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<th>Trinity Module Name and course code</th>
<th>Credits (ECTS)</th>
<th>Duration and semester</th>
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<tr>
<td>ZOU33000</td>
<td>5</td>
<td>Michaelmas Term 5 day field course</td>
<td>none</td>
<td>This two-part module commences with a 5-day residential field course at Portaferry, Co. Down, followed by a series of lectures in the latter part of the semester. The field course is designed to teach students some of the key techniques and skills required for field-based environmental biology and to introduce key concepts in marine biology. This includes common species identification, benthic and pelagic sampling methods and experimental design. Students are required to keep detailed field notebooks. This module introduces students to the oceanographic and ecological processes that underpin marine ecosystems and their associated biodiversity and functioning. Topics include: characteristic features of different marine ecosystems (e.g. rocky shores, coral reefs, deep seas); application (fisheries and aquaculture) and human impacts on marine ecosystems (disturbances, pollution and climate change). 1. Describe basic principles of oceanography and</td>
<td>50% continuous assessment (based on field course notebooks and a class ‘spot’ test): 50% annual written examination.</td>
<td>10 hours of lectures + 5 day field course</td>
<td>Prof. Nessa O’Connor</td>
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factors that affect organisms living in marine environments.
2. Identify and describe the characteristic features of important marine ecosystems including: rocky shores, estuaries, saltmarshes, seagrass beds, mangroves, coral reefs, shallow seas and the deep sea.
3. Identify and describe human impacts on marine ecosystems.
4. Discuss key issues relating to fisheries, aquaculture, marine conservation and coastal management.
5. Use several field-based practical techniques and quantitative methods in the marine environment.
6. Identify common marine species and describe their key distinguishing features.

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<tr>
<td>ZOU33003</td>
<td>5</td>
<td>Michaelmas Term</td>
<td>50% continuous assessment (including practical spot-tests): 50% annual</td>
<td>Prof. Nicholas Payne</td>
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approach to functional aspects of life by drawing links across all animal groups. The module is based on lectures and practicals, with additional self-learning exercises. The practical work involves online information and demonstrations of material from the Zoological Department's extensive collections, as well as hand-on experience with specimens. The module will take an evolutionary and comparative rather than taxonomic perspective on animal diversity with a focus on the Chordata. The module will open by charting the diversification of marine vertebrates and conclude with the conquest of land by the tetrapods. Throughout, the module will use form and function to draw comparisons across taxonomic groups, such as considering locomotion across cartilaginous fish, bony fish and amphibia.

1. give examples of the major chordate taxa and compare their physiology, anatomy and ecology.
2. describe the basic anatomy, and adaptive features of the chordate classes and give a reasoned identification of representative specimens of written examination.
the classes (and in some cases orders & families) of the Chordata.
3. Understand the distinguishing characteristics and their function for major evolutionary transitions such as the diversification of marine ‘fish’, the conquest of the land by tetrapods; the origin and radiation of amniotes.

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<tr>
<td>ZOU33004</td>
<td>5</td>
<td>Hilary Term</td>
<td>50% in-course short-question exam. 50% essay based annual written exam.</td>
<td>This module provides a detailed consideration and comparison of the structure, life cycles and general biology of animal groups focussing on the amniotes (reptiles, dinosaurs, birds and mammals) but taking a comparative approach to functional aspects of life by drawing links to anamniotes and invertebrates. The module is based on lectures and practicals, with additional self-learning exercises. The practical work involves online information, demonstrations of material from the Zoological Department’s extensive collections, as well as live specimens. The module will take an evolutionary and comparative rather than taxonomic perspective on amniote diversity. The module will open by describing how...</td>
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amniotes adapted to terrestrial living through the diversification of their morphological and physiological characteristics, and the escape into the air by the birds. Throughout, the module will use form and function to draw comparisons across taxonomic groups, such as considering locomotion such as flight across birds, mammals, reptiles and insects. The module will conclude by taking a macro-ecological perspective on the diversity of animal life in order to identify the main drivers of diversity at global, long term scales.

1. give examples of the major amniote taxa and compare their physiology, anatomy and ecology.
2. describe the basic anatomy, and adaptive features of the vertebrate classes and give a reasoned identification of representative specimens of the classes (and in some cases orders & families) of the vertebrates.
3. use allometric scaling approaches to compare form and function across taxonomic scales.
4. review the palaeontological evidence for such
evolutionary transitions as the evolutionary transition from dinosaurs to birds, and the evolution of endothermy in mammals, birds, fishes, and non-avian reptiles.

