Population and Conservation Genetics (BIOL452/BIOL601J)

Course outline: Winter 2013 (Tue/Thu 10:15-11:30 – CC314)

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Office hours: Tuesday 12:00 – 13:00

Objectives of this course are to assist students to gain competence and knowledge in 1) Population genetic principles and tools as applied to conservation of genetic resources 2) critical reading of current literature in population and conservation genetics, 3) writing scientific papers in population and conservation genetics and, 4) oral presentation of topics/case studies in population and conservation genetics.

Course description: Conservation genetics employ the principles of population genetics and systematics to address problems related to conservation of biodiversity. This course examines the factors that affect genetic variation within and among populations, including natural selection, random genetic drift, mutation and gene flow. The impact of human activities on levels and patterns of genetic variation in both plant and animal communities is discussed. The utility of genetic markers in determining conservation units is examined. Several case studies selected from the current literature are used to illustrate many applications of modern molecular techniques in conservation genetics. The course comprises lectures, student presentations, and discussions.

Assignments and Grading: Student presentations, Summary/critiques, Term paper, Class participation Final Exam.

Prerequisites: BIOL 261 and 3 credits from BIOL 321, BIOL 351, BIOL 353, BIOL367 **or** Instructor approval

Topics:
- Introduction to population and conservation genetics
- Molecular techniques (Restriction cleavage, Electrophoresis, Southern blotting, DNA Hybridization, DNA amplification, DNA sequencing, genotyping)
- DNA polymorphism (SNP, Synonymous/nonsynonymous substitution, Indels, STS, RFLP, RAPD, SCAR, CAPS (PCR-RFLP), Minisatellites (VNTR), Microsatellites (SSRs or SSLP), AFLP, ISSR.
- Protein polymorphism (allozymes).
- Principles of population genetics: Allele (gene) and genotypic (zygotic) frequencies, Hardy-Weinberg principle, Population subdivision and Wahland's effect, Natural selection, Mutation, Genetic load, Migration, Random genetic drift, Inbreeding, Effective population size, Speciation
- Software tools for population genetic data analysis
- Phylogeny reconstruction
- Software tools for phylogeny reconstruction
- Phylogeography
- Case studies (Student presentations of case studies followed by discussions)

References: [Following books are on reserve in the Concordia (Vanier) library]

[3 hour loan]
Frankham, R., J.D. Ballou, and D.A. Briscoe (2009). Introduction to Conservation Genetics (2nd edition). Cambridge University Press, Cambridge, UK. *[This is an excellent textbook on Conservation Genetics]*

[24 hour loan]
Avise, J. C. and J.L. Hamrick (1996). Conservation Genetics: case histories from nature. Chapman and Hall, New York, NY.

Hartl, D.L. and A. G. Clark (2007). Principles of Population Genetics, Fourth Edition. Sinauer Associates, Sunderland, MA.

Hedrick, P.W. (2011). Genetics of Populations, Fourth edition. Jones and Bartlett publishers, Sudburry, MA.

Hillis, D.M., C. Moritz and B.K. Mable (1996). Molecular Systematics (2nd Edition). Sinauer Associates, Sunderland, MA.

Young, A., D. Boshier, and T. Boyle (2000). Forest Conservation Genetics: Principles and Practice CABI Publishing, New York, NY.

Journals:
Molecular Ecology
Conservation Genetics
Conservation Biology
Other Journals of interest: American Journal of Botany, PNAS, PLosONE, Nature, Science,

Evaluation:

1. Student presentation	25
2. Summary/critiques	10
3. Term paper	20
4. Class participation	10
5. Final Exam	35

Grading scheme: A+=90<; A=85-89; A-=80-84; B+=77-79; B=74-76; B-=70-73; C+=67-69; C=64-66; C-=60-63; D+=57-59; D=54-56; D-=50-53; F=<49

1. Student presentations: Each student (or in groups of 2 students depending on the class size) will be responsible for giving an oral presentation of a case-study in population and conservation genetics based on a paper(s) selected from current literature. The presenting student(s) should choose a paper to be discussed in advance. Copies of the paper(s) will be made available to the class through Moodle. Limit your presentation to about 30-40 minutes followed by a questions and discussion period.

2. Summary/critiques: All students should critically read the paper, write a summary or a critique including discussion questions and hand in at the beginning of the class (~1 page). Be prepared to argue for/against main points of the paper during the class discussion. The written summary/critique is due at the beginning of each class, and late submissions will not be considered for credit.

3. Term paper in conservation genetics: Write a paper on a topic related to Conservation and Population Genetics. Follow author's guidelines of the journal "Conservation Biology" or "Molecular Ecology" for style. The paper should comprise a) abstract, b) introduction, c) main body of the paper, d) Summary or conclusions, and e) Literature cited. The length of the paper should be about 4-5 double-spaced printed pages of text (excluding figures, tables and literature citation). The paper is due on or before April 4th 2013.

4. Class participation:

This includes participation in class discussions, and oral presentations.

5. Final exam:
The final exam will comprise questions requiring short essay type answers.

6. Rights and Responsibilities:

http://provost.concordia.ca/academicintegrity/plagiarism/

7. Disclaimer: "In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change".