BIOL 302
Population and Evolutionary Ecology

Fall Term (2013-14)

CALENDAR DESCRIPTION

Introductory ecology dealing with population growth and regulation, species interactions and reproductive and life history strategies. Laboratory work includes field studies as well as individual and group projects.

NOTE Field trip: estimated cost $75. PREREQUISITE BIOL 201/3.0, BIOL 202/3.0 and (a minimum grade of C- in BIOL 206/3.0). COREQUISITE BIOL 243/3.0 or PSYC 202/3.0 or STAT 269/3.0.

SCHEDULE

Lectures: Tuesday 12:30-1:30, Thursday 11:30-12:30, Friday 13:30-14:30. Dupuis Aud.
Labs: Various days and times in BIOSCI, refer to SOLUS for details.

Instructor	**Dr. L. Ratcliffe**
Instructor Contact	ratcliff@queensu.ca Phone: 613-533-6142
Office Hours	Open door, email for appointment
TA:	B. Schamehorn, Program Associate; see 302 Moodle site for TAs
TA Contact Information	See 302 Moodle Site
Office Hours	TBA

Learning Objectives

Ecology is the study of general principles concerning the interactions and relationships between organisms and their physical and biological environments. These principles are used to interpret patterns in the abundance, distribution, and diversity of organisms, taxa, biomass and productivity in space and time. These interpretations form the scientific basis for:

- predicting the consequences of environmental change on ecosystems;
- management strategies for preventing or minimizing the loss of ecosystem services threatened by human activities or environmental change; and
- management strategies for manipulating natural systems to yield sustainable net benefits to society.

The learning objectives of Biology 302* (Population and Evolutionary Ecology) are:

- to provide students with a fundamental understanding of the ecological forces that affect population size, behaviour, and distribution
- to provide students with practical quantitative skills for the analysis of real world population issues, including training in field data collection and use of large data sets and simulations
- to provide students with training in scientific communication, including the production of a research paper based on field data collection

In Biology 302*, we will examine patterns of variation in the size, composition, and distribution of plant and animal populations. We will study factors that affect the growth and dynamics of populations within natural habitats, including competition for resources, predation, parasitism and mutualism. Emphasis will be placed on a fundamental interpretation of these patterns in terms of mechanisms and consequences of evolution by natural selection. This will include an examination of adaptive strategies for growth, survival and reproduction in plants and animals.

Biology 302* students who are most interested in ecology should plan also to take Biology 303* (Community and Ecosystem Ecology) offered in the winter term. This course examines the ecology of higher levels of organization. Topics include patterns and processes associated with community structure (e.g. dominance, species diversity, niche theory), community development (succession), habitat productivity, energy flow and the cycling of elements through the ecosystem, and the interpretation of global patterns in the distribution and diversity of biotas.

Learning Hours

Teaching method		*Average hours per week*	*Number of weeks*	*Total hours*
In-class hours	Lecture	3	12	36
	Seminar			
	Laboratory	3	9	27
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	Online activity	15 est total	Research report	15
	Off-campus activity	17 total	Field trip	17
	Private study	2 est/wk	12	24
Total hours on task				119

Course Outline

See 302 Moodle site

Lecture Topics

Introduction to Ecology

Overview and scope of ecological studies, research approaches and tools, importance of temporal and spatial scales

Terrestrial Life

Patterns and influence of global climatic variation, soil structure, distribution and natural history of biomes

The Life Aquatic

The hydrologic cycle, natural history and human influence on marine and freshwater environments

Natural selection

Darwin and Mendel, phenotypic and genotypic variation in populations, measuring selection, adaptation, human-induced evolution

Evolutionary differentiation
Genetic drift, founder effects, measuring population genetic diversity, local adaptation, speciation

Coping with environmental variation
Macroclimate and microclimate; organismal adaptations to variation in environmental temperature, water availability, and light; extreme environments, Encelia case studies, stable isotope applications

Energy and nutrient acquisition
Sources of energy, why rates of energy and nutrient intake are limited, optimal foraging in plants and animals

Life Histories
Trade-offs in plants and animals; within-species variation in life-history traits, the utility of life history classifications, life-history indicators of environmental change

Population Dynamics
Population structure, population growth, life tables, survivorship and age distributions, sex ratios, dispersal; A Case Study in Population Collapse: The Northern Cod

Competition
Resource limits and forms of competition within and between species; how important is competition? Evidence from lab experiments versus natural systems; Lotka-Volterra models of interspecific competition; evolutionary divergence in resource use, ecological character displacement

Exploitation: Predation
Predator-prey cycles – Case Study: lynx & snowshoe hares; modeling predator-prey dynamics, evolution of prey defense strategies

Exploitation: Herbivory
Herbivore behaviour and the evolution of plant defences, herbivory and the control of invasive species

Mutualism
Parasites, disease and the Mutualist-Exploiter continuum; pollination biology- Case Study: Yuccas and Yucca Moths

Textbooks/Readings

Ecology Concepts and Applications, Manuel C. Molles Jr. and James F. Cahill Jr., 2nd Canadian ed., McGraw-Hill., 2011

See 302 Moodle site for Reserve material, other readings.

Grading Scheme

Component	Weight (%)	Date
Lab Assignments	20%	weekly
Field Trip Paper	30%	November 15, 2013
Quiz 1	10%	October 4, 2013
Quiz 2 Quiz 3	20% 20%	October 31, 2013 November 29, 2013

Grading Method

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale.
Your course average will then be converted to a final letter grade according to Queen's Official Grade Conversion Scale:

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

Academic Integrity and Queen's Code of Conduct

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and conduct conform to the principles of academic integrity. Information is available in the Arts and Science Calendar (see Academic Regulation 1 - http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations, on the Arts and Science website (see http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity), and at

Biology's website (http://www.queensu.ca/biology/undergrad/integrity.html) and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulations on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

Accommodation Policy, Exam Conflicts, and Other Conflicts

Students who feel they need accommodations for disabilities or extenuating circumstances, or have a conflict between exams or other commitments should consult the Biology Department's website for details about how to proceed (http://www.queensu.ca/biology/undergrad/integrity.html). In general, the earlier a course coordinator is apprised of an extenuating circumstance, the more likely an accommodation can be made. Students are encouraged to be proactive in anticipating difficulties, when it is possible to do so.

Students may apply to write a make-up or deferred exam if they have an exam conflict as defined in the Academic Regulations of the Faculty (See Arts and Science Calendar Regulation 8 - http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations). In this case, the student should report to the Exams Office first to verify that there is a genuine exam conflict. Biology professors will not consider your situation to be a conflict unless it meets the criteria set out by the Faculty of Arts and Sciences.

Students may request a make-up or deferred exam if they have an exam conflict with off-campus travel associated with a field course (e.g BIOL-307/3.0 or 407/3.0) that is held during the fall or winter terms.

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Accommodation of Disabilities

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact the Disability Services Office (DSO) and register as early as possible. For more information, including important deadlines, please visit the DSO website at: http://www.queensu.ca/hcds/ds/