

University of California Education Abroad Program (UCEAP)

Marine Biology and Human/Terrestrial Ecology Australia Program Syllabus

Program Synopsis: Taught at The University of Queensland, Brisbane, Australia, and its field sites and research stations in Queensland, this is a diverse, interdisciplinary program that has a primary emphasis on science. Intensive courses on **Marine Biology** (13 quarter units) and **Human and Terrestrial Ecology (HTE)** (8 quarter units), with the HTE course split into two courses **Terrestrial Ecology** (weighted 60%) and **Australian Studies** (weighted 40%). Since the academic content of all three courses is taught from first principles using Australian examples, prior student experience in biology or history is desirable but not essential.

The program is undertaken over a three-month teaching semester (full time) and is open to undergraduate students from all UC campuses, with the exception of UC San Francisco, and is typically undertaken by students from sophomore to senior. Class size ranges from 30-45 with a maximum of 50 students.

All three courses in the program seek to provide a comprehensive overview of their discipline in the Australian context, while emphasising general insights that will equip students with new perspectives, field and laboratory skills in marine biology, terrestrial ecology, and the study of history and culture.

Program Director: Associate Professor Ian Tibbetts

Updated February 2017

UCEAP Queensland - Course Syllabus

GRADUATE ATTRIBUTES

We envision that students undertaking the UCEAP in Queensland program will complete their experience abroad with the following enhanced skills and attributes:

KNOWLEDGE: Students will gain a comprehensive understanding of the forces that have shaped the unique nature of Australian marine biology, terrestrial ecology, and the country's human history and culture. Students will be able to apply this Australian perspective to the broader academic context, by way of comparison and contrast with other global environments, such as that of North America.

ANALYTICAL THINKING: The program places a strong emphasis on analytical (or critical) thinking, by developing the students ability to evaluate complex ideas and proposed "answers" to problems in terms of a rational, dispassionate, and balanced review of the evidence both for and against. Our students develop their ability to formulate engaging and relevant research questions in the form of a testable hypothesis.

RESEARCH SKILLS: Students will obtain practical skills in data gathering, and the ability to transform that data into information to address a specific research question. The program provides practical experience of a wide range of research skills, including field and laboratory techniques for scientific measurement and quantification, and the scholarship of locating and critically analysing a representative sample of published sources.

WRITING SKILLS: Students will hone their ability to write lucidly, articulately and informatively in a variety of formats, including scientific reports, scholarly essays, and project proposals. Students will be proficient in citing and referencing quantitative data, case studies and published sources in the construction of a logical argument, and will improve their writing skills through the incorporation of constructive editorial feedback.

LIFE EXPERIENCE: In addition to fostering academic excellence, our goal is to produce program graduates who are more informed, experienced and well-rounded scholars and citizens generally. The program seeks to promote a stronger sense of self-reliance and teamwork, an enhanced self-confidence, and a more positive attitude to dealing with challenges and opportunities generally, after a student's unique life experience in Australia.

UCEAP Queensland - Course Syllabus

MARINE BIOLOGY

(BIOLS160 Marine Biology 13.0 UC Units)

Coordinator: **Associate Professor Ian Tibbetts** i.tibbetts@uq.edu.au

Course Synopsis (18 days field, 5 research workshops) The Marine Biology course has two fundamental aims; firstly, to give students a comprehensive overview of marine biology in the context of the unique marine life that inhabits the seas surrounding Australia; and secondly, to provide students with a solid grounding in "real world" science through immersion in original research projects in marine biology. The synthesis of Australian marine biology is presented in the context of topics such as the evolution of fish diversity and the ecology of distinctive marine habitats such as seagrass beds, mangroves, rocky and sandy shores, and coral reefs.

A core aspect of the course is the examination of current issues in marine conservation, such as algal blooms, the sustainability of fisheries and aquaculture, and the nexus between climate change, coral bleaching, and the future of coral reefs. The original research component of the marine biology course emphasises how quantitative science is done and reported in peer-reviewed journals. Students undertake original marine biology research projects during extended field trips to the University of Queensland's marine biology research stations at North Stradbroke Island in Moreton bay, and Heron Island on the Great Barrier Reef. The following lectures are presented by full time teaching and research staff.

