

ECOL 4000/6000 Population and Community Ecology Fall 2008

Time: 3 Hours. Tu Th 2.00 – 3.15 pm.

Place: Ecology auditorium

Instructors: John Drake, Ph.D. and Drew Kramer, Ph.D.

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Office: 151 Ecology Building

Office hours: By appt (or walk-in between 11:30-2:00 on MWF)

Overview

Population and community ecology are active fields of research with important applications for management and conservation. This course links conceptual issues and basic models with data and field approaches relevant for understanding population dynamics in time and space. The first half of the course focuses on the birth, death, and movement of organisms, with particular reference to the population dynamics of single-species. Other topics include metapopulation dynamics, age-structured populations, and demographic and environmental stochasticity. The second half of the course focuses on species interactions such as competition, predation and parasitism, and the forces that structure communities of plants and animals. Additional topics include the causes and consequences of biodiversity and the organization of species assemblages.

Format

The course format includes lecture, discussions, computer labs, and problem sets. We expect that you will attend lectures on a regular basis, complete weekly assignments, and prepare for and participate in class discussions.

Text

Gotelli, N. 2001. *A Primer of Ecology*. 3rd ed. Sinauer Associates, Inc.

A bibliography of required reading is provided at the end of this syllabus to supplement lecture material and for class discussions. Electronic versions of these readings will be posted on the WEBCT course page for ECOL 4000.

Prerequisites

This course assumes you are familiar with general ecology and biology, and have taken ECOL 3500.



Attendance

Attendance is essential. If you miss a class, you are responsible for contacting fellow students for lecture notes and assignments, and will be expected to submit assignments at the regular set deadlines.

More than 7 unexcused absences will result in a lowering of your final score by one letter grade. An excused absence is constituted by the student notifying the instructor in advance and producing proof for reason of absence immediately upon return to the class.

Assignments

People learn best by doing. Problem sets and assignments will be distributed every 1-2 weeks to give you experience in applying the concepts and models presented in lecture. Unless otherwise specified, homework assignments will be due by 5pm on the date specified on the assignment sheet. You may turn this in during class or in my mailbox in the Ecology building.

Exams

There will be a mid-term exam on October 9, and final exam on December 11 (3:30-6:30 pm).

Grade calculation

35% Assignments
20% Mid-term exam
35% Final exam
10% Participation and class discussions

Accommodations

Please contact the instructor if you require special accommodations due to learning disabilities, religious practices, physical or medical needs, or for any other reason.

General Notes

(i) All academic work must meet the standards contained in "A Culture of Honesty." Students are responsible for informing themselves about those standards before performing any academic work.

The link to more detailed information about academic honesty can be found at: <http://www.uga.edu/ovpi/honesty/acadhon.htm>

(ii) The course syllabus is a general plan for the course; deviations announced to the class by the instructors may be necessary.

Schedule of Topics

Date	Topic	Readings	Lecturer
	Part I: Growth of single populations		
Aug 19	Overview of the course; introduction to population ecology	NJG Preface and 'to the student'	Drake
Aug 21	Population growth and regulation I	NJG Chapter 1	Drake
Aug 26	Application: Optimal harvesting	NJG Chapter 2	Drake
Aug 28	Stochastic growth and random processes; <i>Discussion: Determinism, noise and extinction</i>	NJG Chapter 1; Griffen and Drake 2008, Coulson <i>et al.</i> 2004	Drake
Sep 2	Age-structured growth	NJG Chapter 3	Drake
Sep 4	Application: Population viability analysis and extinction	Menges 1990	Drake <u>Homework 1 due</u>
Sep 9	Metapopulations I. Dispersal and migration	NJG Chapter 4	Rohani
Sep 11	Metapopulations II. Dynamics and persistence; <i>Discussion: spatial structure and population dynamics</i>	NJG Chapter 4; Hanski <i>et al.</i> 2006; Hanski and Saccheri 2006	Rohani <u>Homework 2 due</u>
Sep 16	Life history evolution	TBA	TBA
Sep 18	Infectious diseases I. Epidemics and immunity	Nunn and Altizer 2006 Ch. 4	Altizer <u>Homework 3 due</u>
Sep 23	Infectious diseases II. Wormy worlds	Nunn and Altizer 2006 Ch. 4	Altizer
Sep 25	Infectious diseases III. Pathogen threats to biodiversity and human health	Harvell <i>et al.</i> 2002; McCallum and Jones 2006	Altizer
	Part II: Multi-species interactions		
Sep 30	Competition between 2 species	NJG Chapter 5	Kramer
Oct 2	Spatial models of competition; <i>Discussion: habitat destruction, competition and extinction</i>	Tilman <i>et al.</i> 1994; 2002	Kramer <u>Homework 4 due</u>
Oct 7	Models of predator-prey interactions	NJG Chapter 6	Drake
Oct 9	MID-TERM EXAM		
Oct 14	Real predator-prey interactions; <i>Discussion: lynx-hare population cycles</i>	Krebs <i>et al.</i> 1995	Drake <u>Homework 5 due</u>
Oct 16	Mutualism	TBA	Drake
Oct 21	Host-parasitoid	TBA	Kramer <u>Homework 6 due</u>
Oct 23	Herbivory and plant defenses	Coley <i>et al.</i> 2006	Kramer
	Part III: Biodiversity, communities and ecosystems		
Oct 28	Apparent competition and indirect effects; <i>Discussion: complex community interactions</i>	Hudson and Greenman 1998; Duffy 2007	Kramer
Oct 30	TBA		
Nov 4	Food webs and keystone species; <i>Discussion: keystone species, food webs and communities</i>	Power <i>et al.</i> 1996; Estes <i>et al.</i> 1998	Kramer
Nov 6	Biodiversity I. Definition and measures	Purvis and Hector 2000	Durso
Nov 11	Biodiversity II. Global patterns. <i>Discussion: causes of global diversity gradients</i>	Lambers <i>et al.</i> 2002; Wiens 2007	Durso

