BIOLOGY 3065 CONSERVATION BIOLOGY

LECTURES: WED/FRI 11:35 – 12:25 in LSC C236

TUTORIAL: WED 2:35 – 4:25 in LSC C206

INSTRUCTORS: Camilo Mora (Prof), Derek Tittensor (Prof) and Dave Keith (TA)

OFFICE: LSC 4089 on the LSC 4th floor

OFFICE HOURS: Wednesday and Friday after class or by appointment

E-mail: cmora@dal.ca, derekt@mathstat.dal.ca, keithdm@dal.ca

Class Web Site: BLS

GRADING COMPONENTS:

EXAMS

Midterm (19 February 2009)	25%
Final (14 April 2009)	40%
ASSIGNMENTS (group projects)	35%

Thereof 20% individual presentation, 15% group paper

RECOMMENDED TEXTS:

A Primer of Conservation Biology, by R.B. Primack, Published by Sinauer Associates

This text is short, concise and affordable, but offers little detail

Essentials of Conservation Biology, by R.B. Primack, Published by Sinauer Associates

This text is more detailed and has more examples than the Primer

MANUAL:

The Biol 3065 manual contains a selection of overheads presented in class, downloadable the day before each class from the BLS site

COURSE OUTLINE:

In this course we will first cover the basics of conservation biology, by reviewing the fundamental processes that affect populations, species, and communities in nature. We will learn how human impacts strongly influence animal and plant populations, as well as the communities and ecosystems in which they are embedded. Most people who graduate and work in ecology become involved in some kind of management framework (that is managing human impacts on ecosystems). We will attempt to teach you some of the concepts that underlie such work, including topics such as conservation genetics, protected area design, and restoration ecology. In doing so, we expect that you contribute actively to a successful course by engaging in discussions, which will form an important element of this class.

ASSIGNMENTS: Groups of 5-6 students will perform research on an assigned topic in conservation biology. During each Wednesday tutorial, one group will report their findings in a presentation of 50 minutes, with each group member talking for 10 minutes. In addition each group will prepare a paper of up to 2500 words outlining the findings of their research and provide the reader with graphs, tables, and references. The paper and talk are graded independently and contribute 20% (talk) and 15% (paper) towards your final grade.

EXAMS: Both exams will cover lecture material and presented material from the tutorials. They will be held during regular class hours.

LECTURE SCHEDULE (may be subject to some change):

Block 1: Trends and causes of biodiversity loss

- Biodiversity, its value and need for conservation
- Global trends in marine and terrestrial biodiversity
- Causes of biodiversity loss: overexploitation
- Causes of biodiversity loss: habitat loss
- Causes of biodiversity loss: climate change
- Causes of biodiversity loss: human population and consumption

Block 2: Targeting the causes of biodiversity loss

- Overexploitation: Population viability analysis and harvesting regulation
- Habitat loss: meta-population dynamics and protected areas design
- Warming and pollution: regulating CO2 emissions and human pollutants
- Strategies to curb human population growth and consumption
- Future scenarios for biodiversity change and conservation
- Midterm Exam

Block 3: Conservation at genetic, population, and ecosystem levels

- Conservation genetics (Dennis Roy)
- Variability and its influence on populations (Coilin Minto)
- Macroecology and conservation
- Management of fisheries
- Marine protected area networks
- Conservation of highly migratory species
- Restoration ecology

Block 4: Conservation and sustainability

- Conservation and resource management

- Global approaches to conservation
- Synthesis: conservation for the future
- Final exam

TUTORIAL SCHEDULE, TOPICS, AND RESEARCH QUESTIONS:

- **Talks on conservation of biological diversity**
  - What does the IUCN red list of threatened species do, and what has achieved?
  - Lead source: http://www.redlist.org
- **Talks on changes in biodiversity I**
  - What intrinsic factors (e.g. range size, body size, etc) make species vulnerable to extinction?
  - Cardillo M (2003) Biological determinants of extinction risk: Why are smaller species less vulnerable? Anim Conserv 6: 63–69
  - Fisher DO, Blomberg SP, Owens IPF (2003) Extrinsic versus intrinsic factors in the decline and extinction of Australian marsupials. Proc R Soc Lond B Biol Sci 270: 1801–1808
  - Gaston KJ, Blackburn TM (1995) Birds, body size and the threat of extinction. Philos Trans R Soc Lond B Biol Sci 347: 205–212.
  - Cardillo et al (2004) Human Population Density and Extinction Risk in the World's Carnivores. PLoS Biol 2(7): e197. doi:10.1371/journal.pbio.0020197
- **Talks on changes in biodiversity II**
  - What extrinsic factors (e.g. environmental and anthropogenic) make species vulnerable to extinction?
  - Cardillo, et al (2005) Multiple causes of high extinction risk in large mammal species. Science 309, 1239-1241
  - Jetz et al (2007) Projected impacts of climate and land-use change on the global diversity of birds. Plos Biology doi:10.1371/journal.pbio.0050157
- **Talks on changes in biodiversity III**
  - What are coupled social-ecological systems?
  - Liu, et al. (2007) Complexity of coupled human and natural systems. Science 317, 1513-1516
  - Adams (2004) Biodiversity conservation and the eradication of poverty. Science 306, 1146-1149
- **Talks on biodiversity change IV**

