



# BIOL334

## Conservation and Ecological Genetics

S2 External 2015

*Dept of Biological Sciences*

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#### Disclaimer

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## General Information

Unit convenor and teaching staff

Unit Convenor

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Credit points

3

Prerequisites

39cp including BIOL206(P)

Corequisites

Co-badged status

### Unit description

Continuing advances in DNA technology and statistical analyses have greatly improved our ability to use genetic information to address questions in ecology, conservation, evolution, behaviour and forensics. This unit deals with the distribution of genetic diversity in individuals, populations and species, and examines how different fields of science can benefit from integrating genetic knowledge into their research agenda. Emphasis is placed on the relevance of genetic factors to the conservation, management and restoration of wild populations. We will also explore several strands of ecological genetic research, drawing upon a broad base of expertise at Macquarie University and beyond, and addressing such topics as climate change genetics, adaptation and evolvability in the wild, and the ecological genetics of sex.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics
- Prepare analytical findings in the correct format for submission to a peer-reviewed scientific journal

## Assessment Tasks

Name	Weighting	Due
<a href="#">Assignment 1</a>	5%	5:00PM Friday Aug 21

Name	Weighting	Due
<u>Problem test 1</u>	15%	Aug 27(int) Oct 19(ext)
<u>Problem test 2</u>	15%	Nov 5 (int) Oct 19 (ext)
<u>Seminar</u>	15%	Oct 1 & 8(int) Oct 18 (ext)
<u>Assignment 2</u>	20%	Oct 2 (int) Nov 20 (ext)
<u>Final Exam</u>	30%	TBA

## Assignment 1

Due: **5:00PM Friday Aug 21**

Weighting: **5%**

You are required to write a short (500-600 word) 'commentary'-style manuscript on a published paper dealing with genetic variation and conservation. This will require a short search of relevant current literature to identify a paper from among the leading journals in the field of conservation genetics (incl. *Science*, *Nature*, *PNAS*, *PLOS biology*, *Evolution*, *Molecular Ecology*, *Conservation Biology*, *Conservation Genetics* + many others). You should then familiarize yourself with the paper and its methodologies and write a commentary in the style of those appearing in the 'Perspectives' section of the journal *Science*. Further information regarding this task will be provided in the first few lectures of the unit. This is an early assessment task, with assessment criteria weighted for participation and genuine effort over scientific insight (given that you are yet to be delivered the bulk of unit material at the early stage of the teaching session). There is a link embedded in iLearn Week 4 for the submission of this assignment to TURNITIN.

On successful completion you will be able to:

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations

## Problem test 1

Due: **Aug 27(int) Oct 19(ext)**

Weighting: **15%**

In week 5 – and the final day of the on-campus session for external students – you will be tested on material from tutorials 1-3. The test will constitute a series of multiple choice questions coupled with a series of genetics-based problems for you to solve mathematically. The problems will be modeled on those worked through in preceding tutorials. The test will be 1hr in duration and conducted in the tutorial room under exam conditions, that is, silently and with no written material, books or mobile phones allowed at your workstation. Non-programmable calculators

will be permitted.

On successful completion you will be able to:

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software

## Problem test 2

Due: **Nov 5 (int) Oct 19 (ext)**

Weighting: **15%**

In week 13 – and the final day of the on-campus session for external students – you will be tested on material from tutorials 8-10. The test will constitute a series of multiple choice questions coupled with a series of genetics-based problems for you to solve mathematically. The problems will be modeled on those worked through in preceding tutorials. The test will be 1hr in duration and conducted in the tutorial room under exam conditions, that is, silently and with no written material, books or mobile phones allowed at your workstation. Non-programmable calculators will be permitted.

On successful completion you will be able to:

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software

## Seminar

Due: **Oct 1 & 8(int) Oct 18 (ext)**

Weighting: **15%**

In weeks 8 & 9 – and in day 2 of the residential session for external students – you will be

required to give a 12-min oral presentation based on one to several topical research paper(s) in conservation/ecological genetics. Conference presentations are a primary means of communicating knowledge in science, and these sessions will be ran in the manner of a formal scientific conference. Your talk should be delivered as a Powerpoint presentation of 10-min duration, leaving ~2 min to field questions from the audience. Time limits will be strictly enforced, and will constitute part of the assessment criteria for this task. More details will be provided in lecture 14.

On successful completion you will be able to:

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- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics

## Assignment 2

Due: **Oct 2 (int) Nov 20 (ext)**

Weighting: **20%**

You will be required to prepare a scientific manuscript based on the data analysed in the computer lab tutorial (as conducted in week 7 for internal students and on day 1 of the on-campus session for external students). Your manuscript should adhere to the instructions for authors for 'original articles' in the high-ranking journal *Evolution*, available online. The assignment is due 2-weeks after completion of computer lab tutorial for both internals and externals, both via TURNITIN AND a hardcopy to the science centre (internals) or emailed directly to the unit convener (externals) by 5:00 PM on the due-date. As with Assignment 1, there are links for TURNITIN submission in iLearn for both internal and external students. More detailed information, discussion and resources (including a marking rubric) will be provided during the computer lab tutorial.

