BIOL332
Genetics, Evolution and Ecology of Invasive Species

0.125 EFTS 15 Points
Semester 2

Description
An introduction to the genetics and evolution of biological invasions, including the use of molecular tools to answer applied questions regarding the source and spread of introduced organisms.

Goals of the course
• To introduce students to the use of molecular tools to answer applied questions regarding the source, spread, and ecological impacts of introduced organisms.
• To develop understanding of the genetics and evolution of invasive species, and the genetic impacts of invasive species on native species.
• To develop skills in evaluating and understanding the scientific literature related to invasion ecology.
• To develop skills in writing and evaluating scientific proposals, including addressing Vision Mātauranga.

Research proposal
The in-course assessment will be writing a research proposal, including a pre-proposal followed by a full proposal. This counts for 40% of the final grade (15% for the pre-proposal and 25% for final proposal).

Lectures
All lectures will be recorded on Echo360. This is intended to enhance lecture, not replace attendance. In class discussions are a vital part of this class, and are poorly captured by Echo360.

Tutorial sessions and in-class test
The first two tutorial sessions will focus on the research proposal including discussing the assignment expectations and helping you develop the skills needed to write a strong proposal. Please note that tutorial sessions are held in three different locations over the term, so check timetable! While most course material will be posted on learn and lectures will be recorded, tutorial sessions will not be posted or recorded.

There will be an in-class test during the third tutorial. This will cover material presented in weeks 1 to 4 by Ian Dickie and will count for 20% of the final grade. If you have special consideration conditions approved by the university, please contact Ian so that we can make arrangements.

Exam
The final exam will cover material presented by Hazel Chapman and Sarah Flanagan, including material covered in tutorials 4 and 5. The final exam will count for 40% of your final grade.

Course Lecturers
Coordinator: Ian Dickie, Room 320 Julius von Haast, ian.dickie@canterbury.ac.nz
Hazel Chapman, Room 335 Julius von Haast, hazel.chapman@canterbury.ac.nz
Sarah Flanagan, Room 520 Julius von Haast, sarah.flanagan@canterbury.ac.nz
Assessment
Initial research proposal outline 15%
Final research proposal 25%
In class test 20%
Final exam 40%

Lecture timetable

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<tr>
<th>Weeks</th>
<th>Topics</th>
<th>Lecturer</th>
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<tbody>
<tr>
<td>1 – 4</td>
<td>Molecular methods in invasion ecology</td>
<td>Ian Dickie</td>
</tr>
<tr>
<td>5 – 8</td>
<td>Quantitative and population genetics</td>
<td>Sarah Flanagan</td>
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<tr>
<td>9 – 12</td>
<td>Evolution and broader context</td>
<td>Hazel Chapman</td>
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Tutorial timetable (rough guide)

<table>
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<tr>
<th>Date</th>
<th>Topics</th>
<th>Lecturer</th>
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<tbody>
<tr>
<td>23 July 2019</td>
<td>Proposal reviewing and writing</td>
<td>Ian Dickie</td>
</tr>
<tr>
<td>6 August 2019</td>
<td>Computer lab: proposal writing skills</td>
<td>Ian Dickie</td>
</tr>
<tr>
<td>20 August 2019</td>
<td>In class test covering Ian’s material from weeks 1-4</td>
<td>Ian Dickie</td>
</tr>
<tr>
<td>10 September 2019</td>
<td>Population Bottlenecks</td>
<td>Sarah Flanagan</td>
</tr>
<tr>
<td>24 September 2019</td>
<td>Genetic Drift and Selection</td>
<td>Sarah Flanagan</td>
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Learning outcomes:
1. Appreciate of the scale of biological invasions in New Zealand.
2. Able to interpret and evaluate primary literature using molecular tools in invasion biology
3. Understand the application of molecular tools to identify species, source populations, impacts on ecological communities, and invasion routes from genetic data
4. Understand the use of genetic modification as a tool in invasive species management
5. Appreciate the role of genetic variation, genetic variance, and plasticity in biological invasions
6. Understand the evolutionary consequences of biological invasions at various stages of the invasion process
7. Understand the importance of hybridisation in the invasion process
8. Understand the impact of invasive species on the genetics and evolution of non-invasive species.

Transferable Skills Register
Synthesising information. In everyday life and in many job situations you will be required to read information from different sources, construct your own understanding and shape your own viewpoint. In the lectures and research proposal assessment you will develop your abilities to evaluate primary data sources, evaluate validity, and integrate views.
Preparation of a research grant proposal. The ability to identify clear questions (or hypotheses) and to develop and communicate a coherent plan to test those questions. In science and in many businesses and government agencies this is done in the form of proposals.
proposal you will write a grant application for a novel research project, involving invasive species AND either a genetic or evolutionary approach. This will involve developing skills in formulating clear objectives, preparing a concise review of the literature to support the proposal, and a detailed summary of the methods you plan to use to complete the proposed study.

