

University of Northern British Columbia
POPULATION AND COMMUNITY ECOLOGY (BIOL 410) – FALL 2009

Course Syllabus

Instructor: **Dr. Chris Johnson**
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Office hours: Monday 14:30-15:30

Class Meeting Rooms and Timing

Lecture room: 5-177
Lecture time: Monday & Wednesday 11:30-12:50
Tutorial room: 5-177
Tutorial time: Monday 13:30-14:20

Course Description

This course is designed to provide students with an understanding of the fundamental concepts underlying the interrelated disciplines of population and community ecology. Successful completion of this course will provide the theoretical foundation necessary to tackle applied problems in other upper division courses including animal and plant ecology, conservation biology, and wildlife management. The scope of learning is incremental starting from simple population models and progressing to system dynamics that generally characterise plant and animal communities. Thus, we will examine increasingly more complex ecological processes; successful completion of the course will require the integration of ideas and concepts presented throughout the semester. Topics include population structure and growth, competition and mutualism, predator-prey systems, community dynamics and stability, and spatiotemporal patterns in distribution and abundance. Population and community ecology is an inherently mathematical discipline; students should expect some exposure to quantitative principles and techniques. As this is not a course in quantitative ecology, the focus is on qualitative principles and supporting calculations not mathematical derivation.

The learning objectives for the course are:

- understand the fundamental principles and theory that help us describe and interpret population change and community dynamics and structure;
- develop comfort and ability to work with and interpret data used to describe changes in the distribution, abundance, and interactions of plants and animals;
- recognise and appreciate the assumptions and limitations of our understanding of population and community ecology;
- awareness of the science and leading edge thinking in the discipline; and
- exercise critical thinking skills relative to peer-reviewed published literature.

Tutorial

This course has a scheduled tutorial. The tutorial is designed to provide students with additional opportunities to ask questions and further explore lecture material and assignments.

When time permits, we will use computer models and simulation tools to investigate concepts presented in class.

Text Book

There is no required text for this class; however, for supplemental reading I recommend: Gotelli, N.J. 2008. *A Primer of Ecology* (4rd Edition). Sinauer Associates, Inc. This book can be purchased online (at discount used prices) or through the bookstore. For those of you on a budget the 3rd edition published in 2004 will provide nearly all the content you will require for the course. Also, several copies are on reserve in the library.

Evaluation

The grade for this course will be based on exams, individual practice exercises, and a brief review of a scientific paper¹:

- two midterms worth 15% each are prescheduled (see syllabus); each midterm will test lecture and tutorial material presented over that examination period;
- the final exam is worth 30% and will be scheduled by the Registrars Office; the final exam will focus on material presented following the second midterm, but will also challenge a comprehensive understanding of the course material;
- 5 problem sets will allow a hands-on examination of material offered during lecture; each problem set is worth 3% for a total of 15%; each problem set is due one week after they are assigned;
- students will develop a diagrammatic population model for a species of their choice;
- working in groups of two, students will choose and review a peer-reviewed article that deals explicitly with population or community ecology¹.

Assignment	Grade	Due Date
Midterm exams	2 × 17.5%	Oct 5 and Nov 2
Problem sets	5 × 3%	One week after assigned
Population model	5%	Oct 26
Review peer-reviewed paper ¹	15%	Dec 4
Final Exam	30%	TBA

Dishonesty and Professional Conduct

Purposeful dishonesty and plagiarism is a series offence. If you are unsure of what constitutes *Plagiarism* or *Cheating* please consult the calendar (2009-2010, P.62) or see your instructor for definitions, explanation, and potential consequences. Ignorance is not a valid excuse.

Other Details

- The schedule of topics and assignments, as currently outlined in the syllabus, are subject to change with notification.
- Persons with disabilities requiring special learning approaches should contact the instructor and Disability Services early in the semester (<http://www.unbc.ca/disabilities/index.html>).

¹ As a substitute for the paper review I will allow students to self direct a short population experiment.