On successful completion you will be able to:

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- Identify and apply the correct statistical formulae for addressing specific genetic

questions

- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software
- Prepare analytical findings in the correct format for submission to a peer-reviewed scientific journal

## Final Exam

Due: **TBA**

Weighting: **30%**

You will be tested on your knowledge of course content, including information from all lectures and tutorials, plus prescribed reading from the textbook (Frankham *et al.*) and other sources. This will consist of a formal exam of 2-hr duration, held during the end-of-year examination period, and will consist of multiple choice questions plus one long-answer essay-style question. No mathematical problem solving will be required in this examination. Check online ([www.mq.edu.au](http://www.mq.edu.au)) for scheduling updates towards the end of the teaching session.

On successful completion you will be able to:

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software

## Delivery and Resources

### Changes to the unit

After a short break, Biol334 has been delivered as a regular semester offering since 2013. The unit draws partly upon material developed for the unit in 2010 and 2012 (with acknowledgement to Shannon Corrigan, Vincenzo Repaci, Shannon Smith and Adam Stow), but has been modified according to student feedback received during regular semester delivery in 2013 and 2014.

### Required unit materials

The content of this unit is closely linked to **Frankham R, Ballou JD and Briscoe DA (2010) *Introduction to Conservation Genetics 2nd edition*. Cambridge University Press**. This textbook is required reading for Biol334 students. The book was written by Emeritus Prof Richard Frankham and Prof Dave Briscoe, of Macquarie Biological Sciences, together with Dr Jon Ballou (Head of the Department of Conservation Biology at the Smithsonian's National Zoological Park). There is only a single copy of this book on special reserve at the university library; therefore we strongly advise that each student purchase their own copy.

## Unit Schedule

Please consult iLearn for full Lecture and Tutorial schedule.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

## Due dates, extensions, penalties and special consideration

Late assignments will attract a penalty at the rate of **5 %** of the total mark allocated for the assignment **per day** past the due date. Marks lost for lateness will be capped at 75 %, so once an assignment is more than 15-days overdue then you can earn up to a maximum of 25 %. The deadlines for assignments are **not negotiable**. You will only escape penalties if you can produce



a valid medical certificate or a letter with appropriate supporting documents outlining extenuating circumstances, or seek and be approved for formal special consideration. All applications for special consideration or extension must be sought *before the due date* unless this is impossible, from the unit convener, Dr. Darrell Kemp. Please note that an Assignment will be considered late if both the required hardcopy (or emailed copy for external students) **AND** the electronic TURNITIN submission are not received prior to the advertised due date/time.

## **Academic Honesty**

The university now has an academic honesty policy, which replaces and expands upon former policies on plagiarism. Plagiarism is defined as presenting the work of another person as one's own. It is a serious breach of the University's rules. Depending on the level of plagiarism, **penalties** range from a loss of marks to awarding of a zero and reporting to Faculty disciplinary committee.

Full details of the University's policy on academic honesty is provided in the Student handbook, and at:

[http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

This includes an explanation of what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. This site links to pages outlining the procedures to be undertaken in cases of suspected plagiarism. Information on penalties is given at:

[http://www.mq.edu.au/policy/docs/academic\\_honesty/schedule\\_penalties.html](http://www.mq.edu.au/policy/docs/academic_honesty/schedule_penalties.html)

An excellent set of resources regarding plagiarism is provided online at the Department of Linguistics site:

[http://www.ling.mq.edu.au/support/policies\\_plagiarism.htm](http://www.ling.mq.edu.au/support/policies_plagiarism.htm)

## **Student Support**

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## **Learning Skills**

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

### Learning outcomes

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics
- Prepare analytical findings in the correct format for submission to a peer-reviewed scientific journal

## Assessment tasks

- Assignment 1
- Problem test 1
- Problem test 2
- Seminar
- Assignment 2
- Final Exam

## Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

## Learning outcomes

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics
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- Assignment 2
- Final Exam

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

### Learning outcomes

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software
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- Seminar
- Assignment 2
- Final Exam

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific

knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## **Learning outcomes**

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
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## **Assessment tasks**

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- Problem test 1
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- Seminar
- Assignment 2
- Final Exam

## **Critical, Analytical and Integrative Thinking**

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## **Learning outcomes**

- Identify the genetic factors of key importance in evolutionary and conservation biology

- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
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## **Assessment tasks**

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- Problem test 1
- Problem test 2
- Seminar
- Assignment 2
- Final Exam

## **Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## **Learning outcomes**

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both

wild and captive populations

- Conduct exploratory analyses of genetic diversity and divergence by hand and with the assistance of computer software
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics
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## **Assessment tasks**

- Assignment 1
- Problem test 1
- Problem test 2
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## **Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

## **Learning outcomes**

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
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## Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

## Learning outcomes

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
- Prepare and give oral presentations that synthesize information on contemporary topics in conservation and ecological genetics

## Assessment tasks

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- Problem test 1
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- Assignment 2
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## Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

### Learning outcomes

- Identify the genetic factors of key importance in evolutionary and conservation biology
- Describe the importance of genetic diversity in populations and species
- Recall the phenomena that influence and maintain genetic diversity in wild and captive populations
- Identify and apply the correct statistical formulae for addressing specific genetic questions
- Apply conservation genetic theory in order to propose management strategies for both wild and captive populations
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