

**MSC WILD ANIMAL BIOLOGY
MSC WILD ANIMAL HEALTH**

COURSE CONTENT

2016/2017

Educational philosophy

The modular structure of the Master of Science Courses in Wild Animal Biology and Wild Animal Health is built around practical rotations and problem-based learning scenarios, which together encourage critical thinking, decision-making, exploration and inquiry, and awareness of current issues at the forefront of wild animal health and biology. Important systematic knowledge and insights into novel research are given in lectures to complement the problem-based approach, while additional practical skills are taught through visits to selected advanced institutions.

Figures in parentheses denote the number of hours of teaching allocated.

Certificate in Wild Animal Biology / Wild Animal Health

Learning objectives

A graduate of the **Certificate** in Wild Animal Health/Biology must demonstrate:

- a conceptual understanding of population dynamics, threats to wildlife populations and how resources can be allocated for wildlife conservation
- a critical understanding of epidemiology and the impact of disease on wild animal populations
- the ability to evaluate the effect of interventions on the health, welfare and conservation of captive and free-living wild animals
- a systematic understanding of the biological principles underpinning wild animal management, and the husbandry, care and welfare of wild animals

Introductory week

Important information on the Course objectives, the mission of the partner organizations running the Course and the services you receive is provided in the first week.

MSc WAB and MSc WAH

Introduction to ZSL

Introduction to the Course and Zoological Society of London (4)

Health, safety and fieldwork guidance at ZSL (1)

Introduction to generic learning skills

Introduction to Problem-Based Learning (1)

Learning in groups through concept maps (1)

ZSL Library Services and Computing

Introduction to the use of the ZSL Library (1)

Literature searching in the ZSL library (1)

Module 1: Conservation Biology

Following some introductory lectures in this module, we develop a conceptual understanding of why certain species and populations are more vulnerable to extinction than others, examine the models we can use to assess population viability, explain how we can monitor population dynamics and critically analyse how resources to conserve species can be most successfully allocated using a scientific approach.

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Introduction

Principles of conservation biology (2)
Introduction to population ecology (2)
Introduction to conservation genetics (1)
Conservation genetic techniques (1)

Population monitoring

Censusing of semi-free-ranging populations at Whipsnade (2 days)
Techniques for monitoring (sampling) populations (2)

Using population data to plan conservation programmes

Species conservation planning (1)

Causes of Extinction

Problem-based Learning Scenario: The kakapo – an endangered parrot (8)
Introduction to Conservation Programmes at ZSL (1)
From hurricanes to Ebola: forecasting future biodiversity (1)
Management of island birds for conservation (1)

Allocation of Conservation Resources

Problem-based Learning Scenario: The agony of choice (8)
The role of species management plans, zoos and other captive collections in conservation (1)
Monitoring global biodiversity (1)
Developing the tiger conservation programme at ZSL (1)

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Coursework Planning and Generic Teaching

Tutorial 1 - Differences between learning at undergraduate and postgraduate level (1)
Tutorial 2 - Strategies for reading and managing scientific papers (1)
Tutorial 3 - Feedback on assessment (1)

Module 2: The Impact of Disease on Populations

The effects of diseases on populations can be complex but even subtle influences can markedly unbalance free-living and captive populations of wild animals. An understanding of these effects requires a critical evaluation of epidemiology and the population biology of infectious agents, and armed with this knowledge we can make informed decisions on control methods, where these are considered an ethical approach.

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Problem-based learning scenario – Avian malaria and avian pox in Hawaiian birds (8)
Introduction to epidemiology (12)
The impact of infectious disease on free-living populations (2)
Computer modelling of diseases in wildlife populations (2)
Epidemiology of infectious diseases in free-living Artiodactyls (2)

Disease Management in Wildlife

Methods of disease control in free-living wild animals are fundamentally different from those in captive animals, and require a profound knowledge of epidemiology and ethics. In this unit we examine the control methods available to wild animal health professionals using examples of diseases in carnivores.

Wildlife disease epidemiology: investigation of disease outbreaks and implementation of control measures (3)

Wildlife disease epidemiology: investigation of disease outbreaks and implementation of control measures: problem solving using examples followed by student presentations and discussion (6)

Wildlife disease investigation and control: case studies and biopolitics (3)

MSc WAB and MSc WAH Coursework Planning

Introduction to the Scientific Review (1)

Module 3: Health and Welfare of Captive Wild Animals

Considering the enormous diversity of animal species, the management of healthy populations in captivity is a exacting challenge. In this module we gain a critical understanding of the principles of animal management and preventive medical approaches to maintain healthy populations and enhance their welfare.