Lecture Topics

1. Australia's Marine Environment 1: Introduces the geography of the world's oceans, major current patterns, Australia's coastline, nomenclature of marine habitats
2. Australia's marine environments 2: Topics include sediment transport, tide curves and the effects of latitude on biodiversity and productivity
3. Marine Reptiles
4. Marine Mammals
5. Marine Invertebrates I: The protists, sponges and cnidarians
6. Marine Invertebrates II: The worms - Platyhelminthes, Nemertea, Annelida, Sipunculida. The Arthropods - crustaceans.
7. The Biology of Fishes
8. Sharks vs Goldfish
9. Australian Waterways and their Management
10. Marine plants 1: Photosynthesis, algae, phytoplankton, algal blooms
11. Marine plants 2: Angiosperms (seagrass, saltmarsh, mangroves)
12. Marine Invertebrates I: The protists, sponges and cnidarians
13. Marine Invertebrates II: The worms - Platyhelminthes, Nemertea, Annelida, Sipunculida. The Arthropods - crustaceans.
14. Australian Freshwater Fishes
15. Moreton Bay's Native Invader

16. Australian Estuarine Fishes
17. The Biology of Sea Birds
18. Estuaries and Tropical Food Webs
19. Life in the Zone – Rocky Shores
20. Life in the Zone – Sandy Shores
21. Moreton Bay 1 – Geography and Diversity
22. Moreton Bay 2 – Resources and Significance
23. Biology and Corals
24. Biogeography of Corals
25. Colour, vision and species recognition in Marine systems
26. Pacific Ocean Deep Sea Diversity
27. Darwin's Paradox and symbiosis in reef systems
28. Climate change and coral reefs
29. Threats to coral reefs
30. Life in the Open Oceans
31. Coral Reef Resilience
32. Marine Protected Areas
33. Venoms and Poisons of Reef Organisms
34. Benthic Microalgae and Algal Matrices in Reef Ecology
35. Space wars in Coral Reefs
36. Grazing in Reef Systems
37. Sustainable aquaculture - how fatal are the 5 fatal flaws?
38. Sustainable aquaculture - mass escape
39. Sustainable aquaculture - chemical soup or chemical free?
40. Sustainable aquaculture - fishing for fish to feed fish - how much for how much?
41. Predatory Fishes in reef systems
42. Forget Finding Nemo

Assessment Tasks

- Two **written examinations** (a mid-term and final) will assess each student understanding of the marine biology lecture content.
- A **research proposal** will assess student's ability to develop an original testable hypothesis in marine biology, and ability to frame this question in the context of a research proposal in the style used to apply for academic research funding.
- A **Scientific Report from North Stradbroke Island** consists of an individual written report of original research undertaken by small groups (4-5) at Moreton Bay Research Station. The report must be correctly-formatted and fully referenced scientific report to a standard suitable for submission to a peer-reviewed academic journal. A series of workshops of scientific communication, peer review process, proofing, statistics and experimental design are conducted at MBRS, as is a preliminary overnight field trip to

the station one week prior to commencement of the full field program to assist project planning and resourcing.

- A **Scientific Report from Heron Island** consists of a student write-up of original research undertaken at the Heron Island Research Station on the Great Barrier Reef. As was done at Stradbroke, the student produces a complete scientific report to a sufficient standard for submission to a peer-reviewed academic journal.

Field Trips: An eight day field trip to the **Moreton Bay Research Station on North Stradbroke Island** gives students a practical introduction to sub-tropical marine biology, with an emphasis on the diversity of habitats found in Moreton Bay, such as seagrass beds, mangroves, low and high energy rocky shores, low and high energy beaches, and high latitude coral reef environments. While at MBRS, students undertake fieldwork to address an original research testable hypothesis concerning some aspect of marine biology and ecology in Moreton Bay.

A nine day field trip to the **Heron Island Research Station on the Great Barrier Reef** gives students a comprehensive overview of coral reef ecology, with an emphasis on diversity, interactions and symbioses in reef systems. While at Heron Island, students undertake fieldwork to address an original research testable hypothesis concerning some aspect of coral reef ecology.



Research on the Great Barrier Reef

HUMAN AND TERRESTRIAL ECOLOGY

(BIOLS106 Human & Terrestrial 8.0 UC Units)

Coordinator: **Dr John Hall** john.hall@uq.edu.au (Terrestrial Ecology)

Coordinator: **Dr Chris Salisbury** c.salisbury@uq.edu.au (Australian Studies)

Terrestrial Ecology Course Synopsis (14 days field, 20 lectures). The Terrestrial Ecology course encourages students to explore the question - "what makes the natural environments of Australia so distinctive and different from those of the rest of the world?" The course provides a complete overview of Australian terrestrial ecology, beginning with the physical factors that define the landscape, such as geology, climate and fire. Australia's biological heritage is explored in terms of the ancient Gondwanan rainforests, and how physical challenges such as low nutrient soils, low and variable rainfall and frequent fire have shaped the evolution of plants that now define quintessentially Australian habitats such as *Eucalyptus* bushland and the Australian outback. Also explored, is how the physical nature and biological history of the Australian continent has resulted in the evolution of completely unique animal life, such as the kangaroo, cockatoo and platypus, which are found nowhere else on earth. The course concludes with a detailed examination of the conservation of Australian biodiversity. It is intended that students will complete the course with a new appreciation of the factors that cause similarities and differences among terrestrial ecosystems in different parts of the globe.

