Fall 9-1-2001

BIOL 480.01: Consesrvation Genetics

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Biology 480 4 September 2001

CONSERVATION GENETICS

Instructor: Fred Allendorf, HS301, 243-5503, darwin@selway.umt.edu.

Office Hours: You are welcome to stop by my office at any time to talk with me. You also can make an appointment by talking with me in class, by phone, or by email.

Assistants: Chris Funk, HS203, 243-6749, wcfunk@selway.umt.edu
Andrew Whiteley, HS311, 243-6749, whiteley@selway.umt.edu

Meeting Times: Tuesday and Thursday, 2:10 - 3:30, JRH 204.

Course Description: The objective of this course is to provide the genetic basis for solving biological problems in conservation. Major topics will include (1) the basics of population genetics, with emphasis on the genetics of small populations; (2) the application of molecular genetic techniques to conservation biology; and (3) the consideration of case studies of the application of genetics to conservation problems.

Text: *Conservation and the Genetics of Populations*. Notes written for this class by myself and Gordon Luikart. The first eight chapters of these notes are currently available as a Faculty-Pac in the UC Bookstore.

Miller, P.S., and R.C. Lacy. 1999. *VORTEX: A Stochastic Simulation of the Extinction Process. Version 8 User's Manual*. Conservation Biology Specialist Group (SSC/IUCN). Apple Valley, MN.

The Gist of Genetics: Guide to Learning and Review by R.H. Davis and S.G. Weller. 1996. Jones and Bartlett. This is an optional text that is recommended for this who would like help in reviewing the basic principles of genetics.

Computer Programs: Several computer programs will be used during this course:

Populus contains a set of simulation models developed in teaching population biology and evolutionary ecology at the University of Minnesota. This program is designed to be used like an arcade game, with students trying different parameter values and puzzling out their dynamic effects in many of the models we will be using. We will use version 3.42 (1998) because the genetic modules have not yet been included in the latest update (version 5.01).

http://www.cbs.umn.edu/populus/

Simul8 simulates the effects of genetic drift, natural selection, mutation, and genetic drift at a single locus with two-alleles. This program is provided by Joe Felsenstein at the University of Washington. It is powerful but not too user-friendly.

ftp://evolution.genetics.washington.edu/pub/popgen/simul8.html

VORTEX is a simulation program for population viability analysis developed at the Brookfield Zoo of the Chicago Zoological Society.

http://home.netcom.com/~rlacy/vortex.html

PM2000 (Population Management 2000) is a tool for demographic and genetic analysis of captive breed animals

http://www.b22crew.com/pm2000/index.html

Paper: Each student will write a paper on the genetics and conservation of a particular species or group of closely related species. You should pick your species or group as soon as possible so that you can begin accumulating literature and organizing your paper. The objective of this paper is to describe what is known about the genetics of the taxon you select and to consider the significance of this information for conservation.

The opportunity to write this paper is designed to encourage independent thinking and synthesis in some area of special interest to you. You are encouraged to think creatively, both in the selection of your topic and in writing the paper. This paper will give you the opportunity to explore beyond the material that is directly covered in class and readings.

See Paper handout for detailed instructions.

Final Exam Period: There will not be a Final Exam in this course. However, we will meet during Finals week to allow each student to make a short presentation that will be based upon the paper written for the course. There are two times scheduled for us to meet during Finals week because we meet over two time periods during the semester; we will decide later whether we will meet on Monday, Thursday, or both of these days during Finals week. More detailed instructions on your presentation will be provided later.

Grades: Your grade in this course will be based upon your performance on class participation, take-home questions, exams, paper, and class presentation of your paper.

Class participation	100 points
Take-home questions	100 points
Exams (100 each)	200 points
Paper	150 points
Class presentation	50 points
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	600 points

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LECTURE SCHEDULE

Date	Topic	Reading in Allendorf and Luikart
T 4 Sep	Introduction	Ch. 1
Th 6	Phenotypic variation	Ch. 2
T 11	Chromosomal variation	Section (S) 3.1
Th 13	Protein electrophoresis	S 3.2
T 18	Mitochondrial and chloroplast DNA	S 3.3
Th 20	Nuclear DNA	S 3.4-3.7
T 25	Hardy-Weinberg principle	S 4.1-4.2
Th 27	Genotypic proportions in natural populations	S 4.3-4.4
T 2 Oct	Small populations and genetic drift	S 5.1-5.4
Th 4	Bottlenecks and the effects of drift	S 5.5-5.7
T 9	EXAM 1	Chs. 1-5
Th 11	Effective population size	Ch. 6
T 16	Natural selection	Ch. 7
Th 18	Natural selection in small populations	-----
T 23	Population subdivision	Ch. 8
Th 25	*Populus, Simul8*	-----
T 30	Multiple loci **[Paper Outline]**	Ch. 9
Th 1 Nov	Inbreeding and pedigree analysis	S 11.1
T 6	Conservation and genetic population structure	-----
Th 8	EXAM 2	Chs. 1-9 and 11.1
T 13	Demography, genetics, and extinction	Ch. 12 / Appendix 1
Th 15	*VORTEX* (Read Appendix II, *VORTEX User's Manual*)	-----
T 20	Metapopulations	S 12.6
Th 22	Thanksgiving - No class meeting	-----
T 27	The ESA and distinct population segments **[Paper Draft]**	Appendix 2
Th 29	Hybridization and outbreeding depression	Ch. 16, Appendix 3

T 4 Dec	Captive breeding; *PM2000*	S 17.1-17.2, Appendix 4
Th 6	Reintroduction programs	S 17.3-17.4
T 11	Case study 1: Bull trout	Appendix 5
Th 13	Case study 2: Grizzly bears	-----
M 17	Final Exam Period I (3:20 - 5:20 pm)	
Th 20	Final Exam Period II (3:20 - 5:20 pm) **[Paper]**	