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Problem-based learning scenario: An African exhibit (8)

Management of invertebrates (1)

Discussion tour - Management of invertebrates (1)

Diversity in the anatomy and physiology of invertebrates (1)

Demonstration - Physical restraint, clinical examination and administration of medicines to invertebrates (1)

The management of amphibians (1)

Management of amphibians: discussion tour (1.5)

The management of reptiles (1)

Discussion tour – Management of reptiles (1.5)

Management of Anseriformes (1)

Mycobacterium avium infections in wildfowl and other taxa (2)

Practical – Post-mortem examination of tuberculous wildfowl (1)

Management of raptors (3)

Preventive medicine for captive collections of Anseriformes and raptors (1)

The aetiological agents of disease in captive wild animals (1)

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Discussion tour and practical- Raptor restraint and management (6)

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Practical – Handling, clinical examination and administration of medicines to raptors (2)

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Therapeutics of birds (route of administration, supportive therapy, antibacterials, antifungals, parasiticides) (1.5)

Bumblefoot, arthritis and other musculoskeletal problems in birds (1.5)

Discussion tour on the management of artiodactyls and perissodactyls (2)

The management and biology of deer (2)

Discussion tour at Woburn Park on the management and biology of deer (1)

Management, preventive medicine, therapeutics and physical and chemical restraint of camelids (1)

Demonstration - Management, and physical and chemical restraint of camelids (1)

Infectious and non-infectious diseases of Camelidae (1)

Management of primates (2)

Management of carnivores (2)

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Gorilla management discussion tour (1)

Carnivore management discussion tour (1) Lee

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Coursework Planning and Generic Teaching

Planning your Critical Review – Journal clubs (2)

Introduction to Ethics and Animals (1)

Debate: Culling or Contraception? (2)

Module 4: Interventions

Where anthropogenic threats endanger free-living populations of animals, people increasingly see a need to intervene for the conservation or welfare of these populations. However, given the need to understand complex ecological systems and the potential stress of intervention methods, such activities require detailed planning, highly skilled input and scientific evaluation to ensure lessons are learned. Using real examples this module develops a conceptual understanding of intervention methods.

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Interventions Module

Problem-based learning scenario: Translocations: Boas and orangutans (8)

Post-release survival of rehabilitated wildlife (1)

Changes in host-parasite interactions associated with translocations (1)

Disease risk analysis, disease risk management and post-release health surveillance to assess and manage the disease risks of translocation (2)

Resolving wildlife-human conflict (1)

Viral infections of reptiles (2.5)

Primate medicine (2)

Retroviral infections in primates (2)

Mycobacterial infections in primates (1)

Shigellosis in primates (1)

Legislation relevant to free-living and captive wildlife (1)

Capture and translocation of African mammals (1)

Practical – Handling, clinical examination, and administration of medicines to marine mammals (3)

Practical – Treatment of oil toxicosis in seabirds (1)

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Ophthalmic disease in wild birds (1)

Practical - Ophthalmic assessment of wild birds prior to release (1)

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Coursework Planning and Generic Teaching

Communication skills

Preparing and giving scientific talks (3)

Examination Planning

Preparing for your examination (1)

Diploma in Wild Animal Biology / Wild Animal Health

Learning Objectives

A graduate of the **Diploma** in Wild Animal Health/Biology must demonstrate (in addition to the achievements of the PG Certificate):

- A critical awareness of methods to detect disease, disease surveillance systems and the effects of emerging diseases on captive and free living wild animal health
- A conceptual and practical understanding of the diagnosis, management (WAB), investigation (pathology), treatment (WAH only) and control of disease in captive and free-living wild animal populations
- a comprehensive insight into the interdependence of human, domestic animal and ecosystem health
- a creative approach to the evaluation of the health, welfare and reproduction of captive and free-living wild animals

Module 5: Detection, Surveillance and Emerging Diseases

Morbidity and mortality in free-living populations of wild animals are difficult to detect and monitor given their natural absorption into the ecosystem. Complex methods are required to detect and monitor changes in endemic diseases and to detect emergent diseases, and interpret the findings in a scientific manner.

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Problem-based Learning Scenario: Seals and amphibians (8)

Wildlife disease surveillance programmes (2)

Introduction to epidemiology – diagnostic testing (3)

Pathology of phocine distemper virus infection in marine mammals (1)

Introduction to molecular biology (3)

Introduction to immunology (3)

Infectious diseases of amphibians (2)

Emerging infectious disease of birds in the UK (2)

Parasites, environment and amphibian declines (1)

The invasion of squirrelpox virus and apparent competition between squirrels (1)

Geographical information systems as a tool in epidemiological assessment and wildlife disease management (3)

The risk to wildlife from anticoagulant rodenticides - assessing exposure and effects (2)

Algal and cyanobacterial toxins and wildlife disease (2)

Module 6: Ecosystem Health

In this module we examine the impact of anthropogenic stressors on the ecosystem and how ecosystem health can be measured, with a focus on harvesting of ecosystem resources and sustainable utilization. We develop our understanding through examples and specifically examine the influence of human behaviour on our interpretation of the scientific evidence and, consequently, policy changes. The module concludes with a series of case studies in ecosystem health, in which there is interplay between the health of domestic animals, humans and wildlife, including bovine tuberculosis, zoonotic viral infections and myiasis.

