



BIOL316

Invertebrates: Evolution, Behaviour and Diversity

S1 External 2016

Dept of Biological Sciences

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Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff

Unit Convenor

Katherine McClellan

katherine.mcclellan@mq.edu.au

Contact via katherine.mcclellan@mq.edu.au

E8B224

Tuesday 2-4pm & Friday 9-12

Credit points

3

Prerequisites

39cp including BIOL208(P)

Corequisites

Co-badged status

Unit description

This unit explores the fascinating world of invertebrate animals. The unit starts by briefly outlining the features of the major groups of invertebrate animals (excluding unicellular organisms). Once this is established, we move away from a taxonomic focus to discuss major topics including: mating systems, communication, host-parasite relationships, predator-prey interactions, biological control, climate change, and conservation. These major topics draw on examples from research papers on various groups of invertebrates. This unit is suitable for students who are interested in whole animal biology or biological education, or for students who are interested in further research.

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 and assign key invertebrate species to their major taxonomic classifications
- Identify and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Assess biodiversity using invertebrate sampling methods

Identify and interpret invertebrate behaviours relevant to interactions at species and community levels

Generate hypotheses and design experiments to test hypotheses and collect data

Analyse data using basic statistical techniques and prepare experimental findings for publication

Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

General Assessment Information

Assessment details

Details of assessments will be provided on iLearn and in class.

Unit completion

To pass this unit students need to achieve a minimum grade of 50%, attempt and submit all assessments, and gain at least 45% in the final examination.

Assignment submission

All assignments will be digitally submitted through the appropriate Turnitin submission link on iLearn. No hardcopy / paper submissions are needed. All assessments need to be written in the students own words.

Extensions and penalties

10% of the mark allocated for the assignment will be deducted **per day** that any work is submitted late.

The deadlines for assignments are not negotiable. If you have a serious and unavoidable disruption to your studies and require an extension please submit a Disruptions to Studies notification via Ask.mq.edu.au with supporting documentation, and a Professional Authority Form completed by your health care professional. All applications for an extension must be sought *before the due date* unless this is absolutely impossible. If you anticipate any potential problems speak to the unit convenor early.

Academic dishonesty

All assessments need to be written in the students own words. The penalties imposed by the University for plagiarism are serious and may include expulsion from the University. ANY evidence of plagiarism WILL be dealt with following University policy. Penalties for plagiarism range from a loss of marks to awarding of a zero depending on the level of plagiarism and

reporting to Faculty disciplinary committee.

Assessment Tasks

Name	Weighting	Due
<u>Early assessment quiz</u>	5%	Week 3
<u>Taxonomic Key</u>	20%	Int:Week 6, Ext:OCS2
<u>Mid Semester Test</u>	10%	Int: Week 7, Ext: OCS2
<u>Scientific Journal Article</u>	25%	Week 10
<u>Final exam</u>	40%	TBA

Early assessment quiz

Due: **Week 3**

Weighting: **5%**

This is an early assessment quiz to help you know how you are doing early on in the unit. It will cover lectures 1-6 and will consist of 20 multiple choice answer questions.

On successful completion you will be able to:

- Identify and assign key invertebrate species to their major taxonomic classifications
- Identify and asses invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats

Taxonomic Key

Due: **Int:Week 6, Ext:OCS2**

Weighting: **20%**

Students will develop their own dichotomous / taxonomic key based on lab specimens. Students will also draw accurate scientific drawings of four of the lab specimen and provide a short (100 words max) descriptions of each organisms natural history, in their own words, with appropriate referencing.

On successful completion you will be able to:

- Identify and assign key invertebrate species to their major taxonomic classifications
- Identify and asses invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels

- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Mid Semester Test

Due: **Int: Week 7, Ext: OCS2**

Weighting: **10%**

A multiple choice answer test on knowledge of course content up to and including wk 6. This one hour test will take place in the prac, under closed-book exam conditions during the first prac after the mid-semester break.

On successful completion you will be able to:

- Identify and assign key invertebrate species to their major taxonomic classifications
- Identify and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels

Scientific Journal Article

Due: **Week 10**

Weighting: **25%**

Students will complete a scientific research report (~2000 words, excluding references and short abstract), written in their own words and based on a data collected in class. The report will follow the standard format of scientific article (i.e., it will have a short abstract, introduction, materials and methods, results and discussion sections and it will be appropriately referenced), and be formatted according to the *Austral Ecology* guidelines for authors. Further details of the assignment and requirements will be given in class and online in iLearn.

On successful completion you will be able to:

- Identify and assign key invertebrate species to their major taxonomic classifications
- Identify and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Assess biodiversity using invertebrate sampling methods
- Generate hypotheses and design experiments to test hypotheses and collect data
- Analyse data using basic statistical techniques and prepare experimental findings for publication
- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Final exam

Due: **TBA**

Weighting: **40%**

A test on knowledge of course content (lectures, pracs and readings) up to and including wk 13.

