

BIOL 302

Population and Evolutionary Ecology

Fall Term (2016)

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 \$85.

LEARNING HOURS 118 (36L;27Lb;12O;19Oc;24P)

PREREQUISITE BIOL 201/3.0 and BIOL 202/3.0 and BIOL 206/3.0.

COREQUISITE BIOL 243/3.0 or PSYC 202/3.0 or STAT 269/3.0.

NOTE: BIOL302 has a **Required** Weekend Field Trip (full day Saturday October 1 or Sunday October 2, overnight optional): estimated cost of full day trip \$90.

SCHEDULE

Refer to SOLUS for details.

Instructors	Dr. Fran Bonier, Coordinator Dr. Rob Colautti
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Office Hours	TBA
Lab Coordinator	Dr. Laura Nagel, Program Associate nagell@queensu.ca ; Phone: 613-533-6000 ext. 77437; BIOSC 2321
TA Information	See BIOL 302 OnQ site
Lab Instructor Office Hours	TBA

Learning Objectives

Ecology is the study of general principles concerning the interactions 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 both 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 guide students in applying the scientific method to critically evaluate evidence as it relates to fundamental concepts in ecology

- to provide students with a fundamental understanding of the ecological factors that affect population size, behaviour, and distribution
- to provide students with practical skills for the analysis of ecological data, including training in a range of field survey methods, data management, graphing of data, statistical analysis, and dynamic models. Some of these skills will be taught using the software packages R and RStudio.
- to provide students with training in scientific communication, including the presentation of data and production of research reports 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. Emphasis will be placed on a fundamental interpretation of these patterns in terms of mechanisms and consequences of evolution by natural selection.

Learning Hours

<i>Teaching method</i>		<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
In-class hours	Lecture	3	12	36
	Seminar			
	Laboratory	3	9	27
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	Online activity			
	Off-campus activity	12 total	Field trips	12
	Private study	4	11	44
Total hours on task				119

Course Outline

See 302 OnQ site

Overview of Lecture Topics

The scientific method

Overview of the scientific method as it relates to developing and testing ecological hypotheses

Evolution as a framework for ecology

How do fitness costs and benefits shape ecosystems? Genetic drift, founder effects, local adaptation, speciation

Coping with environmental variation

The importance of abiotic and biotic environments in exerting selective pressures and influencing individuals and populations

Behavioural ecology

The evolutionary basis for animal behaviour, fitness costs and benefits of variation in behaviour across different environments

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

Abundance and distribution

Why do species have range limits? We look for clues in endangered species, biological invasions, and climatic niche models. Practical approaches to measuring abundance and distribution in nature.

Population growth models

Using population growth models, demographic structure, and life history tables to manage natural populations.

Population dynamics

Understanding the 'boom-and-bust' phenomenon in natural populations: density dependence, chaos theory, and metapopulation dynamics.

Predation/herbivory

Predator-prey dynamics, functional responses, and the co-evolutionary arms race.

Parasitism

A natural history of parasites and their hosts. Modelling disease in humans and other animals to prevent outbreaks. Lyme disease ecology as a model for human health as an ecosystem service.

Competition

Resources are limited and species compete in many ways. So why are there so many different species that use the same resources – why aren't there just a few superior competitors that exclude all others? Competition models, competitive exclusion and mechanisms of co-existence.

Mutualisms

Coral-zooxanthellae, plant-mycorrhizae, ant-acacia, and other amazing examples of co-evolving mutualists. Key mechanisms including defence, pollination, dispersal. Cheaters and other frenemies.

Textbooks/Readings

Ecology: The Economy of Nature, Robert Ricklefs, Rick Relyea, Christoph Richter, 7th Canadian Edition.

See 302 OnQ site for Reserve material, other readings.

Grading Scheme

Component	Weight (%)	Date
Lab Assignments	50%	weekly
Lecture and Reading Quizzes, Discussion Questions	50%	weekly

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.

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>), on the Biology Department website (<http://biology.queensu.ca/academics/undergraduate/prepare-yourself/>), 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 that 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 should consult the University Student Accessibility Services (<http://www.queensu.ca/studentwellness/accessibility-services>). Students with a conflict between exams, lectures, or other course requirements should consult the Biology Department's website for details about how to proceed (<http://biology.queensu.ca/academics/undergraduate/prepare-yourself/>). 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.

Make-up quizzes will not be offered, but students who have made **PRIOR** arrangements with the instructor might be permitted to have quizzes pro-rated if they are missed due to illness, family emergencies, or other extenuating circumstances, dependent on approval by the instructor.

Assignments must be submitted by the posted deadlines, barring any prior arrangements approved by the instructor due to extenuating circumstances. Assignment marks will be reduced by 5% for each day late up to 3 days, then 10% per day up to 7 days. Assignments will be assigned a mark of 0 if they are submitted more than 7 days after the posted deadline.

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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 Queen's Student Accessibility Services (QSAS) and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: <http://www.queensu.ca/studentwellness/accessibility-services/how-register/current-returning-students>