BIOL334

Evolutionary and Conservation Genetics

S2 Day 2019

Dept of Biological Sciences

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General Information

Unit convenor and teaching staff Adam Stow adam.stow@mq.edu.au Kate Barry kate.barry@mq.edu.au
Credit points 3
Prerequisites (39cp at 100 level or above) including BIOL206
Corequisites
Co-badged status
Unit description Ongoing advances in molecular technology, statistics and bioinformatics have revolutionized our ability to gather and apply genetic information. This unit deals with the distribution of genetic variation among individuals, populations and species, and the relevance of such variation to evolutionary processes. Specific topics include selection and adaptive potential; mutation; inbreeding; population divergence; speciation; effective population size and extinction risk. Approaches to the study of genetic variation are explored at levels ranging from pedigree analysis to molecular genomics. Particular emphasis is placed on the importance of evolutionary genetics to the conservation, management and restoration of wild populations.

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:

> By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to

propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Assessment Tasks

Name	Weighting	Hurdle	Due
Commentary Article	5%	No	August 16th
Problem Test 1	15%	No	Week 6
Problem set 2	15%	No	Week 13
Seminar	15%	No	Weeks 9-10
Scientific Report	20%	No	15th October
Final Exam	30%	No	TBA

Commentary Article

Due: **August 16th**
Weighting: **5%**

You are required to write a short (500-600 word) commentary article on a published paper dealing with genetic variation and conservation. This will require a short literature search to identify a relevant paper from among the leading journals in 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 early lectures. This is an early assessment task, with assessment criteria weighted for participation and genuine effort (given the early stage of unit material delivery). There is a link embedded in iLearn Week 3 for you to submit this assignment via TURNITIN.

On successful completion you will be able to:

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presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Problem Test 1

Due: **Week 6**
Weighting: **15%**

In weeks 6 & 13 – and each day of the residential session for externals – you will be tested on material from the two problem-based tutorial sets. Each test will constitute a series of multiple choice questions coupled with problems for you to solve mathematically. The problems will be modeled on those worked through in preceding tutorials. Each test will be one hour 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:

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Problem set 2

Due: **Week 13**
Weighting: **15%**

In weeks 6 & 13 – and each day of the residential session for externals – you will be tested on material from the two problem-based tutorial sets. Each test will constitute a series of multiple choice questions coupled with problems for you to solve mathematically. The problems will be modeled on those worked through in preceding tutorials. Each test will be one hour 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:

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in

populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Seminar

Due: **Weeks 9-10**
Weighting: **15%**

In weeks 9 and 10 – and day 2 of the residential session for external students – you are required to give an 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 conducted in the manner of a formal scientific conference. Your talk should be delivered as a Powerpoint presentation of 10 minutes duration, leaving several minutes to field questions from the audience. Time limits will be strictly enforced, and will constitute part of the assessment criteria for this task. Your powerpoint presentation must also be submitted on the day of your presentation. More details and a schedule will be provided in lectures beforehand.

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Scientific Report

Due: **15th October**
Weighting: **20%**

You are required to prepare a scientific manuscript based on the data analysed in the computer lab tutorial. Your manuscript should structured according to the author instructions for 'original articles' in the journal *Evolution*:

http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291558-5646/homepage/ForAuthors.html

The assignment is due four weeks after completion of the computer lab tutorial. As with Assignment 1, there are links for TURNITIN submission in iLearn for internal and external

students. Further information, discussion and resources (including a marking rubric) will be provided prior to and during the computer lab tutorial.

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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 two hour exam, 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) for scheduling updates towards the end of the teaching session.

On successful completion you will be able to:

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Delivery and Resources

The unit is taught by means of two lectures per week and a weekly tutorial. Please visit the ilearn page to view the lecture and tutorial schedule.

To achieve at least a pass (P) in this unit, you must achieve a numerical grade of at least 50. Participation in problem set tutorials is non-compulsory but strongly encouraged. Attendance for the computer laboratory and problem test tutorials are compulsory for earning marks. Absence from these tutorials is subject to the procedures of special consideration and – in exceptional circumstances – formally documented and negotiated exemption by the unit convener (further details are given below).

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://stu

dents.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

If you are a Global MBA student contact globalmba.support@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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare

presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Assessment tasks

- Commentary Article
- Seminar
- Scientific Report

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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Assessment task

- Scientific Report

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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic

diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

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 outcome

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Assessment tasks

- Commentary Article
- Problem Test 1
- Problem set 2
- Seminar
- Scientific Report
- 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 outcome

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- Commentary Article
- Problem Test 1
- Problem set 2
- Seminar
- Scientific Report
- 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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics

in conservation and evolutionary genetics;

Assessment tasks

- Problem Test 1
- Problem set 2
- Final Exam

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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Assessment tasks

- Commentary Article
- Seminar
- Scientific Report

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 outcome

- By the end of this unit you should be able to: 1. Explain why and how genetic factors have key importance in conservation biology; 2. Explain the importance of genetic diversity, and identify the phenomena that influence and maintain genetic diversity in populations; 3. Identify and apply appropriate statistical formulae to solve questions in conservation and evolutionary genetics; 4. Apply conservation genetic theory in order to propose management strategies for both wild and captive populations; 5. Prepare presentations (both written and oral) that synthesize information on contemporary topics in conservation and evolutionary genetics;

Assessment tasks

- Seminar
- Final Exam

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 outcome

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Assessment task

- Scientific Report