

School of Biological Sciences | Te Kura Pūtaiao Koiora

BIOL332

Genetics, Evolution and Ecology of Invasive Species

0.125 EFTS 15 Points, Semester 2

Whakamahuki | 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.

The goals of the course are:

- 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.

Pūkenga | Teachers

Coordinator | Kairuruku Akoranga: 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

Pieter Pelsler, Room 530 Julius von Haast, pieter.pelsler@canterbury.ac.nz

Tuhinga | Texts and Readings

Readings will be posted on LEARN and are required. Completing the reading BEFORE lecture will greatly enhance your learning and enjoyment of lecture. All reading material may be examined (in Quizzes or in test or exam).

There is no required textbook for the course, but you may find helpful background reading in: Herron JC, Freeman S (2014) *Evolutionary Analysis*. 5th edition, Pearson Education International.

Aromatawai | Assessment

Initial research proposal 15%

Final research proposal 30%

Mid term test 22.5%

Final exam 22.5%

Quizzes 10% (in total, lowest quiz score dropped)

Research proposal: The in-course assessment will be writing a research proposal, including a pre-proposal followed by a full proposal. This counts for 45% of the final grade (15% for the pre-proposal and 30% for final proposal).

The research proposal 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). An important part of research proposals is addressing Vision Mātauranga, which recognises the bicultural context of scientific research in New Zealand.

The four 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!

Quizzes: Each week there will be a quiz announced during lecture and via LEARN. You will have 24 hours to answer the quiz question(s) online. Quizzes will be designed to encourage doing the readings, attending lectures whenever possible, and participating in discussions. No special considerations will be given for quizzes, but your lowest quiz score will be dropped. There will be around 10 to 12 quizzes in total.

Tutorial sessions: The tutorial sessions will focus on the research proposal. This will include discussing the assignment expectations and helping you develop the skills needed to write a strong proposal. Please note that tutorial sessions are held in different locations over the term, so check timetable! Tutorial sessions will not be recorded.

Mid-term and final exam: There will be a mid-term and final exam. The mid-term exam will cover material presented by Ian Dickie and Sarah Flanagan in lecture. The final exam will cover material presented by Pieter Pelsler and Hazel Chapman in lecture. Tutorial material is not included in examinations.

Lecture timetable

Weeks	Topics	Lecturer
1 – 4	Molecular methods in invasion ecology	Ian Dickie
5 – 6	Quantitative and population genetics	Sarah Flanagan
7-8	Phylogenetic approaches	Pieter Pelsler
9 – 12	Evolution and broader context	Hazel Chapman

Note: All lectures will be recorded on Echo360, but we encourage in-class participation whenever possible.

Tutorial timetable (rough guide)

Tutorial number	Topics	Lecturer
1	Proposal reviewing and writing	Ian Dickie
2	Computer lab: proposal writing skills	Ian Dickie
4	Full proposal and Vision Mātauranga	Sarah Flanagan
5	Writing workshop	Sarah Flanagan

Āhukatanga Taura | Graduate Profile

This course will provide students with an opportunity to develop these UC Graduate Attributes (GP) and Kaupapa (K) (www.canterbury.ac.nz/study/graduate-profile/students/what-are-the-graduate-attributes/):

- GP1 Critically competent in a core academic discipline.
- GP2 Employable, innovative and enterprising.
- GP3 Biculturally competent and confident: K5 The processes of colonisation and globalisation; K7 Application of bicultural competence and confidence in a chosen discipline and career.

Hua Akoranga | Learning outcomes

1. Able to interpret and evaluate primary literature using molecular tools in invasion biology (assessment: quizzes, research proposal; GP1).
2. Able to formulate hypotheses based on available knowledge, and propose scientifically robust tests of those hypotheses (research proposal; GP2)
3. Understand the application of molecular tools to identify species, source populations, impacts on ecological communities, and invasion routes from genetic data, and the use of genetic modification in invasive species management (test/quizzes/exam, research proposal; GP1)
4. Appreciate the role of genetic variation, genetic variance, plasticity, and hybridisation in biological invasions (test/quizzes/exam; GP1)
5. Understand the evolutionary consequences and impact of invasive species on the genetics and evolution of species, including native species (test/quizzes/exam; GP1)
6. Able to discuss and respond to Vision Mātauranga in the context of research design and implementation (research proposal; GP3: K7).