On successful completion you will be able to:

- Identify and assign key invertebrate species to their major taxonomic classifications
- Identify and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Assess biodiversity using invertebrate sampling methods
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses and collect data
- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Delivery and Resources

Required unit materials

The work carried out during practical classes is an important and integral part of the course. You must read, download and either print the prac notes to bring to each class, or bring them on a laptop or tablet.

You will also need a practical notebook with unlined pages that you will use to draw organisms, record data and observations from field and laboratory classes. We recommend you use an **A4 bound notebook with alternate unlined pages** for drawing (i.e. a botany notebook). Loose pages are not suitable. You may also bring your own dissecting kits to class, although some equipment will also be provided.

You will need enclosed shoes for every practical class in accordance with standard laboratory safety procedures. Without which you will not be allowed entry to the laboratory.

Recommended readings

There are a number of books (also available in the library) that cover various aspects of BIOL316:

- Ruppert EE, Fox RS & RD Barnes (2004) Invertebrate zoology: a functional evolutionary approach. 7th ed. Sunders College Publishing (3 copies available in Special Reserve)
- Ponder W & D. Lunney (1999) The Other 99%: The Conservation and Biodiversity of Invertebrates. Transactions of the Royal Zoological Society of NSW. Surrey beattie &

Sons, Chipping Norton

- Pechenik, J.A. Biology of the invertebrates. 6th ed. Boston, Mass.: McGraw-Hill, 2010.
- Anderson, D.T. (Ed). Invertebrate zoology. 2nd ed. South Melbourne, Vic.: Oxford University Press, 2001
- Moore, J. Introduction to the invertebrates. Cambridge: Cambridge University Press, 2001.
- Romoser, W.S. & Stoffolano, J.G. The science of entomology. 4th ed. Boston, Mass.: WCB McGraw-Hill, 1998.
- Choe, J.C. & Crespi, B.J. (Eds). The evolution of mating systems in insects and arachnids. Cambridge; New York: Cambridge University Press, 1997.
- Herrera, C.M. & Pellmyr, O. Plant-animal interactions: an evolutionary approach. Oxford: Blackwell Science, 2002.

UNIT WEBPAGE, TECHNOLOGY USED AND REQUIRED

Website

Lecture graphics (slides as PDFs) and iLectures will be available on iLearn

<http://ilearn@mq.edu.au> iLearn is a web-based computer mediated communication package and can be accessed by most web browsers from inside or outside the University. iLearn and email will be the principle method of communication in this subject. You will need stable access to the internet to access iLearn.

We expect you to use iLearn to:

- Regularly check subject announcements
- Access weekly reading and videos
- Download lecture materials
- Download laboratory materials
- Download reference materials
- Check your grades

How do you log in? The URL for the iLearn log in page is: <http://ilearn.mq.edu.au/>. You will need to log in to iLearn each time you use it. Your user name is your student number. If you are having trouble accessing your online unit due to a disability or health condition, please go to the Student Services Website at <http://sss.mq.edu.au/equity/about> for information on how to get assistance. If you cannot log in after ensuring you have entered your username and password correctly, you should contact Student IT Help, Phone: (02) 9850 4357 (in Sydney) or 1 800 063 191 (outside Sydney).

Assignment submission

All assignments will be digitally submitted through a Turnitin submission available in iLearn.

Unit Schedule

Timetable

Lecture 1	Monday	3-4pm	E7B 100
Lecture 2	Tuesday	12-1pm	E7B 100
Practical sessions	Thursday	9-12pm OR 1-4	E8A 120 & 160
OCS 1 (external Students)	Saturday 2nd April	9-5pm	E8A 120 & 160
OCS 2,3&4 (external Students)	Wed 20, Thurs 21 & Fri 22 April	9-5pm	E8A 120 & 160
OCS 3 (external Students)	Saturday 14th May	9-5pm	E8A 120 & 160

Lecture topics*

Week	Lecture #	Topic	Lecturer
1	1	Introduction to BIOL316	Katherine McClellan
	2	Taxonomy and phylogenetics	Katherine McClellan
2	3	Invertebrate diversity I	Katherine McClellan
	4	Invertebrate diversity II	Katherine McClellan
3	5	Invertebrate diversity III	Katherine McClellan
	6	Invertebrate diversity IV	Katherine McClellan
4	7	Invertebrate immune responses	David Raftos
	8	Invertebrate interactions I - Parasitism	Fleur Ponton
5	-	No lecture - Public Holiday	
	9	Invertebrate responses to environmental stress	David Raftos
6	10	Reproduction and mating I	Mariella Herberstein
	11	Reproduction and mating I	Mariella Herberstein

Mid-semester lecture break			
7	-	No lecture - Public Holiday	-
	12	Invertebrate interactions II - Predation & Foraging	Katherine McClellan
8	13	Invertebrate interactions III - Herbivory	Katherine McClellan
	14	Sociality in invertebrates	Marianne Peso
9	15	Freshwater invertebrates	Grant Hose / Kath Korbel
	16	Invertebrates as environmental indicators	Grant Hose / Kath Korbel
10	17	Invertebrates and climate change	Lesley Hughes
	18	Invertebrate communication I	Katherine McClellan
11	19	Invertebrate communication II	Katherine McClellan
	20	Invertebrate navigation	Ajay Narendra
12	21	Invertebrates pests and control	Phil Taylor
	22	Conservation issues	Lesley Hughes
13	23	Exam outline and revision	Katherine McClellan
	24	No lecture - private study for exam	

