

Syllabus - Conservation Biology (BISC 373L/ ENST 373L) Spring 2005, Catalina Island

Overview

As the second course in the Catalina semester, BISC 373L builds on the background in island ecology and conservation gained from BISC 369L. This second course focuses on principles of population genetics and demography that are important in predicting population viability. Particular emphasis will be placed on similarities and differences between marine and terrestrial systems. The course will provide hands-on experience in techniques ranging from field sampling methods to the design and implementation of computer simulations to basic laboratory protocols for measuring genetic variation.

Personnel

Instructors:

Dr. Suzanne Edmands, AHF 314, mc 0371, x05548 (USC campus);
Fax: 213-740-8123, Email: sedmands@usc.edu

Dr. Dennis Hedgecock, AHF 130, mc 0371, 213-821-2091 (USC campus)
Fax: 213-740-8123, Email: dhedge@usc.edu

TA: Augustus Vogel, AHF 306, mc 0371, 213-740-9698 (USC campus)
Fax: 213-740-8123, Email: avogel@usc.edu

Course Materials

Frankham R, JD Ballou and DA Briscoe. 2002. Introduction to Conservation Genetics. Cambridge University Press.

Computer labs

Computer labs will use a series of simulations, spreadsheets and phylogenetics software programs. Computer lab reports will be in the form of a completed worksheet (*neat* handwriting is acceptable) and computer printouts as described in the lab instructions.

Laboratory exercises

The four lab exercises will be written up in standard scientific format (Abstract, Introduction, Methods, Discussion, Literature Cited, Table and Figures). Reports must be typed and should be approximately 3-5 pages in length (excluding tables and figures).

Journal Clubs

In journal club we will be discussing topical papers from the primary literature. Each student will sign up to lead the discussion of one paper. All students will read the main paper, and the person leading the discussion will also be responsible for reading a series of supplemental papers.

Grading

Computer lab reports, 4 x 2.5%	10%
Lab reports, 4 x 10%	40%
Midterm	15%
Final	25%
Overall participation	<u>10%</u>
	100%

Policies

Missed Exams: Missed exams will receive a grade of zero unless the student has an excused absence due to a documented medical or family emergency. At the discretion of the instructor, a missed exam a) may be retaken as a written exam, b) may be retaken as an oral exam or c) may be given a prorated score based on performance in the rest of the course.

Regrades: If you would like to contest a grade on an exam or assignment, you must submit a written explanation of why you think the grade was incorrect. Please note that the ENTIRE exam or assignment will be subject to reevaluation and your score may therefore go up, go down or remain the same. Regrade requests must be submitted to the instructor within two weeks of when the exam/assignment is returned.

Late assignments: Due dates are written in the schedule. Late assignments will be downgraded by 10% per day.

Academic honesty: Academic integrity policies of the university will be strictly followed. Infractions can result in severe penalties. See Scampus for these policies.

Schedule: Due to the vagaries of weather, boat schedules and island life, it may be necessary to make some adjustments in the course schedule.

Journal Club Papers

1. Conflicts

Roemer GW and RK Wayne. 2003. Conservation in conflict: the tale of two endangered species. *Cons. Biol.* 17(5): 1251-1260.

Supplemental papers:

Eggert LS, Mundy NI and Woodruff DS. 2004. Population structure of loggerhead shrikes in the California Channel Islands. *MOLECULAR ECOLOGY* 13 (8): 2121-2133.

Wayne, RK, SB George, D Gilbert, PW Collins, SD Kovach, D Girman and N Lehman. 1991. A morphological and genetic study of the island fox, *Urocyon littoralis*. *Evolution* 45:1849-1868.

2. Conservation and Poverty

Brashares, J. S., P. Arcese, M. K. Sam, P. B. Coppolillo, A. R. E. Sinclair, and A. Balmford. 2004. Bushmeat hunting, wildlife declines, and fish supply in West Africa. *Science* 306:1180-1183.

Supplemental papers:

Brashares et al. 2004. Supporting Online Material to above article.

Adams, W. M., R. Aveling, D. Brockington, B. Dickson, J. Elliott, J. Hutton, D. Roe, B. Vira, and W. Wolmer. 2004. Biodiversity conservation and the eradication of poverty. *Science* 306: 1146-1149.

3. Genetics vs. Demography

Spielman D, Brook BW, Frankham R. 2004. Most species are not driven to extinction before genetic factors impact them *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 101 (42): 15261-15264.

Supplemental papers:

Lande, R.1988. Genetics and demography in biological conservation. *Science* 241: 1455-1460.

Lande, R. 1995. Mutation and conservation. *Cons. Biol.* 9: 782-791.

4. Urchins and Temporal Variance

Moberg PE, Burton RS. 2000. Genetic heterogeneity among adult and recruit red sea urchins, *Strongylocentrotus franciscanus* *MARINE BIOLOGY* 136 (5): 773-784 JUN 2000

Supplemental papers:

Larson, RJ and RM Julian. 1999. Spatial and temporal genetic patchiness in marine populations and their implications for fisheries management. *CalCOFI Rep.* 40: 94-99.