7. Able to discuss colonial history and attitudes contributing to species introductions and their long-term consequences for ecosystems and Māori (Lectures and discussion of introduction of species to NZ and interpretation of phylogenetic patterns; GP3: K5)

Pūkenga Ngaio | Transferable Skills

As a student in this course, I will develop the following skills:

- Developing complex ideas in writing, including formulating testable scientific hypotheses, through writing a research proposal. (GP2)
- Critically reading scientific methods and findings to assess their validity and application to real world problems (GP2)

Feedback from 2019 Course Surveys:

	Score (scale 1 – 5)
1. The material provided helped me to understand what was required to succeed in the course.	4.23
2. The organization of the course helped me learn	4.19
3. I found the workload was appropriate to the level of the course	4.1
4. I found the assessments throughout the semester appropriate for the course	4.23
5. Where I sought feedback on my assessments, I found it helpful	4.32
6. The tutorial sessions were helpful in understanding the course material and completing the assessment.	3.77
7. The course gave me a good understanding of genetic tools and approaches in invasive species.	4.23
8 - The course gave me a good understanding of evolution and invasive species.	4.41

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 italics.*

Tutorials:

- I think the tutorials at the start were well organised and useful however the last couple of tutorials using R studio were not that useful. I think this is partly due to having to use codes that we had never really used before - even in BIOL309. I understand that using things like R studio is useful for us to know but I was focusing most of the time on the code and not what I was actually doing or what results I was achieving. However, both the lecturer and the demonstrator were really helpful. Maybe some question hand outs to fill out so we know what we should focus on in the tutorial / for the exam.
- I think it could have been better if there were more tutorials on how to write the full proposal. Writing the full proposal without being told a lot of how to do it, even with a list of instructions, was a bit confusing and difficult.

Response: We have changed the tutorial structure, removing the R studio based component and focusing more on proposal writing. We have added quizzes to help students help know what to focus on and prepare for the exam.

Assessment:

- The open book test was good to have as part of coursework, but there were too many questions within the allocated time and so was hard to give our best in each question as we were pushed for time.

Reply: We agree. 2019 was the first year we tried this method of assessment, and the test was slightly too long. We took this into account during grading for 2019 and adjusted the test in subsequent years.

- The assignments seemed more like a 30 point course but rewarding
- As expected, the proposal was hard. However, the assessment itself was very useful and therefore it was worth it.

- I haven't really done a lot of genetics before so this course was a bit of a struggle for me, but I really enjoyed learning about it and especially enjoyed the grant proposals. I think it is actually a great course for anyone going into post grad as it gives you a bit of a taste of what you need to do for a grant proposal/thesis

- The research proposal was really challenging but I really appreciated it as I believe it's very practical and close to what many of us may do in future (either it be jobs or post-graduation).

Reply: The research proposal is a very large part of this course, and many of the comments reflect the value that students see in doing this exercise. We have adjusted the tutorial sessions to provide additional support to students and to manage the overall workload of the course.

Feedback:

- Very quick replies and great feedback given, helped enhance my learning.

- I thought the thorough feedback given on the pre-proposal was extremely valuable.

- Ian was great at giving feedback on what to improve for the grant proposals. It is obvious he wants his students to do well

Reply: We put a ton of work into providing detailed feedback on the proposal, and it is great to see that this is appreciated. We definitely want every student to succeed, and will try to do our best to support you!

RULES, REGULATIONS, AND WHAT TO DO WHEN THINGS GO WRONG

[updated 3 April 2020]

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 the 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 website <http://www.canterbury.ac.nz/study/special-consideration/> *within five working days* of the assessment or its due date. You will also need to notify the course coordinator. If you apply for Special Consideration because of medical reasons, you should visit a doctor within a reasonable timeframe (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).

You should also apply for Special Consideration if you are not able to complete an assessment or attend a field trip because of **involvement in international or national representative sport or cultural groups**. Please review the Special Considerations policy, because very few kinds of activities will be eligible for such 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/> no later than five working days after the examination period has finished.

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 have any doubt about the appropriate use of published material, please speak with an academic staff member. If you are unsure what plagiarism is, seek advice.

It is a School policy that courses may request that 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 as 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>). 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 handed in within 1 hour of the deadline: penalty of up to 5 percentage points of the mark for the assignment (e.g., a mark of 75% might be reduced to 70%).
- work handed in 1 – 24 hours after the deadline: penalty of 10 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 65%).
- work handed in 1 – 7 days after the deadline: penalty of 15 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 60%).
- work handed in more than 7 days after the deadline 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. 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

A+	90% or above
A	85 – 90
A-	80 – 84
B+	75 – 79
B	70 – 74
B-	65 – 69
C+	60 – 64
C	55 – 59
C-	50 – 54

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