



# BIOL316

## Invertebrates: Evolution, Behaviour and Diversity

S1 External 2014

*Dept of Biological Sciences*

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## General Information

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Unit Convenor

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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:

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## Assessment Tasks

Name	Weighting	Due
<u>Prac tasks completion</u>	10%	TBA
<u>Taxonomic Key</u>	15%	21/3/2014
<u>Spider Poster</u>	10%	23/5/2014
<u>Scientific Journal Article</u>	15%	1/5/2014 or 5/6/2014
<u>Mid-term test</u>	10%	10/5/2014
<u>Final exam</u>	40%	TBA

### Prac tasks completion

Due: **TBA**

Weighting: **10%**

In class tasks associated with the practicals must be completed and shown to tutors before leaving the labs. Tasks may be assessed in terms of accuracy/correctness and/or completeness. Further details of the tasks will be given in the associated practical classes.

On successful completion you will be able to:

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## Taxonomic Key

Due: **21/3/2014**

Weighting: **15%**

Students will develop their own dichotomous / taxonomic key based on lab specimens. Accurate scientific drawings of the organisms along with short (100 words max) descriptions of their natural history will be provided as references for the taxonomic key.

On successful completion you will be able to:

- Assign key invertebrate species to their major taxonomic classifications
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats

## Spider Poster

Due: **23/5/2014**

Weighting: **10%**

Students will prepare and submit Posters designed to effectively communicate their findings to an audience of non-biologists. The content of the posters will be based on the results of a class experiment which tests the intra-specific interactions of leaf curling spiders. Effective posters will consider a broader ecological perspective than the study organisms by placing the results of the experiments in to both behavioural and ecological contexts. Details and expectations of the report will be provided in class and online.

On successful completion you will be able to:

- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## Scientific Journal Article

Due: **1/5/2014 or 5/6/2014**

Weighting: **15%**

Students will complete a written scientific report (1300-1500 words, excluding references) based on a field-based survey of either terrestrial or aquatic habitats. Invertebrates will be collected from different habitats during class time. Students will be expected to identify the invertebrates collected and report on the diversity found. The report will follow the standard format for a scientific report article, i.e., it will have a short abstract, introduction, materials and methods, results and discussion sections and it will be appropriately referenced. Further details of the assignment requirements will be given in class or online.

On successful completion you will be able to:

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## Mid-term test

Due: **10/5/2014**

Weighting: **10%**

## A test on knowledge of course content up to and including wk 6.

On successful completion you will be able to:

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels

## Final exam

Due: **TBA**

Weighting: **40%**

A test on knowledge of course content up to and including wk 13.

On successful completion you will be able to:

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses

## Delivery and Resources

### CLASSES

#### Timetable

Lecture 1	Wednesday	4-5 pm	W5C 320
Lecture 2	Wednesday	5-6 pm	W5C 320

Practical session	Thursdays	2-5 pm	E8A 160 & 120
On campus session 1	March 8th and 9th	9-5 pm	E8A 160 & 120
On campus session 2	May 10th and 11th	9-5 pm	E8A 160 & 120

## REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

### Required unit materials

The work carried out during practical classes is an important and integral part of the course.

You need a practical notebook that you will use to record data and observations from field and laboratory classes. We recommend you use an A4 bound botany notebook (alternating lined and unlined pages). Loose pages are not suitable.

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

We have not nominated a textbook for this course. There are a number of books (also available in the library) that cover various aspects of BIOL316:

- 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 AND TECHNOLOGY USED AND REQUIRED

### Website

Lecture graphics 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.

We expect you to use iLearn to:

- Regularly check subject announcements
- 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).

## Unit Schedule

### Timetable

<b>Lecture 1</b>	<b>Wednesday</b>	<b>4-5 pm</b>	<b>W5C 320</b>
<b>Lecture 2</b>	<b>Wednesday</b>	<b>5-6 pm</b>	<b>W5C 320</b>
<b>Practical sessions</b>	<b>Thursday</b>	<b>2-5 pm</b>	<b>E8A 160 &amp; 120</b>
<b>On campus session 1</b>	<b>March 8-9th</b>	<b>9-5pm</b>	<b>E8A 160</b>
<b>On campus session 2</b>	<b>May 10-11th</b>	<b>9-5pm</b>	<b>E8A 160</b>

### Lecture topics\*

Week	Date	Number	Topic	Lecturer
1	05/03/14	1	Introduction	Kath McClellan
	05/03/14	2	Taxonomy and phylogenetics	Michelle Power
2	12/03/14	3	Invertebrate diversity I	Kath McClellan
	12/03/14	4	Invertebrate diversity II	Kath McClellan
3	19/03/14	5	Invertebrate diversity III	Kath McClellan