Schedule of Lecture Topics

Date	Topic	Text	Peer Reviewed Paper
Sep 9	Introduction to course; defining population and community ecology		Vonesh et al. 2009
Sep 14	Spatiotemporal distribution of organisms		Moore & Elmendorf 2006
Sep 16	Population sampling and estimation – direct and indirect methods		Boyce & McDonald 1999
Sep 21	Concepts in pop. growth – exponential model	Ch1	
Sep 23	Density dependence and independence		Nowicki et al. 2009
Sep 28	Concepts in pop. growth – logistic model	Ch2	Oedekoven & Joern 2000
Sep 30	Population regulation and limiting factors		Krebs 2002
Oct 5	<i>Midterm test #1</i>	Ch2	
Oct 7	Calculating vital rates – natality and survival		McCann et al. 2006
Oct 12	<i>Thanksgiving – No class</i>		
Oct 14	Demographic relationships and life tables	Ch3	
Oct 19	Population growth with age or stage structure	Ch3	Bonesi et al. 2004
Oct 21	Stochastic population models and PVA	Ch1 P13-19; Ch2 P38	Slotta-Bachmayr et al. 2004
Oct 26	Predator-prey interactions	Ch6	Messier 1994
Oct 28	Competition – exploitation and interference	Ch5	Bonesi et al. 2004
Nov 2	<i>Midterm test #2</i>		
Nov 4	Guest Lecture – Doug Heard MoE		Mowat et al. 2005
Nov 9	Habitat selection and partitioning		Silvertown 2004
Nov 11	<i>Remembrance Day – No class</i>		
Nov 16	Disturbance and succession	Ch8	Schmitz et al. 2006
Nov 18	Synthesis: spatially explicit population models		Butler et al. 2005, Hawkes 2009
Nov 23	Mutualism and symbioses		Joppa et al. 2009
Nov 25	Food webs and trophic cascades		Hebblewhite et al. 2005
Nov 30	Diversity, stability, and community resilience		Worm & Duffy 2003
Dec 2	Last class – piecing it together and review		

Suggested Course Readings

- Bonesi, L., P. Chanin, and D.W. Macdonald. 2004. Competition between Eurasian otter *Lutra lutra* and American mink *Mustela vison* probed by niche shift. *Oikos* 106:19-26.
- Boyce, M.S. and L.L. McDonald. 1999. Relating populations to habitats using resource selection functions. *Trends in Ecology and Evolution* 14:268-272.
- Butler, M.J., T.W. Dolan, J.H. Hunt, K.A. Rose, and W.E. Herrnkind. 2005. Recruitment in degraded marine habitats: A spatially explicit individual-based model for spiny lobster. *Ecological Applications* 15:902-918.
- Caudill, C.C. 2005. Trout predators and demographic sources and sinks in a mayfly metapopulation. *Ecology* 86:935-946.
- Hawkes, C. 2009. Linking movement behaviour, dispersal and population processes: is individual variation a key? *Journal of Animal Ecology* 78:894-906.

- Hebblewhite, M., C.A. White, C.G. Nietvelt, J.A. McKenzie, T.E. Hurd, J.M. Fryxell, S.E. Bayley, and P.C. Paquet. 2005. Human activity mediates a trophic cascade caused by wolves. *Ecology* 86:2135-2144.
- Joppa, L.N., J. Bacompte, J.M. Montoya, R.V. Sole, J. Sanderson, S.L. Pimm. 2009. Reciprocal specialization in ecological networks. *Ecology Letters* 12:961-969.
- Krebs, C.J. 2002. Two complementary paradigms for analyzing population dynamics. *Transactions of the Royal Society of London B* 357:1211-1219.
- McCann K G. Moreau, E.S. Eveleigh, C.J. Lucarotti, and D.T. Quiring. 2006. Ecosystem alteration modifies the relative strengths of bottom-up and top-down forces in a herbivore population. *Journal of Animal Ecology* 75:853-861.
- Messier, F. 1994. Ungulate population models with predation: a case study with the North American moose. *Ecology* 75:478-488.
- Moore, K.A., and S.C. Elmendorf. 2006. Propagule vs. niche limitation: untangling the mechanisms behind plant species' distributions. *Ecology Letters* 9:797-804.
- Wowat, G., D.C. Heard, D.R. Seip, K.G. Poole, G. Stenhouse, and D.W. Paetkau. 2005. Grizzly *Ursus arctos* and black bear *U-americanus* densities in the interior mountains of North America. *Wildlife Biology* 11:31-48.
- Nowicki, P., S. Bonelli, F. Barbero, and E. Balletto. 2009. Relative importance of density-dependent regulation and environmental stochasticity for butterfly population dynamics. *Oecologia* 161:227-239.
- Oedekoven, M.A., and A. Joern. 2000. Plant quality and spider predation affects grasshoppers (Acrididae): food-quality-dependent compensatory mortality. *Ecology* 81:66-77.
- Schmitz, O.J., E.L. Kalies, and M.G. Booth. 2006. Alternative dynamic regimes and trophic control of plant succession. *Ecosystems* 9:659-672.
- Silvertown, J. 2004. Plant coexistence and the niche. *Trends in Ecology and Evolution* 19:605-611.
- Slotta-Bachmayr L, R. Boegel, P. Kaczensky, C. Stauffer, and C. Walzer. 2004. Use of population viability analysis to identify management priorities and success in reintroducing Przewalski's horses to southwestern Mongolia. *Journal of Wildlife Management* 68:790-798.
- Vonesh, J.R., J.M. Kraus, J.S. Rosenberg, and J.M. Chase. 2009. Predator effects on aquatic community assembly: disentangling the roles of habitat selection and post-colonization processes. *Oikos* 118:1219-1229.
- Worm, B. and J.E. Duffy. 2003. Biodiversity, productivity and stability in real food webs. *Trends in Ecology and Evolution* 18:628-632.