- What is the ecological human footprint on Earth?
- Wackernagel (2002) Tracking the ecological overshoot of the human economy. PNAS 99, 9266-9271
- Kitzes, et al. (2008) Shrink and share: humanity's present and future Ecological Footprint. Phil. Trans. R. Soc. B. 363, 467–475

- **Talks on conservation solutions**
  - What is the global coverage of marine and terrestrial protected areas?
  - Woods et al. (2008) Assessing progress towards global marine protection targets. Oryx 42, 340-351
  - Chape et al (2005) Measuring the extent and effectiveness of protected areas as an indicator for meeting global biodiversity targets. Phil. Trans. R. Soc. B. 28, 443-455.

Mid-term break

- **Talks on future scenarios for biodiversity and conservation**

  Are future scenarios in ecology and conservation always useful?
  - Lead source: Coreau, A. et al. (2009). The rise of research on futures in ecology: rebalancing scenarios and predictions. Ecology Letters, 12, 1277-1286.
  - Beaumont, L. J. et al. (2008). Why is the choice of future climate scenarios for species distribution modelling important? Ecology Letters, 11, 1135-1146.
- **Talks on conservation genetics**
  - What are the challenges and successes of captive breeding programs?
  - Lead source: Fraser, D. J. (2008). How well can captive breeding programs conserve biodiversity? A review of salmonids. Evolutionary Applications, 1, 535-586.
  - Jule, K. R., Leaver, L. A., Lea, S. E. G. (2008). The effects of captive experience on reintroduction survival in carnivores: a review and analysis. Biological Conservation, 141, 355-363.
- **Talks on macroecology**
  - How do macroecological patterns on land and on sea inform differing conservation strategies?
  - Lead source: Gaston, K. (2000). Global patterns in biodiversity. Nature, 405, 200-227.
  - MacPherson, E., et al. (2009). Macroecological patterns among marine fishes. *In*: Marine Macroecology, Eds. J. D. Witman & K. Roy. University of Chicago Press.
- **Talks on marine protected areas**
  - Can high seas marine protected areas (MPAs) be used to protect highly migratory species?

- Lead source: Palumbi, S. R. (2004). Marine reserves and ocean neighbourhoods: the spatial scale of marine populations and their management. Annual Review of Environment and Resources, 29, 31-68.
- Block, B. A. et al. (2005). Electronic tagging and population structure of Atlantic bluefin tuna. Nature, 434, 1121-1127.

- **Talks on natural resource management**
  - How can conservation and fisheries interests be reconciled?
  - Lead source: Worm, B. et al. (2009). Rebuilding global fisheries. Science 325, 578-585.
  - Stokstad, E. (2009). Détente in the fisheries war. Science, 324, 170-171.
- **Talks on global approaches to conservation**
  - How will global climate change impact conservation in the future?
  - Lead source: Thomas, C. D. et al. (2004). Extinction risk from climate change. Nature, 145-148.
  - Araújo, M. B. et al. (2004). Would climate change drive species out of reserves? An assessment of existing reserve-selection methods. Global Change biology, 10, 1618-1626.

Talks to be held at Wednesday Tutorials, Papers are due the same day.

IMPORTANT: please choose your 3 favourite topics from the above list and email them to keithdm@dal.ca. He will get back to you to confirm one of your choices, which will be your assignment.

PLEASE NOTE: We encourage and expect you to attend all lectures and tutorials, especially since the tutorial is thought as a forum for discussion, which we regard a critical component of this course. You are expected to contribute actively to an interesting and stimulating course. This is through your presentations, but also through questions and discussions. Some of the material presented in the tutorials will also be part of the exams.

DETAILS ON THE ASSIGNMENTS:

There is one written and one oral assignment in this course, worth 15% and 20% of your final grade, respectively. You are expected to give a **10 min** talk and write a short (**≤2500 word**) paper, which examines a principal question (see topics above) in conservation biology. We expect the assignments to be based on information extracted from the primary scientific literature, i.e. academic journals, which can be accessed easily by Dalhousie library data bases, or via science search engines such as http://scholar.google.ca/. In most cases we provide lead sources, which should serve as starting point (but never as your sole reference) for your research. We consider these assignments to be a very important component of the course as they should indicate whether you have understood the relevant theoretical

concepts, whether you can critically read, evaluate and synthesize the literature, and whether you can present your findings, both orally an in writing.

All papers should be in scientific format (see below), with appropriate documentation of sources. Marks will be given both for content and for presentation. In addition we will award bonus points for truly original ideas, and for original analysis (where you compile data and analyse them yourself).

