BIOL334

Conservation and Ecological Genetics

S2 Day 2016

Dept of Biological Sciences

Contents

General Information

Unit convenor and teaching staff
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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

General Assessment Information

Due dates, extensions, penalties and disruption to study

Overdue assignments will attract a penalty at the rate of **5 % of the total mark allocated for the assignment per day past the due date**. This penalty will be capped at 75 %, which means that once your submission is more than 15-days overdue you can earn up to a maximum of 25 %

of the assessment grade. The date and time of your submission will be taken as registered by TURNITIN.

Deadlines for assessments are **not negotiable** except under circumstances when you have experienced a serious and unavoidable disruption. In such instances, you should formally lodge a disruption to studies notification via ASK@MQ. University policy and procedure in regard to disruptions is given in the link provided below, but please note in particular:

1. To be eligible for special consideration, you must notify the University of a *serious and unavoidable* disruption **within five (5) working days** of the commencement of the disruption;

2. Such requests must be lodged for the **specific assessment task** for which you experienced disruption. Special consideration cannot be granted retrospectively (i.e., beyond the 5-day window of each assessment due-date);

3. Unit staff will NOT be held responsible for assessing special consideration **unless a disruption notification is formally lodged** via ASK@MQ.

Assessment Tasks

Name	Weighting	Due
Commentary article	5%	5:00PM Friday Aug 19
Problem-based test 1	15%	Sept 6-7 (int) Oct 24 (ext)
Problem-based test 2	15%	Nov 8-9 (int) Oct 24 (ext)
Oral Presentation	15%	Oct 4-12 (int) Oct 23 (ext)
Research manuscript	20%	Oct 7 (int) Nov 11 (ext)
Final Examination	30%	TBA

Commentary article

Due: **5:00PM Friday Aug 19**
Weighting: **5%**

You are required to **write a short (500-600 word) 'commentary'-style paper** on a research publication in conservation genetics. This will require a short literature search to identify a paper from among the leading journals in the field (e.g., *Science, Nature, PLOS biology, Evolution, Molecular Ecology, Conservation Biology, Conservation Genetics* + many others). You should then familiarize yourself with the research and write a commentary in the style the 'Perspectives' section of the journal *Science*. Further information regarding this task will be provided in the first 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). A link will be embedded in iLearn Week 3 for submission 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-based test 1

Due: **Sept 6-7 (int) Oct 24 (ext)**
Weighting: **15%**

In week 6 – and the final day of the on-campus session for external students – you will be **tested on material from the first set of problem-based tutorials** (sets 1-3). The test will constitute multiple choice questions and genetics-based problems for you to solve mathematically (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-based test 2

Due: **Nov 8-9 (int) Oct 24 (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 the second set of problem-based tutorials** (sets 4-5). The test will constitute multiple choice questions and genetics-based problems for you to solve mathematically. 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

Oral Presentation

Due: **Oct 4-12 (int) Oct 23 (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 **10-min oral presentation on a research topic in conservation/ecological genetics**. Oral 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. Further details will be provided in lectures.

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
- 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

Research manuscript

Due: **Oct 7 (int) Nov 11 (ext)**
Weighting: **20%**

You will be required to **prepare a scientific manuscript based on the data analyzed in the computer lab tutorial** (conducted in week 7 for internal students and during the on-campus session for external students). Your manuscript should adhere to the instructions for authors for 'original articles' in the journal *Evolution* (available online). The assignment is due 3-weeks after the computer lab tutorial for both internal and external students. There are links for submission to TURNITIN in iLearn for both internal and external students. Further information, discussion and

resources will be provided during the computer lab tutorial.

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
- Prepare analytical findings in the correct format for submission to a peer-reviewed scientific journal

Final Examination

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 contain 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) 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) and has been modified according to student feedback received since.

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 you purchase your own copy.

Unit Schedule

Weekly Lectures:

Lecture 1	Tuesday	09:00 - 10:00 AM	C5C-CF
Lecture 2	Wednesday	10:00 - 11:00 AM	E6A-102

Weekly tutorials (internal students):

Tutorial class 1	Tuesday	10:00 - 11:50 AM	E5A-260
Tutorial class 2	Wednesday	11:00 - 12:50 PM	E5A-270

On-campus session (external students):

Day 1	Sat 22 October	9:00 - 5:00 PM	E8A-150
Day 2	Sun 23 October	9:00 - 5:00 PM	E5A-230
Day 3	Mon 24 October	10:00 - 5:00 PM	E6B-149

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy 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/

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.

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) 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

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources 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

- Commentary article
- Problem-based test 1
- Problem-based test 2
- Oral Presentation

- Research manuscript
- Final Examination

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
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- Research manuscript
- Final Examination

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
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- Problem-based test 2
- Oral Presentation
- Research manuscript
- Final Examination

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-based test 2
- Oral Presentation
- Research manuscript
- Final Examination

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-based test 2
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- Research manuscript
- Final Examination

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
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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
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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
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Assessment tasks

- Commentary article
- Problem-based test 1
- Problem-based test 2
- Oral Presentation
- Research manuscript
- Final Examination

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
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