5. explain the main macro-ecological processes that drive the origination and extinction of species on global scales.

“Nothing in biology makes sense except in light of evolution” – T. Dobzhansky. Evolution plays a central role in almost every biological process ranging from adaptation to rising temperatures, spread of multi drug resistant bacteria, conservation of small populations, spread of invasive species to understanding human and animal behavior. This course will provide students with an advanced understanding of current evolutionary thinking by introducing new ideas and extending concepts already encountered in the fresher years. Special attention will be given to how selection shapes adaptation.

1. gained an advanced understanding of evolutionary theory.

40% continuous assessment: 60% annual written examination.

35

Prof. Pepijn Luijckx
2. a basic understanding of population genetics.
3. familiar with the processes of evolutionary change over time and space.
4. a good understanding of how species interactions affect fitness.

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<tr>
<td>ZOU33010</td>
<td>5</td>
<td>Michaelmas Term</td>
<td>none</td>
<td>This module examines the factors that affect the distribution, growth and survival of plant and animal communities. It describes how organisms interact with their environment and the role that they have in ecosystem and community structure. There is an introduction to the concepts and models that help to explain and predict organism distributions and interactions. The module comprises interrelated components of lectures, practical sessions and fieldwork. It has been designed to provide a foundation to ecological theory and its application.</td>
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<td>50% Continuous Assessment 50% annual written examination</td>
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1. Define what we mean by ecology and describe its principles and practice.
2. Show a firm methodological and theoretical understanding of the study of the distribution

|              |         |             |                          | 35 | Prof. Ian Donohue |
and abundance of species.
3. Describe and evaluate unifying concepts of distributions and ecological processes (e.g. feeding strategies, interspecific interactions, etc.).
4. Show, through practical exercises, a good approach to project work.
5. Show enhanced communication skills through a variety of techniques.

The significance of the host-parasite relationship and the processes associated with the definition of parasitism are discussed in this module. Examples from important parasite phyla are reviewed with a focus upon life cycle strategies, ecology, pathology and control. The epidemiology of parasitic diseases including important differences between microparasites and macroparasites are defined. The significance of parasite distributions within host populations is highlighted. External and internal factors, 50% Continuous Assessment 50% annual written examination 30
Prof. Celia Holland
which influence parasite populations, are outlined and particular attention is paid to host behaviour, genetics and immunity. The concept of a parasite community at the infracommunity and component community level is developed. The challenges associated with parasite control are explored. The practical work provides access to a wide range of parasitic material and gives emphasis to the diversity of parasitic lifestyles and forms. A number of the sessions are experimental in nature and explore parasitic adaptations for infection, the significance of parasite distributions in infected hosts, behavioural changes in parasitised hosts and the nature of parasite communities.

1. know the broad context of the host-parasite relationship and recall key definitions of parasitism.
2. identify a range of parasites from four major groups and recognize the epidemiological differences between microparasites and macroparasites
3. explore three internal factors that influence parasite populations and
develop an understanding of strategies for parasite control.
4. locate and identify parasites from a range of hosts in the laboratory.
5. explore the impact of parasitism on host fitness and behaviour.
6. sample hosts for parasite community analyses.
7. become familiar with aspects of experimental design and write up the results of a laboratory experiment in the form of a scientific paper.
8. present a lightening talk on a parasite of your choice

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<th>Module Code</th>
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<tr>
<td>ZOU33050</td>
<td>5</td>
<td>Michaelmas Term</td>
<td>none</td>
<td>This module consists of a series of lectures, tutorials and laboratory sessions that deals with a range of developmental topics emphasising a molecular approach to understanding the principles of animal development. A number of animal model systems will be dealt with and the contribution of each to our overall understanding of development discussed. Specific topics will include the following: Developmental genetics: the identification of genes that regulate development in <em>Drosophila</em> and vertebrates,</td>
<td>50% Continuous Assessment 50% annual written examination</td>
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Positional determination: how the body plan of the embryo is laid down including the role of homeo-box genes, Induction: the role of cell and tissue interactions and signalling cascades, Developmental neurobiology: positional determination within the vertebrate central nervous system, neuronal diversity and axonal guidance, neural crest cells and development of the peripheral nervous system. Other topics include limb development, organogenesis, and evolutionary developmental biology.