Lecture Topics (Terrestrial Module)

1. *Terra Australis* - Welcome to Australia.
2. Sugar from sunlight - An introduction to how plants work.
3. Ozymandias - Australian geology and its ecological significance.
4. Waiting for the rain - Australian climate and its ecological significance.
5. Botany Bay - An overview of the Australian vegetation.
6. The phoenix continent - Fire and the Australian vegetation.
7. The rainforest inheritance - The significance of rainforests in Australia.
8. The spirit of endurance - The sclerophyll leaf: Eucalypt forest and heathland.
9. The Never Never - Vegetation of the dry Australian inland.
10. The ultimate tree - The prehistory of Australian vegetation.
11. The future eaters - The "Big Picture" in Australian ecology?
12. Two sides to every story - Critically evaluating "The Future Eaters".
13. The ecology of bunyips - An overview of Australian zoology.
14. The daisy world problem - The diversity of terrestrial invertebrates in Australia.
15. How Tiddalick was made to laugh - Introduction to Australia's reptiles and amphibians.
16. Blinky Bill's victory - An introduction to Australia's mammals.
17. The land of parrots - An introduction to Australia's birds.
18. Time and the cycads - A case study in the postgraduate research experience.
19. The Deep Field - An introduction to stargazing and astronomy.
20. Wonderful things - Australian biodiversity: Its exploitation and conservation.

Australian Studies Course Synopsis (13 lectures). The Australian Studies course provides an overview of Australia's history and culture, and reveals how and why Australia differs from other settler colonies and societies (such as Canada and the United States of America). Furthermore, the course focuses on certain aspects of the past, including experiences common to other societies in different parts of the world, that have contributed to the making of modern Australia and its people. The course aims to separate popular myths from realities in understandings of Australian history, and consider the uniqueness *and* commonalities that are inherent in contemporary notions of the 'Australian way of life'.

Lecture Topics (Australian Studies Module)

1. Introduction and overview of Australian history.
2. Aboriginal Australia: Timeless Land, First Peoples.
3. Out of Empire: Transportation and Colonisation.
4. Culture Clash: Conflict on the Settler Frontier
5. Gold Rush: Australia Greeted the World.
6. Following America's Lead: Federation of Australia's States.
7. Anzacs: War and the 'National Image'.
8. Sporting Traditions: Australians at Play.
9. New Chums: Mass Immigration and Multiculturalism.
10. Being Australian: Depictions of Legend and Identity
11. Exploitation: Mining, Development and Indigenous Lands.
12. Conservation: Protecting and Politicising the Environment.
13. Contesting Australia: The Land of the 'Fair Go'?

Assessment Tasks

- A **Terrestrial Ecology Exam** (Quiz and Final exam) will assess student understanding of the terrestrial ecology lecture content.
- A **Terrestrial Ecology field book** consists of a series of set exercises that will be completed on field trips. These exercises teach the practical application of ecological field techniques such as quantifying abundance, biomass and species diversity, and emphasise the observation and interpretation of organisms in terms of their ecological form and function. As part of the field book, students will undertake a series of writing workshop tasks to increase their skills in academic writing.
- An **Australian Studies Exam** (Part A and B) will assess the students' understanding of the Australian Studies lecture content.
- An **Australian Studies Research Essay** requires students to submit an essay responding to one question from a set of 12 questions that are provided. This essay requires students to consult both print and online research material to formulate an intelligent response to the chosen question. The essay must be fully referenced according to an accepted style of referencing, of the student's choice.

Terrestrial Ecology Field Trips

A four-day field trip to **Girraween National Park** examines the role of low nutrient soils and fire in shaping the sclerophyll vegetation of Australian *Eucalyptus* bushland. A five-day field trip to **Lamington National Park** emphasises how favourable circumstances of geology, climate and soils have allowed ancient Gondwanan rainforest to persist in Australia. A five-day Field trip to **Carnarvon Gorge National Park** emphasises how low rainfall combined with intense climate variability have shaped the unique ecology of the dry Australian inland.



The view from a hike at Girraween National Park