** Lecture topics may change to accommodate guest lecturer's schedules

Practical schedule

Week	Prac Topic
1	No prac
2	Phylogenetics
3	Invertebrate diversity 1 - Garden invertebrates
4	Invertebrate diversity 2 - Taxonomic key
5	Food choice in infected fruit flies
6	Spider behaviour - Intruder vs resident
	Mid-semester lecture break
7	Mid semester test & Biodiversity assessment
8	Biodiversity assessment

9	Butterfly dissection / Ant Morphology (TBC)
10	Herbivory
11	No Prac - private study for assessment
12	No Prac - private study for exam
13	No Prac - private study for exam

On-Campus Session Schedule

OCS	Date	Prac	Time
1	Saturday 2nd April	Taxonomic Key Parasites (TBC)	9-12 1-4
2	Wed 20 Thurs 21 & Fri 22 April	Mid-semester test Phylogenetics Garden Inverts Spider Behaviour Biodiversity Assessment	9-10 11:30-1:30 9-12 1-4 9-12 & 1-4
3	Saturday 14th May	Butterfly Dissection / Ant Morphology(TBC) Herbivory	9-12 1-4

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.

Special consideration / Disruptions to studies

If you have a serious and unavoidable disruption during your studies you can make an application for special consideration [Ask.mq.edu.au](http://ask.mq.edu.au) using the "Disruptions to Studies form." Disruptions need to be filed within 5 days of the disruption and have the correct supporting documentation. For more information on Disruptions to Studies notifications please refer to the university policy (http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) and procedure (http://www.mq.edu.au/policy/docs/disruption_studies/procedure.html).

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](#)

If you feel that you are not coping and could use some extra help or guidance, the Faculty of Science and Engineering has dedicated academic support officers to help you settle into studies and reach your full potential. If you are struggling and don't know where to turn for help, contact Helene or Michele (available for appointments on Tuesday, Wednesday, Thursday 10-3pm). Please contact them on 9850-8348, or email sci.studentsupport@mq.edu.au or drop in to the FSE Student Centre and make an appointment to be called back.

Some pearls of wisdom:

- Don't take on too much work
- Don't leave things to the last minute
- If anything is not making sense, get help

For **Counselling, Disability and Student Advocacy Services** please contact [Campus Wellbeing](#) 9850 7497, Email: campuswellbeing@mq.edu.au

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 outcome

- Generate hypotheses and design experiments to test hypotheses and collect data

Assessment tasks

- Scientific Journal Article
- 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 and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses and collect data
- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Assessment tasks

- Taxonomic Key
- Mid Semester Test
- Scientific Journal Article
- 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 outcome

- Generate hypotheses and design experiments to test hypotheses and collect data

Assessment tasks

- Scientific Journal Article
- 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 and assign key invertebrate species to their major taxonomic classifications

- Identify and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Assess biodiversity using invertebrate sampling methods
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses and collect data
- Analyse data using basic statistical techniques and prepare experimental findings for publication

Assessment tasks

- Early assessment quiz
- Taxonomic Key
- Mid Semester Test
- Scientific Journal Article
- 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 and assess invertebrate adaptations (behavioural, life history, physical and physiological) that have contributed to their survival success in different habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses and collect data
- Analyse data using basic statistical techniques and prepare experimental findings for publication
- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Assessment tasks

- Early assessment quiz
- Taxonomic Key

- Mid Semester Test
- Scientific Journal Article
- 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

- Assess biodiversity using invertebrate sampling methods
- Generate hypotheses and design experiments to test hypotheses and collect data
- Analyse data using basic statistical techniques and prepare experimental findings for publication
- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Assessment tasks

- Taxonomic Key
- Scientific Journal Article
- 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

- Effectively communicate biological concepts and thinking to diverse audiences including the scientific community and the general public

Assessment tasks

- Taxonomic Key
- Scientific Journal Article

- 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

- Assess biodiversity using invertebrate sampling methods

Assessment tasks

- Scientific Journal Article
- Final exam

Changes from Previous Offering

Two new pracs are being developed (effects of parasites on behaviour, butterfly dissection / ant morphology). Poster assessment has been removed and replaced by an early assessment quiz in week 3, this is so that unit assessments align with Department guidelines for number and timing of assessments in a unit.

Changes since First Published

Date	Description
24/04/2016	Fixed typo in mid-semester test date - 28th April is in week 7, not week 8. Correct dates and weeks have been advertised on iLearn since the beginning of semester.
16/02/2016	Poster assessment has been removed and replaced by an early assessment quiz in week 3, this is so that unit assessments align with Department guidelines for number and timing of assessments in a unit,
01/02/2016	Changes to lecture schedule