Papers are **due** on the Wednesday prior to your scheduled presentation. The papers will be commented on by us and sent back to you one week after submission, with suggestions for revisions. Revised papers are due one week after that. The paper grade will take into account in equal parts the quality of both the initial submission and the revision. No grade will be assigned until the final revision is received.

Suggested procedure for writing the research paper and preparing the talk

1) Read the primary literature and decide what the main conclusions are.
2) Think about how these main conclusions relate to the principal question.
- Which of the information is relevant, which addresses a different question?
- Do different authors disagree, and if so, what is their source of disagreement?
- Can you extract some of the underlying data and summarize or analyse it yourself?

3) Discuss these findings with your group co-authors, and divide up the writing work and the topics for presentation.
4) Have all co-authors listen to your presentation read and agree on the final paper before submission – make sure what you are saying makes sense to everyone and all fits well together.
5) End your paper with a concluding paragraph, where you briefly sum up what you think is the key message of your paper.
6) In the very end add a section entitled „references" which lists alphabetically all the sources citied in the main text. Use a common, standardized style that you find in scientific papers, e.g.

Carpenter SC, Kitchell, JF, Hodgson, JR (1985) Cascading trophic interactions and lake productivity. Bioscience 35: 634 - 639.

Christensen, V, Pauly D (1992) A guide to the Ecopath II software system (Version 2.1) ICLARM Software 6, ICLARM, Manila, Philippines

You may also include web sources. List them in an appendix.

Some notes on paper style:

1) Use proper English, crafted into short, clear sentences. Do not use colloquial language or slang. Avoid complicated sentence structure, jargon and acronyms (if you most use acronyms define them upon first use)
2) Pay close attention to spelling, grammar, sentence, and paragraph structure.

3) Do **NOT** quote from directly from the articles you have read. Paraphrase and cite appropriately.
4) Extracting sentences from the literature (even if somewhat modified) is not appropriate and considered plagiarism. Try to explain what the author means in your own words.
4) Every idea that is not yours or that is not common knowledge MUST be cited. For example you may want to state that „predatory fish introductions to lakes can result in trophic cascades (Carpenter et al. 1985)." Carpenter et al. is the source for that statement and needs to be listed in the References as:

Carpenter SC, Kitchell, JF, Hodgson, JR (1985) Cascading trophic interactions and lake productivity. Bioscience 35: 634 - 639.

HOW TO STRUCTURE YOUR PAPER:

Your paper should closely follow the format of a published scientific paper or review article. It should contain the following elements:

Title Should be short and convey the major idea of the paper.

Author list This is a list of the authors of the paper. You may wish to choose one person as the Lead Author (listed first), or simply list everyone in alphabetical order.

Abstract This is a short (100-200 words) summary of your paper. Someone should be able to read the abstract and know what your paper is about. It summarises the major question being answered, how it was answered, and the main conclusion; as well a good abstract (briefly) conveys the importance and relevance of the question.

Introduction This short section outlines the relevance and importance of the question being asked. It „sets the stage" for the paper by including background information which explains why the question is being asked.

Methods This part describes how the question was answered. It explains how the data or information used to answer the question was collected and analysed. You should explain, for example, which criteria you used to search for the relevant information. The goal is to make the reader understand precisely what you did, so he or she could repeat your analysis from scratch if necessary.

Results and Discussion This section describes what you found out using the methods described above. You will want to include graphs or tables which you refer to in the methods section as (for example) (Fig. 3A) or (Table 1). There should not be more than 5-6 figures in total, and each should take up no more than ½ a page. See any scientific paper for how to format tables and graphs. You also interpret your results and explain how they answer the question that is being asked. It is important to discuss the relevance of your findings in relation to the literature cited in your introduction as well as any larger-scale implications. Finally, a discussion of future action that should be taken or studies that should be done should be included, and is a good way to end the paper.

Conclusions In this final short paragraph you outline the main „take-home" messages.

Acknowledgements This is a (very) short, optional paragraph thanking anyone or any organisation that helped you write and research your paper.

References Follow standard citation formatting. See above for examples.

HOW TO STRUCTURE YOUR TALK

You may follow the traditional style of

- Introduction / Outline
- Methods
- Results
- Discussion and Conclusion,

or come up with your own style, which should however be framed by an Introduction and a "take-home-message" or conclusions. DO NOT simply read your paper to the audience. The talk and paper are 2 separate assignments. In your talk you should present at least some graphical material (e.g. plots, graphs, maps, charts). Be prepared to engage with the rest of the class in a discussion following your presentation. Do not cram too much information into your slides, which should be simple, well organized and clear. They are used to illustrate your talk, and should contain mostly graphical material and only brief bullet points. Use large fonts so people can actually see what is written. Speak slowly and clearly and project your voice to the audience. Look at the class, not at the overheads. Always emphasize the key points (what people should remember) and use (few) examples to illustrate them. Often one well-explained example is better than three or four that are rushed through. Time your talk when you practise at home (ideally in front of your group). If is longer than 10 minutes you need to shorten and leave some things out.