

# BIOL 302

## Population and Evolutionary Ecology

Fall Term (2015)

### 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 \$100.

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

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

Please refer to SOLUS for scheduling details.

<b>Instructors</b>	<b>Dr. Fran Bonier, Coordinator</b> <b>Dr. Rob Colautti</b>
<b>Instructor Contact</b>	<a href="mailto:bonierf@queensu.ca">bonierf@queensu.ca</a> ; Phone: 613-533-6000 ext. 77024; BIOSC 3523 <a href="mailto:robert.colautti@queensu.ca">robert.colautti@queensu.ca</a> ; Phone: TBA; BIOSCXXXX
<b>Office Hours</b>	TBA
<b>Lab Coordinator</b>	Laura Nagel, Program Associate <a href="mailto:nagell@queensu.ca">nagell@queensu.ca</a> ; Phone: 613-533-6000 ext.77437; BIOSC 2321
<b>TA Information</b>	See BIOL 302 Moodle Site
<b>Lab Instructor Office Hours</b>	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 provide students with a fundamental understanding of the ecological factors that affect population size, behaviour, and distribution
- to provide students with practical quantitative skills for the analysis of animal and plant populations, including training in field data collection, data management and analysis, and simulation models
- 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 should also consider taking Biology 303\* (Community and Ecosystem Ecology) offered in the winter term. BIOL 303 examines the ecology of communities and ecosystems, including the 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

<i>Teaching method</i>		<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
In-class hours	Lecture	2	12	24
	Seminar			
	Laboratory	3	9	27
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	Online activity	2.5	Research report	30
	Off-campus activity	14 total	Field trip	14
	Private study	2	12	24
Total hours on task				119

### Course Outline

See 302 Moodle site, and webpage

### Overview of Lecture Topics

#### **Introduction to Ecology**

Overview and scope of ecological studies, research approaches and tools, the scientific method

#### **Natural selection**

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

**Energy and nutrient acquisition**

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

**Behavioural Ecology**

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

**Evolutionary Ecology**

The intersection of evolution and population ecology, the consideration of ecological phenomena within the framework of the organism's evolutionary history

**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

**Competition**

Resource limits and forms of competition within and between species; how important is competition? Evolutionary divergence in resource use, ecological character displacement

**Exploitation: Predation**

Predator-prey cycles; 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

**Textbooks/Readings**

*Ecology: The Economy of Nature*, Robert Ricklefs, Rick Relyea, Christoph Richter, 7<sup>th</sup> Canadian Edition.

See 302 Moodle site for Reserve material, other readings.

**Grading Scheme**

<b>Component</b>	<b>Weight (%)</b>	<b>Date</b>
Lab Assignments	20%	weekly
Field Trip Paper	30%	end of semester
Lecture and Reading Quizzes and 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.

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***

<b>Grade</b>	<b>Numerical Course Average (Range)</b>
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.

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 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/>*