Flowers, JM, S. Schroeter and RS Burton. 2002. The recruitment sweepstakes has many winners: Genetic evidence from the sea urchin *Strongylocentrotus purpuratus*. *Evolution* 56(7): 1445-1453.

5. Bison Conservation

Halbert, N. D., W. E. Grant, J. N. Derr. 2005. Genetic and demographic consequences of importing animals into a small population: a simulation model of the Texas State Bison Herd (USA). *Ecological Modelling* 181: 263–276.

Supplemental papers:

Halbert, N. D., T. Raudsepp, B. P. Chowdhary and J. N. Derr. 2004. Conservation genetic analysis of the Texas State bison herd. *Journal of Mammalogy*, 85(5):924–931,

Minard, A. 2003. Conservation: Unwelcome bison may face a DNA test *Science* 299: 1835-1835.

6. Conservation of Marine Fish

Berkeley, S. A., M. A. Hixon, R. J. Larson, and M. S. Love. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations. *Fisheries* 29:23-32

Supplemental papers:

Berkeley, S. A., C. Chapman and S. M. Sogard. 2004. Maternal age as a determinant of larval growth and survival in a marine fish, *Sebastes melanops*. *Ecology* 85:1258–1264.

Palumbi, S. R. 2004. Why mothers matter. *Nature* 430:621-622.

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Tentative Schedule

	Readings	Morning			Afternoon		
Week		Lectures	Labs	Discussion	Lectures	Labs	Discussion
Week 1							
M 2/14	Frankham 1-39	I. Introduction to course & conservation biology (11 am)			II. Molecular Tools I	L1a. Kelp bass RFLPS- start DNA extraction	
T 2/15	Frankham 45-68 Roemer & Wayne 2003	III. Patterns of diversity & extinction	L1b. Intro to molec. lab, finish DNA extractions		IV. Introduction to population biology	CL1: Constructing life tables	Conflicts
W 2/16	Frankham 72-90 Brashares et al. 2003	V. Hardy-Weinberg principle	L1c: set up PCR CL1 due			L1d: set up kelp bass restriction digests L4a. Begin copepod crosses	Poverty
Th 2/17	Frankham 96-123	VI. Quantitative Genetics	L1d: run, stain and score gels		VII. Molecular Tools II	L1e: analyze kelp bass RFLP data, discuss write-ups	
F 2/18		VIII. Causes of extinction: Genetics vs. demography					
Week 2							
T 2/22	Frankham 365-385	IX. Genetics and Taxonomic Uncertainty (11am)	L1 due			L2a. Urchin msats-extract DNA, set up PCR L4b: More copepod crosses	
W 2/23	Frankham 126-150	X. Phylogeny and Conservation	L2b cont'd. run, stain and score gels		XI. Evolutionary forces 1 Selection	CL2: Phylogenetic methods	
Th 2/24	Frankham 154-167 Spielman et al. 2004	XII. Evolutionary forces 2: Mutation	CL2 due L2c: Discussion of results & write-up		Review for midterm		Genetics vs. Demo-graphy
F 2/25	MIDTERM						

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	Readings	Morning			Afternoon		
Week 3		Lectures	Labs	Discussion	Lectures	Labs	Discussion
M 2/28	Frankham 167-172,175-194	XIII. Evolutionary forces 3: Migration (11am)	L2 due		XIV. Evolutionary forces 4: Drift (simulations)	L3a. Bison □sats; extract DNA, set up PCR	
T 3/1	Frankham 254-278, 90-94 Halbert et al. 2004	XV. Evolutionary forces 5: Non-random mating			XVI. Linkage disequilibrium, assignment, stock ID	L3b. cont'd. run, stain and score gels	Bison Conservation
W 3/2	Frankham 197-221, 280-293, 385-388	XVII. Genetic variation & fitness	CL3. Pop. Gen. Software, GENETIX, GENEPOP, KINSHIP		XVIII. Inbreeding and outbreeding depression	L3c Discussion of results	
Th 3/3	Frankham 502-527	XIX. Population viability analysis				Trip to Middle Ranch	L3d SCIC proposal
F 3/4	Berkeley et al.	XX. Fisheries demographic issues, genetic issues		Marine Fish			
Week 4							
M 3/7	Moberg & Burton	XXI. Augie's talk (11am)	L3 due			L4d: Score fitness of copepod crosses	Temporal variance
T 3/8	Frankham 448-469 http://endangered.fws.gov/	XXII. ESA science and policy	L4e Analysis & discussion of results		XXIII. Reintroduction/translocation	CL 4. Simulations of drift & LD.	
W 3/9	Frankham 310-333	XXIV. Population fragmentation, reserve design			Review session		
Th 3/10	FINAL						
F 3/11			L4 due				