Research proposal
The lab component of this course will involve you developing and writing a research proposal for a research project that will address questions relating to a biological invasion in New Zealand. This means you will need to identify an introduced species or species group in New Zealand that has or seems likely to become invasive, explain clearly what the issues are surrounding this biological invasion (i.e. critically review the literature – what is known about this system, what needs to be determined for the invasion to be understood/controlled/eradicated), and explain how you could use evolutionary theory and/or genetics to address those issues (i.e. explain design of experiments, which molecular tools you will use, and how those tools may need to be adapted). Finally, you need to clearly explain how your research would add to the current knowledge about this particular invasion, and add to the field of invasion biology generally (i.e. you need to put your research into context).

The first two tutorial sessions are designed to help you succeed with your research proposal. These tutorial sessions are designed to require minimal preparation, so that you can focus on your proposal development during out of class time. Good proposals take time to develop – do not leave yours until the last minute!

Keep in mind that good research proposals may well be suitable as future postgraduate research projects, and so could give you a ‘head start’ if you decide to pursue this area of research at postgraduate level.

Tutorials
Two of the tutorials will cover some basic skills in population genetics. Knowledge of these techniques may be tested in the final assessment.

Textbooks
There is no required textbook for the course, but you may find helpful background reading in:


Feedback from Previous Course Surveys:
Student ratings 2014
1. This was a well organised course 5.0
2. Course helped to stimulate my interest 4.7
3. Workload appropriate 4.3
4. Opportunities for active student participation 4.3
5. Feedback was helpful and timely 5.0
6. Overall, this was a good quality course 4.3

The following issues were raised in written feedback by students at the end of the course. The responses were collated by the course coordinator and common responses scored. Action taken in response to feedback is indicated in bold.
Which aspects of this course were most positive?
The research proposal was challenging but a good experience. I enjoyed the project topic and thought it was a good way to learn about preparing proposals, which will be useful in my professional life as a scientist.

How could this course be enhanced to assist your learning?
Offering a 'tutorial' or something in which to ask questions/more explanation about the proposal would be really helpful. We added a tutorial section, in part to address this.

RULES, REGULATIONS, AND WHAT TO DO WHEN THINGS GO WRONG
[updated 12 June 2018]

If in doubt: ASK! The course coordinator is happy to answer questions at any time. All staff involved in the course are available for advice on specific issues.

What do I do if I have to miss something or if my performance was impaired?
If you feel that illness, injury, bereavement or other extenuating circumstances beyond your control prevented you from completing an item of assessment worth 10% or more of total course assessment or if these circumstances affected your performance in such assessments, you should apply for Special Consideration. Applications for Special Consideration should be submitted via the Special Consideration http://www.canterbury.ac.nz/study/special-consideration/ and you need to notify the course coordinator within five days of the assessment or its due date. If you apply for Special Consideration, because of medical reasons, you should visit a doctor within 24 hours of the assessment (application form available on the website above or from the Student Health Centre).

The Special Consideration provisions are intended to assist students who have covered the work of a course but have been prevented by illness or other critical circumstances from demonstrating their mastery of the material or skills at the time of assessment – they do not excuse you from doing the assessment within a reasonable time agreed with the course coordinator. You should expect to be required to submit additional work if you miss a major assignment (e.g. a field trip for which a major write-up is required).

In rare cases you may not be able to complete an assessment or attend a field trip, because of involvement in international or national representative sport or cultural groups. In such cases you should also apply for Special Consideration. Please review the Special Considerations policy because very few kinds of activities will be eligible for consideration (e.g. holiday trips, birthday parties etc. are not given special status in the University policy).

Students prevented by extenuating circumstances from completing the course after the final date for withdrawing, may apply for Special Consideration for late discontinuation of the course. Applications must be submitted via http://www.canterbury.ac.nz/study/special-consideration/within five days of the end of the main examination period for the semester.

Plagiarism
It is essential that you are aware that plagiarism is considered a very serious offence by the academic community, the University and the School of Biological Sciences. Plagiarism is defined as taking content from another work or author and presenting it, without attribution, as if it is your
own work. Content here includes text (sentences or major parts of sentences), display items (graphs and tables), and overall structure (the detailed sequence of ideas). Plagiarism includes:

- re-use of previous assignments (even if each individual sentence has been rephrased to say the same thing in different words, if the overall structure is re-used)
- copying of another student's work (with or without their consent)
- the unreferenced use of published material or material from the internet e.g. cutting and pasting of paragraphs or pages into an essay.