Nov 13	Island biogeography	NJG Chapter 7	Kramer
Nov 20	Niche theory: Hutchinson and MacArthur	TBA	Kramer Homework 7 due
Nov 24-28	THANKSGIVING		
Dec 2	Niche theory vs. neutral theory	Clark et al. 2007	Kramer
Dec 4	Diversity, stability and ecosystem processes; <i>Discussion: ecological consequences of biodiversity</i>	Tilman 2000; Bradford 2002	Kramer

Chapters denoted by “NJG” refer to the Gotelli 2001 text.

Required readings:

Bradford, MA et al. 2002. Impacts of soil faunal community composition on model grassland ecosystems. *Science*. 298: 615-618.

Clark, J., Dietze, M. et al. 2007. Resolving the biodiversity paradox. *Ecol. Lett.* 10(8): 647-59.

Coley, P.D., M.L. Bateman and T.A. Kursar. 2006. The effects of plant quality on caterpillar growth and defense against natural enemies. *Oikos* 115:219-228.

Coulson, T., Rohani, P., and Pascual, M. 2004. Skeletons, noise and population growth: the end of an old debate? *Trends in Ecology and Evolution*. 19:359-364.

Duffy, M.A. 2007. Selective predation, parasitism, and trophic cascades in a bluegill-*Daphnia*-parasite system. *Oecologia* .153:453-460.

Estes, JA, Tinker, MT, Williams, TM, Doak, DF. 1998. Killer whale predation on sea otters linking oceanic and nearshore ecosystems. *Science*. 282: 473-476.

Griffen, BA and Drake, JM. 2008. Effects of habitat size and quality on extinction in experimental populations. *Proceedings of the Royal Society: B*. (In press)

Hanski, I, Saastamoinen, M, and Ovaskainen, O. 2006. Dispersal-related life-history trade-offs in a butterfly metapopulation. *J. Anim. Ecol.* 75: 91-100.

Hanski, I and Saccheri, I. 2006. Molecular-level variation affects population growth in a butterfly metapopulation. *PLoS Biol.* 4(5): e129.

Harvell, D., Mitchell, C.E., Ward, J.R., Altizer, S., Dobson, A., Ostfeld, R.S., and Samuels, M.D. 2002. Climate warming and disease risks for terrestrial and marine biota. *Science*. 296: 2158-2162.

Hudson, P.J. & Greenman, J.V. (1998) Parasite mediated competition. Biological and theoretical progress. *Trends in Ecology & Evolution*. 13, 387-390

- Krebs, C, Boutin, S, Boonstra, R, Sinclair, A, Smith, J, Dale, M, Martin, K, and Turkington, R. 1995. Impact of food and predation on snowshoe hare cycles. *Science*. 269: 1112-1115.
- Lambers, JHR, Clar, JS, Beckage, B. 2002. Density-dependent mortality and the latitudinal gradient in species diversity. *Nature*. 417: 732-735.
- McCallum, H and Jones, M. 2006. To Lose Both Would Look Like Carelessness: Tasmanian Devil Facial Tumour Disease. *PLoS Biol*. 4(10): e342.
- Menges, ES. 1990. Population Viability Analysis for an Endangered Plant. *Conservation Biology* 4:52-62.
- Nunn, CL and Altizer, SM. 2006. Infectious diseases in Primates: Behavior, Ecology and Evolution. Oxford University Press.
- Power, ME, Tilman, D, Estes, JA, Menge, B, Bond, W, et al. 1996. Challenges in the Quest for Keystones *BioScience*. 46(8): 609-620
- Purvis, A and Hector, A. 2000. Getting the measure of biodiversity. *Nature*. 405: 212-219
- Tilman, D. 2000. Causes, consequences and ethics of biodiversity. *Nature*. 405: 208-211.
- Tilman, D. 1994. Competition and biodiversity in spatially structured habitats. *Ecology*. 75: 2-16.
- Tilman, D, May, RM, Lehman, CL, and Nowak, MA. 2002. Habitat destruction and the extinction debt. *Nature*. 371. 65-66.
- Wiens, J.J. 2007 Global Patterns of Diversification and Species Richness in Amphibians *American Naturalist*, 170: S86–S106