University of Guelph

College of Biological Science

Department of Integrative Biology

COURSE OUTLINE

Evolutionary Ecology (BIOL*4120)

Winter 2017

***NOTE** This outline is provisional and the final outline presented a the start of class will be the official course outline.

Course description

This course is an examination of common ecological circumstances faced by plants and animals and the morphological, behavioral and life history characteristics that have evolved in response. Particular emphasis will be placed on evolutionary processes and on adaptive aspects of thermoregulation, foraging strategies, spatial distribution, social and reproductive strategies. The course will emphasize both the theoretical basis and the empirical evidence for ecological adaptation. This course will not be a broad survey of the field, but will instead focus o a few subject areas that we will discuss in detail.
Credit weighting 0.5
Prerequisites BIOL*2060 (Ecology) or BIOL*3110 (Population ecology – discontinued) or other Ecology course with instructor consent), BIOL*2400 (Evolution) or BIOL*3400 or ZOO*3300 (Evolution - discontinued).
Students are expected to have some background and experience in statistics.

Teaching team

Professor: Beren Robinson, Office - Scie 2455, berenrob@uoguelph.ca ext. x58968
Professor: Elizabeth Boulding, Office – Scie 1464, boulding@uoguelph.ca ext. x54961
Office hours: TBA or by appointment.

Teaching assistant: TBA

Course schedule

Lectures: 11:30 AM - 12:20 PM, monday, wednesday and friday,
Location: MCKN 031

Labs

- Tutorial Section 1: 12:30 - 1:30 PM, Fridays, SSC 130 (Jan-Feb), SSC 230 (Feb-April)
- Tutorial Section 2: 1:30 - 2:30 PM, Fridays, SSC 130 (Jan-Feb), SSC 230 (Feb-April)
- Tutorial Section 3: 2:30 - 3:30 PM, Fridays, SSC 130 (Jan-Feb), SSC 230 (Feb-April)

Learning Outcomes

By the end of this course, students should be able to address the following goals and perform the following skills:

Conceptual Goals

Students successfully completing this class should be able to:

1. Evolution: Apply evolutionary principles to new problems in biology and everyday life; use evolutionary principles to develop novel hypotheses based on observation; explain study to document selection-driven evolutionary change in a population.

2. Selection: Measure directional and nonlinear (stabilizing/disruptive) selection differentials; Define and understand how to measure selection gradients; Think critically about genic, individual and group selection; have a general sense of the strength of selection in the wild.

3. Fitness: Explain what fitness is and the variety of ways in which it can be measured; Appreciate challenges of measuring fitness in nature.

4. Heritability: Understand concepts of repeatability, heritability and polygenic inheritance at a more conceptual level; Understand at a basic level genetic covariances, genetic constraints and correlated responses to selection; Appreciate patterns in heritability estimates among types of traits.

5. Phenotypic evolution: Understand how to assess whether observed phenotypic changes/differences are genetically based.

6. Comparative method: Appreciate why it is important to consider evolutionary history in comparisons among species (and higher taxa), and have basic idea of how this can be done.

7. Consider various other features of organisms such as phenotypic plasticity and life history traits in an evolutionary context, and explain using examples such concepts as evolutionary conflict between species, individuals and genes.

Skills Goals

8. Quantify phenotypic variation in a sample in collaboration with others and use basic statistical methods to evaluate selection acting on the population.

9. Practice effective critical thinking during written and oral communication in tutorial discussions focused on analyzing primary scientific literature and creating a final research poster on applied evolution by natural selection.

Course Resources

Recommended readings

Lecture material will be drawn from the primary literature and supplied on the course website (via CourseLink).
However, for background material, chapters in a number of books o evolutionary biology will be useful, such as:
Bell, G. 2008. *Selection: The mechanism of evolution,* 2nd ed. Oxford University Press, New York.

Conner, J.K. and D.L. Hartl. 2004. Primer in Ecological Genetics. Sinauer Assoc. Inc., MA.
Futuyma, D. J. 1986. *Evolutionary Biology*, 2nd edition. Sinauer Assoc. Inc., MA.
Fox, C.W., D.A. Roff and D.J. Fairbairn (eds). 2001. *Evolutionary Ecology: Concepts an case studies*. Oxford University Press, Oxford, UK.