For most pieces of in-term assessment you will be given information concerning the use of direct and indirect quotes from previously published work. If you are in any doubt about appropriate use of published material, please speak with a member of academic staff. If you are still unsure what plagiarism is, then seek advice.

It is a School policy that courses may request you submit work electronically for subsequent analysis of originality using Turnitin. Students agree that by taking courses in BIOL, assessments may be submitted to Turnitin.com for textual similarity review. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com site.

**Where do I hand in assignments and then collect them once marked?**

All assignments should be placed in the designated collection boxes in the foyer of the 2nd floor of the School of Biological Sciences (Julius von Haast building, at the top of the stairs), unless directed otherwise by the course coordinator. All assignments must be accompanied by a cover sheet signed by you stating that the submitted work is not plagiarised. Cover sheets are available on top of the collection boxes, or you can download one from the Biology website ([http://www.canterbury.ac.nz/media/documents/science-documents/assignment-coversheet.pdf](http://www.canterbury.ac.nz/media/documents/science-documents/assignment-coversheet.pdf)). In addition, you may also be asked to submit your work electronically (via Learn) for analysis in Turnitin.

Marked assignments can be collected from the School of Biological Sciences reception, unless directed otherwise by the course coordinator. Teaching staff will endeavour to return work as soon as possible, and should contact you if there are likely to be any delays that will prevent return within the maximum 4-week timeframe.

**What if I can’t get it finished in time?**

Reports and assignments should be handed in on time. Extensions may be granted if you have a valid reason. **If you require an extension, you should request one from the course coordinator** (or the lecturer responsible for marking the work), with as much notice as possible. Please do this BEFORE the deadline for the assignment. **If you have been given an extension you should hand the work DIRECTLY to the course coordinator** (do not put it in the drop box as it may not be cleared after the due date).

If an extension has not been granted:

- work must be handed in by the due date to gain full credit
- work handed in up to 7 days after the deadline will be marked, but the marks will be discounted 25% before they are recorded to the student's credit
- any work handed in more than 7 days after the deadline date will not be marked or earn credit.

**What if I have written more than the word or page limit?**
If there is a word limit on an assignment, it is usually there to stop you doing too much work and to encourage you to write succinctly. It also makes things easier to assess. You can be up to 10% over without too much worry, but if the length increases beyond that your mark may suffer due to failure to follow the requirements. If you find yourself way over the word limit talk to the lecturer concerned about how to get your assignment to an acceptable length.

**What if I fail part of the course?**
In Biological Sciences, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. This means you must attend all class activities and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons). A student must attain an average score of at least 40% for in-course assessments (e.g. assignments, reports) and an average score of at least 40% in the exam and/or tests, AND score at least 50% overall for the course, to be awarded a passing grade. See the course outlines for clarification of the assessment items included in each category and ask the coordinator if you are still unsure.

**What’s the best way to give feedback?**
We welcome constructive feedback at all times – help us to make this a valuable course for you. We endeavour to remain approachable at all times. If you would rather give feedback anonymously, please use the online course survey or talk to lab demonstrators, or your class rep (who will all report back to the staff-student liaison committee that includes a representative from each of the undergraduate classes). Class representatives will be selected from each class at the start of course.

**What’s the best way to complain?**
If you feel you have not been fairly treated during this course, please raise the issue with the lecturer or course coordinator in the first instance. Other avenues include your class rep., who can raise issues anonymously, or the UCSA education coordinator.

**Grading**

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<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A+</td>
<td>90% or above</td>
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<tr>
<td>A</td>
<td>85 – 90</td>
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<tr>
<td>A-</td>
<td>80 – 84</td>
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<tr>
<td>B+</td>
<td>75 – 79</td>
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<tr>
<td>B</td>
<td>70 – 74</td>
</tr>
<tr>
<td>B-</td>
<td>65 – 69</td>
</tr>
<tr>
<td>C+</td>
<td>60 – 64</td>
</tr>
<tr>
<td>C</td>
<td>55 – 59</td>
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<tr>
<td>C-</td>
<td>50 – 54</td>
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A restricted pass (R) may be awarded to those who are close to a pass (i.e. an overall score of 48-49.9%) AND who have achieved at least a 40% overall score in both in-course assessment and tests/exams. If an R grade is awarded you gain credit for the course but cannot continue into papers that require this course as a pre-requisite. NB. The R grade is only available at 100 and 200 level - it cannot be awarded for third year papers.

Failing grades:  D  40-49  E  0–39