	19/03/14	6	Invertebrate diversity IV	Kath McClellan
4	26/03/14	7	Reproduction and mating I	Mariella Herberstein
	26/03/14	8	Reproduction and mating II	Mariella Herberstein
5	02/04/14	9	Invertebrate interactions I	Lara Ainley
	02/04/14	10	Invertebrate evolution and radiation	DVD
6	09/04/14	11	Invertebrate interactions II	Lara Ainley
	09/04/14	12	Invertebrate Interactions III	Lara Ainley
			<b>Mid-semester break</b>	
7	30/04/14	13	Invertebrate immune responses	David Raftos
	30/04/14	14	Responses to environmental stress	David Raftos
8	07/05/14	15	Sociality	Lesley Hughes
	07/05/14	16	Foraging	Michelle Power
9	14/05/14	17	Freshwater invertebrates	Grant Hose
	14/05/14	18	Invertebrates as environmental indicators	Grant Hose
10	21/05/14	19	Communication I	Kath McClellan
	21/05/14	20	Communication II	Kath McClellan
11	28/05/14	21	Invertebrates & climate change	Lesley Hughes
	28/05/14	22	Conservation issues	Lesley Hughes
12	04/06/14	23	Biological control	Phil Taylor
	04/06/14	24	Exam outline and revision	Kath McClellan

## Practical sessions

Session	Class date	Activity	Time*
1	8/3/13	Welcome & Phylogenetics	9 – 11 am
		Invertebrate diversity I - garden collection	11 – 2 pm (lunch 12.30-1)
		Invertebrate diversity II – Taxonomic key	2 – 5 pm
1	9/3/13	Invertebrate diversity III – Pitfall trapping	9 – 1 pm (lunch 12.30-1)
		Invertebrate interactions – Herbivory diversity	1 – 5 pm
2	10/5/13	Mid Semester Test	9 – 10 am
		Diversity of freshwater invertebrates I & II	10 – 5 pm (lunch 12.30-1)
2	11/5/13	Spider behaviour	9 – 12 pm (lunch 12.30-1)
		Earthworm habitat preferences	1 – 5 pm

**On campus session 1** (March 8-9<sup>th</sup>): Pracs 1-5: Phylogenetics, Invertebrate Diversity I, II (Taxonomic Key) & III (Written report choice 1), and, Invertebrate interactions

**On campus session 2** (May 10-11<sup>th</sup>): Pracs 6-9, Behavioural interactions of spiders (Spider Poster), Diversity of benthic ecosystems (Written report choice 2), Habitat selection by earthworms, and mid-semester test

## 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](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](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/](https://students.mq.edu.au/support/student_conduct/)

## 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](http://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](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### 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

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses

#### Assessment tasks

- Prac tasks completion
- Taxonomic Key
- Spider Poster
- Scientific Journal Article

### 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

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## 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

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques

## Assessment tasks

- Prac tasks completion
- Taxonomic Key
- Spider Poster
- Scientific Journal Article
- Mid-term test
- 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**

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify behavioral and life history strategies of invertebrates that have contributed to their success in adapting to diverse habitats
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Analyse data using basic statistical techniques

## **Assessment tasks**

- Prac tasks completion
- Taxonomic Key
- Spider Poster
- Scientific Journal Article
- Mid-term test
- 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**

- Assign key invertebrate species to their major taxonomic classifications
- Apply various field methods for sampling invertebrates
- Identify and interpret invertebrate behaviours relevant to interactions at species and community levels
- Generate hypotheses and design experiments to test hypotheses
- Prepare experimental findings for publication and/or communication to diverse audiences

including the scientific community and the general public

## **Assessment tasks**

- Prac tasks completion
- Taxonomic Key
- Spider Poster
- Scientific Journal Article

## **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**

- Apply various field methods for sampling invertebrates
- Generate hypotheses and design experiments to test hypotheses

## **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**

- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

## **Assessment tasks**

- Prac tasks completion
- Taxonomic Key
- Spider Poster
- Scientific Journal Article
- Final exam

## **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**

- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

### **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**

- Apply various field methods for sampling invertebrates
- Generate hypotheses and design experiments to test hypotheses
- Prepare experimental findings for publication and/or communication to diverse audiences including the scientific community and the general public

### **Assessment tasks**

- Prac tasks completion
- Scientific Journal Article