50: 278-296.*

Oct. 28 **Ecological niche**

Hutchinson, G. E. 1957. Concluding remarks. Population Studies: Animal Ecology and Demography. Cold Spring Harbor Symposia on Quantitative Biology 22: 415-427.*

Hutchinson, G. E. 1959. Homage to Santa Rosalia; or, why are there so many kinds of animals? American Naturalist 93: 145-259.*

Nov. 4 **Competition**

MacArthur, R. H. 1958. Population ecology of some warblers of northeastern coniferous forests. Ecology 39: 599-619.*

Connell, J. H. 1961. The influence of interspecific competition and other factors on the distribution of the barnacle *Chthamalus stellatus*. Ecology 42: 710-723.*

Nov. 11 **Predation**

Hairston, N. G., F. E. Smith, and L. B. Slobodkin. 1960. Community structure, population control, and competition. American Naturalist 94: 421-425.*

Holling, C. S. 1959. The components of predation as revealed by a study of small mammal predation of the European pine sawfly. Canadian Entomologist 91: 293-320.*

Extra: Huffaker, C. B. 1958. Experimental studies on predation: dispersion factors and predator-prey oscillations. Hilgardia 27: 343-383.*

Nov. 18 **Community ecology**

Preston, F. W. 1962. The canonical distribution of commonness and rarity, part I. Ecology 43: 185-215.*

Paine, R. T. 1966. Food web complexity and species diversity. American Naturalist 100: 65-75.*

Nov. 28 **Ecosystem ecology**

Lichens, G. E., F. H. Bormann, N. M. Johnson, D. W. Fisher, and R. S. Pierce. 1970. Effects of forest cutting and herbicide treatment on nutrient budget in the Hubbard Brook watershed-ecosystem. Ecological Monographs 40: 23-47.*

Vitousek, P. M., P. R. Ehrlich, A. H. Ehrlich, and P. A. Matson. 1986. Human appropriation of the products of photosynthesis. BioScience 34: 368-373. ^

Dec. 2 **Evolutionary genetics**

Dobzhansky, T. 1955. A review of some fundamental concepts and problems of population genetics. Cold Spring Harbor Symposium on Quantitative Biology 20: 1-15. ^

Lewontin, R. C., J. L. Hubby. 1966. A molecular approach to the study of genetic heterozygosity in natural populations. II. Amount of variation and degree of heterozygosity in natural populations *Drosophila pseudoobscura*. Genetics 54: 595-609. ^

Extra: Hubby, J. L., and R. C. Lewontin. 1966. A molecular approach to the study of genetic heterozygosity in natural populations. I. The number of alleles at different loci in *Drosophila pseudoobscura*. Genetics 54: 577-594. ^

Muller, H. J. 1949. Redintegration of the symposium on genetics, paleontology, and evolution. Pages 421-445 in Genetics, Paleontology, and Evolution. G. Jepsen, E. Mayr, and G. Simpson, eds. Princeton University Press, Princeton, NJ. ^

Dec. 9 **Conservation Biology**

Simberloff, D. S., and L. G. Abele. 1976. Island biogeography and conservation practice. Science 191: 285-286. +

May, R. M. 1988. How many species are there on Earth? Science 241: 1441-1449. +

Extra: Diamond, J. M. et al. 1976. Island biogeography and conservation: strategy and limitations. Science 193: 1027-1032. +

Extra: Soulé, M. E. 1986. Conservation biology and the "real world." Pages 1-12 *in* Conservation Biology: The Science of Scarcity and Diversity. M. E. Soulé, ed. Sinauer Associates, Sunderland, MA. ^

Dec. 16 **Project planning**

Term II readings: To be determined.