1. demonstrate familiarity with the key principles of embryonic development
2. demonstrate familiarity with the model animals that are used for developmental studies and why they have been so important.
3. describe the key events in building a complex multicellular animal, the common and species features
4. integrate an understanding of molecular control of cell differentiation and the
key molecules involved with morphological events in the embryo e.g. the molecules associated with neural tube patterning.
5. observe and identify key features of vertebrate embryos and use morphological criteria to uncover the stage of embryonic development.
6. demonstrate familiarity with internet resources that aid modern developmental research
7. work in groups to carry out desk-top research using genome project resources.
8. demonstrate improved laboratory record keeping through practical assignments and feedback

ZOU33070  5  Hilary Term  none  This module will aim to put data collection and analysis in the context of research design and will be an important foundation for the Senior Sophister research project. The module consists of two parts. The emphasis will be practical with a more 'hands on'

50% Continuous Assessment
50% annual written examination

Prof. Celia Holland
approach rather than the theory of statistics. Initially students will be taught about experimental design, data collection and sampling and the use of spreadsheets for data entry. This will lead on to preliminary data exploration and issues of normality. Emphasis will be placed upon the importance of visually exploring the data prior to the use of statistical tests. Summary statistics, including measures of centre and spread, skewness, kurtosis, percentiles and boxplots, will be covered. Then the module will move on to explore the concept of hypothesis testing and the need to compare two or more means. This will involve the use of t-tests and analysis of variance. Other types of data will also be introduced including the analysis of frequencies. The relationship between two variables in the context of regression analysis will also be explored. Finally a data set will be used to bring the entire process together starting with simple data exploration through summary statistics to more complex analyses. The aim of the second part of the module is to address, in more detail, the
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<th>fundamentals of experimental design and to explore how previous projects were conducted. In addition, students will learn how to write a moderatorship project proposal.</th>
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<tr>
<td>1.</td>
<td>address the fundamentals of experimental design and use hypothesis testing to answer biological questions.</td>
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<td>2.</td>
<td>appreciate instruments for data collection, and how to explore and analyse data within the context of research design.</td>
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<td>3.</td>
<td>explore a variety of data sets using graphical and summary techniques.</td>
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<td>4.</td>
<td>outline the requirements of parametric statistical tests and recognize the applicability of four such tests.</td>
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<td>5.</td>
<td>learn how to calculate statistical tests by hand and use the statistical package R to explore and analyse data.</td>
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<td>6.</td>
<td>write a moderatorship project proposal, design an experiment and analyse the findings of a scientific paper in a group setting.</td>
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<td>ZOU33085</td>
<td>5</td>
<td>5</td>
<td>Hilary Term</td>
<td>none</td>
<td>This two-part module begins with a series of lectures in Hilary Term, which offer an introduction to terrestrial biodiversity and wildlife biology, both globally and regionally. Topics covered will include: assessment of biodiversity from individual, population, community and landscape scales and the importance of foraging ecology, habitat selection, inter- and intra-specific competition, territoriality, dispersion, population dynamics and regulation for determining diversity and distribution of animals. There will also be a particular focus on the origins, development and current status of the Irish vertebrate fauna. The lecture series will be complemented, in week 37, by a five day residential field course in Glendalough, Co Wicklow, during which field techniques used for the study of terrestrial ecosystems will be introduced, with an emphasis on habitat and population assessment of mammals, insects and birds and their interactions with plants and the abiotic environment. Field visits will help with an understanding of contrasting habitats and species.</td>
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approaches to conservation management. Students will carry out and present a mini-project during the last two days of the course.

1. demonstrate the relationship between determinants of the patterns of terrestrial biodiversity and the practice of wildlife management and conservation
2. recognise and evaluate the main factors influencing the conservation status of species, in particular habitat selection and requirements, population processes and interspecific interactions
3. explain the origin, diversity and status of the current Irish vertebrate fauna.
4. census mammals and insects safely using a variety of the most commonly used methods, and birds by sight and song.
5. construct habitat maps and appreciate the importance of scale in such maps.
6. assess anthropogenic effects on the environment and evaluate some control measures used to minimise them in nature reserves.
7. design, conduct and present a small scale field study investigating an ecological question.