CourseLink

Biol*4120 will make use of the UoG course website on D2L (via CourseLink) for supplying background and reading materials, lab materials, etc. Announcements of course news, deadlines etc, will also be displayed o the Biol*4120 CourseLink website. Please check it regularly.

Undergraduate Calendar

Undergraduate Calendar is the source of all information about UoG procedures, policies and regulations.

Course Content

This course has both lecture and tutorial components. The lecture period (Mon., Wed. and Fri.) will introduce and discuss theoretical concepts and specific methods in evolutionary ecology. The Friday lecture period will be used flexibly. In some weeks it will be used for additional lectures, while in other weeks it will be used for extended tutorials or project time.

Tutorials will be used to apply concepts through practical exercises and the discussion, critique and presentations of the primary literature.

General lecture schedule

Mon	Wed	Fri
Jan 9 Introduction –	**Jan 11** What is an adaptation?	**Jan 13** Asking evolutionary questions. Hypotheses and predictions **Practical Lab 1:** Bythos background, develop hypotheses about anti-predator trait function and selection.
Jan 16 Fitness	**Jan 18** Fitness	**Jan 20** Discuss Practical Lab Hypotheses **Practical Lab 2:** Predictions of Trait change
Jan 23 Fitness	**Jan 25** Natural Selection	**Jan 27** Natural Selection **Practical Lab 3:** Analyze – Measure selection on Bythos

Mon	Wed	Fri
Jan 30 Natural Selection	**Feb 1** Natural Selection	**Feb 3** **Assignment 1:Bytho lab due** **Tutorial:** Losos et al. 2004
Feb 6 Quantitative Genetics	**Feb 8** Quantitative Genetics Breeders Equation	**Feb 10** Levels of Selection **Tutorial:** Freeman & Byers 2006
Feb 13 Phenotypic plasticity	**Feb 15** Genetic Correlations Maternal Effects	**Feb 17** **Assignment 2: Applied Evolution Poster Intro.** **Tutorial:** Nussey et al. 2005
Feb 20 **Winter break (no classes)**	**Feb 22** **Winter break (no classes)**	**Feb 24** **Winter break (no classes)**
Feb 27 Maternal Effects	**Mar 1** Measuring Evolution	**Mar 3** **Applied evolution poster design** **Tutorial:** Schluter 1994
Mar 6 Fst/Qst Rates of Evolution	**Mar8** Comparative Method	**Mar 10 (40th day of classes)** **Tutorial:** Coltman et al. 2003
Mar 13 Life History Evolution	**Mar 15** Life History Evolution	**Mar 17** **Tutorial:** Reznick et al. 1997 **Poster draft due**
Mar 20 Evolutionary Conflict	**Mar 22** Evolutionary Conflict	**Mar 24** **Good Friday (no classes)** **Poster peer-review due**
Mar 27 Coevolution	**Mar 29 Peer review due** Coevolution	**Mar 31** **Tutorial:** Holland & Rice 1999
Apr 3 Final Lecture	**Apr 5** Q and A	**April 7** **Tutorial:** Brodie et al. 2002 **Final Poster due**

Methods of Assessment

Form of Assessment	Weight of Assessment	Due Date	Course Content / Activity	Learning Outcomes Addressed
Assignment 1: Practical Lab	**15%**	Feb.3	Lectures, Readings	1, 2, 3, 5, 8, 9
Assignment 2: Paper Oral Presentation & Discussion	**20%**	Friday of wks: 4-6, 8-12	Lectures, Readings	1-7, 9
3 questions per discussion paper	**5%**	As above	As above	As above
Assignment 3: Scientific Poster project	**25%** Content 15% Structure 10%	April. 7	Lectures, Readings	1-7, 9
Assignment 3: Submission of **complete** draft 1 poster for Peer review	**5%** Peer evaluation	Mar. 17		
Peer Review of Poster draft 1	**5%** Instructor evaluation of Peer evaluation	Mar. 24		9
Final Exam	**25%**	TBA	Lectures, Readings	1-7, 9

Assignments:
There are three assignments that occur over the term. Additional details will be presented in class and on the course website. Assignments are to be performed and reported as your individual work.

Assignment 1: Is a **practical lab** on quantifying phenotypic variation in a real population and estimating selection on the phenotypic traits and writing a summary report (friday labs in

January).