| ZOU44012 | 5    | Michaelmas Term | none | This module consists of two parts. The first part (A) explores the significance and impact of parasitism upon humans. Some of the topics discussed during the module illuminate the practical challenges of designing and undertaking parasitological research in human subjects. In contrast, other topics highlight the relative merits of using animal model systems under experimental conditions as compared to field-based studies in human subjects. The topics are as follows - the impact of parasitism upon cognitive development in growing children; co-infection: challenges and solutions; epidemiology of helminths: aggregation and predisposition; the ultimate challenge - parasite control. The second part (B) focuses upon more ecological aspects of Parasitology with a particular emphasis upon the impact of parasites at the level of the ecosystem and within wild animal hosts. The topics include parasites as ecosystem engineers, parasites and introduced species and the use of wild mammal host-parasite... | 20% Continuous Assessment 80% annual written examination | Prof. Celia Holland |
systems to model human parasitism.
1. demonstrate familiarity with the conduct of human studies under field conditions in developing countries
2. describe the impact of parasitism upon human hosts
3. explore the pros and cons of using animal models in parasitological studies
4. delineate the mechanisms of interaction between co-infections
5. define parasite aggregation and predisposition
6. identify the challenges associated with anti-parasite chemotherapy and vaccination
7. evaluate the use of wild rodent parasite communities as models of human infection
8. demonstrate understanding of the role of parasites in an ecosystem
9. assess the role of introduced host species in parasite transmission
10. demonstrate the skills to critique a scientific paper
11. discuss and debate various contributions to a particular topic

| ZOU44013 | 5 | Michaelmas Term | none | This module, which consists of both lectures and tutorials, looks at some of the practical applications of parasitism. | 50% Continuous Assessment | Prof. John Rochford |
wildlife biology to the conservation and management of animals, both *in*-*situ* and *ex-*-*situ*, including the role of zoos in captive breeding programmes. Among the topics covered are: planning for wildlife management, wildlife survey and census techniques, the principles of managing wildlife for sustainable harvest or control, management of scarce or endangered species, practical issues associated with the *ex-*-*situ* management of species, and the design and management of conservation areas. In the second part of the module, we will concentrate on anthropogenic impacts on biodiversity conservation, including the development and implementation of biodiversity conservation strategies in the wake of the Convention on Biological Diversity, other national and international wildlife legislation, biosecurity and the role of Invasive Alien Species, Biological Data Management and the development of Species Action Plans, and the role of reintroductions in biodiversity conservation.

1. outline the goals and history of sustainable wildlife management
2. determine and evaluate strategies for exploitation and control of animal resources

<p>| 50% annual written examination |  |  |</p>
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<td>ZOU44015</td>
<td>5</td>
<td>Michaelmas Term</td>
<td>none</td>
<td>This module will expand the students’ grasp of some classic topics in the field of behavioural ecology such as the consequences of group living, tool use, optimality models and signaling. We will then explore some currently advancing themes, including multi-level societies, co-operation, and the effects of urbanization on animal behaviour. The content will be delivered in part as lectures and in part using a flipped classroom format. The continuous assessment will involve the students undertaking group research into the evidence for empathy in animals and presenting their findings to the class, and writing a blog on partner choice and the effects of captivity on breeding which will be individually assessed. 1. Discuss the underpinnings of modern behavioural ecology</td>
<td>50% Continuous Assessment 50% annual written examination</td>
<td>Prof. Nicola Marples</td>
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<tr>
<td>ZOU44092</td>
<td>5</td>
<td>Michaelmas</td>
<td>none</td>
<td>This module involves an introduction to the principles and processes of Environmental Impact Assessment, particularly in relation to national and international requirements. All stages of the EIA process, from initial project screening to the final review, are covered, with the emphasis throughout on the role of the natural scientist. Strategic Environmental Assessment is also briefly covered. In addition to the lectures, students carry out a scoping exercise for a proposed development and conduct a quality review of an actual EIS.</td>
<td>50% Continuous Assessment 50% annual written examination</td>
<td>Prof. John Rochford</td>
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1. Outline the development of the Environmental Impact Assessment process as a management and legislative tool from its inception in the 1960s to its present form.
2. Explain the stages in the process from initial screening to post-project monitoring and auditing.
3. Conduct a scoping exercise for a project and produce a draft Scoping Statement.
5. Compare and contrast the process of Environmental Impact Assessment with Strategic Environmental Assessment.
6. Describe Appropriate Assessment in the context of Natura 2000 sites.