Assignment 2: **Paper Oral Presentation and Discussion** in friday's lab sections:
Your group will present an oral summary and help lead a discussion of one of the eight primary research papers in your tutorial section over the term. Students will form groups of 2-3 and sign up for either the summary or critique part of the oral presentation. Student groups will then split up and members from each presenting group will lead a discussion of the paper in a discussion group (2 per tutorial). Note that oral presentations are expected to meet a 4th year level of presentation.

All students are also expected to participate in weekly paper discussions. Provide 3 written questions that you have about each paper read to the instructor in tutorial. Use your questions to help motivate discussion in your group. Submitting questions and participation in discussion gets you an easy 5% of your final grade.

Instructions and materials for paper discussion and reviews are on the course website.

Assignment 3: Using a review of the primary scientific literature, you will analyse a potential example of human induced evolution in any natural system of your choice. You will then create a **scientific poster presentation** analysing the evidence for whether or not human activities may be driving trait evolution in a natural population. Your goal is to find and evaluate data to test the hypothesis that humans are a source of selection (intentionally or unintentionally) that may drive the evolution of specified traits (targets of selection) in a natural population. Focus on evaluating the likelihood that human activities are a source of selection, that selection is strong, the targets of selection are known and the evidence that any phenotypic changes may have evolved. Try to identify and discuss the key uncertainties about the necessary pieces of evidence around evolutionary responses to human actions in nature, and how these uncertainties could be assessed in future studies. Include a minimum of six peer-reviewed scientific articles relevant to your project.

This poster assignment has an additional **pre-submission peer-review process** of the first draft where you will be evaluated by three of your peers. 5% of your your grade will be based on these peer reviews. You will also evaluate and provide feedback on randomly assigned draft versions of posters from three other students. Your review of these posters will be evaluated for an additional 5% by an instructor (ie., we will evaluate your reviews). There are two benefits to peer review: To give and get feedback that improves your final poster, and to see different ways to craft posters. First and final poster drafts will be submitted for through PEAR.

Final exam: Is cumulative for the whole term.

Class Atmosphere:
The success of this course depends on mutual respect among students and instructors. Academic misconduct or personal harassment will not be tolerated and will be subject to University disciplinary procedures. The value of criticism is to provide useful feedback that helps the person improve their understanding or product, so please focus your critiques on the understandings or products and never on the person.

Important Due Dates

- Jan. 20: Deadline to sign up for paper discussion schedule (Assignment 2)
- Feb. 3: Bytho write-up due (Assignment 1)
- Feb 20-24: **Winter break**
- March 10: 40th day of classes (course drop deadline)
- March 17 Poster draft version due (Assignment 3 for peer review)
- March 24: Poster peer reviews due (Assignment 3)
- April 7: Final poster due (Assignment 3)
- April TBA: Final exam
- Note: Assignments 2 (paper oral presentation and participatory questions) are all due on Fridays in tutorial throughout February - April depending on article schedule above.

Course and University Policies

Grading

All assignments are due in class by the end of the period unless consideration is agreed to in advance of the deadline by the instructor. Late penalty is 10% per each additional 24 hr period starting at 12:01 AM, including weekends.

One exception to this rule is for the submission of draft posters and reviews of posters, where No late draft posters or reviews will be accepted in order to keep to schedule.

University Policies

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: Undergraduate Calendar - Academic Consideration

Consideration may be granted at the instructor's discretion. Please note that consideration for medical, compassionate or university-related conflicts (e.g., varsity sports) may require additional discussion with your program counsellor. Consideration is generally more likely when the student proactively advises the instructor of issues well in advance of deadlines.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability

or a short-term disability should contact the Student Accessibility Services - SAS (formerly: Centre for Students with Disabilities - CSD) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: Centre for Students with Disabilities

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

Undergraduate Calendar - Academic Misconduct

E-mail Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:
Undergraduate Calendar - Dropping Courses

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

Academic Calendars

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program. B.Sc. Academic Advising or Program Counsellors

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. The Learning Commons

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. Counselling Services
- Student Health Services is located on campus and is available to provide medical attention. Student Health Services
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. Stress Management and High Performance Clinic

If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: Centre for Students with Disabilities