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Problem-based Learning Scenario: Rio Grande and Amazon (8)

Introduction to ecosystem health (1)

Energy flow through ecosystems, ecosystem services, and biodiversity and ecosystem function (2)
 Sustainable utilisation (1)
 Ecosystem effects of fishing (2)
 Human attitudes and beliefs and conservation (1)
 Military sonar and bubble-gas syndrome in cetaceans (0.5 hours)
 Anthropogenic impacts on the health of cetaceans, sharks and turtles: bycatch; ship-strike; bottlenose attack (and infanticide); grey seal predation and chemical and noise pollution (2)
 Badgers, cattle, *Mycobacterium bovis* and ecosystem health (1)
 The effect of human behaviour and attitudes on policy relating to the health of free-living wild animals – an example from badgers and tuberculosis (1)
 The epidemiology and management of bovine tuberculosis in mammals (2)
 Tuberculosis in the Kalahari: should we (and can we) manage it? (1)
 Influenza in wild birds: from low to high pathogenic (1)
 Influenza in mammals: crossing the species barrier (1)
 Evolution of influenza viruses (1)
 Zoonotic infections of bats (1)
 Infection dynamics: cowpox in wildlife (2)
 Tick-transmitted virus infections of wild animals (1)
 Myiasis in wild animals (1)
 Parasite identification techniques at the NHM (1)

Communication skills

Preparing and giving scientific talks (3)

Module 7: Evaluation of the Health and Welfare of Captive Wild Animals

In the Certificate we gained a critical understanding of the management and preventive medical care required to maintain healthy populations. In this Module we investigate the scientific evaluation of wild animal welfare and critically analyse the relationship between health and firstly reproduction, and secondly, nutrition.

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Problem-based Learning Scenario: successful artificial insemination in an Asian elephant (8)
 Principles of animal welfare (1)
 Welfare assessment: choice of lectures: either HPA axis or stereotypic behaviour (1)
 Welfare of wild animals: choice of lectures: either the welfare implications of controlling pest rodents or the welfare implications of keeping elephants in zoos (1)
Discussion tour on elephant management at Woburn (2)
 Reproductive studies and conservation (2)
 Control and monitoring of reproduction in wild animals (2)
 The management of elephants in Asia (1)
 Contraception of zoo and wild animals (1)
 Management, preventive medicine and therapeutics of elephants (2)
Demonstration - Handling, clinical examination, therapeutics and preventive medicine of elephants (1)
 Preventive medicine and therapeutics for artiodactyls and perissodactyls (administration, supportive therapy, antibacterials, parasiticides and parasite control programmes) (2)
 Energy and nutrient requirements including the effects of allometry, scaling, core body temperature and patterns of growth (1)
 Reptile nutrition and nutritional diseases (1)
 Reptile dermatology (1)
 Reptile gastro-intestinal diseases (1)
 Rational use of medicines in reptiles (1)
 Zoo animal nutrition including iron storage disease (1)
 Comparative digestive anatomy and physiology of herbivores (1.5)

Practical – Comparative digestive anatomy and physiology of herbivores (1.5)

The investigation and control of common parasitic diseases in zoological collections of ungulates (1)

Field parasitological techniques (1)

Practical – Field parasitological techniques (2)

Module 8: Practical Module

Our ability to effectively maintain healthy captive populations of wild animals, and monitor and intervene in the health of free-living populations requires a complex set of skills covered in detail in this Module.

MScWAB

Introduction to Practical Studies

Introduction to Whipsnade (1.5)

Introduction to Wild Animal Conservation and Management Rotations (1)

Trapping and handling free-living birds (1)

Introduction to zoo animal management rotations (1)

Monitoring of restraint and anaesthesia of wild animals, including emergency support for biologists (1)

Remote injection systems (1)

Practical – Remote injection systems (2)

Introduction to pathology at ZSL (2)

Introduction to pathological investigations (3)

Practical on pathological examinations of mammals (3)

Practical on pathological examinations of birds (3)

Forensic pathology (1)

MSc WAB

Pharmacology and Scaling

Pharmacological aspects of allometry, scaling, and core body temperature (1)

Anatomical and physiological influences on pharmacodynamics and pharmacokinetics in wild animals (1)

Investigating the pharmacokinetics of therapeutic agents in wild animals (1)

Restraint and Anaesthesia

Physical restraint and administration of medicines to reptiles (1.5)

Reptilian therapeutics (1)

Hepatic and renal diseases in reptiles (1)

Chemical restraint and surgical anaesthesia of reptiles (administration, suitable agents, pre-operative management, monitoring of anaesthetic and recovery) (1)

Chemical restraint and surgical anaesthesia of birds (1.5)

MScWAH

Introduction to Practical Studies

Introduction to Whipsnade and Ellerman Centre (1)

Introduction to rotation groups, tour of Veterinary Hospital at RP (1)

Monitoring of restraint and anaesthesia of wild animals, including emergency support for veterinarians (1)

Remote injection systems (1)

Practical – Remote injection systems (2)

Introduction to the pathology at ZSL (2)

Forensic pathology (1)

MSc WAH

Pharmacology and Scaling

Pharmacological aspects of allometry, scaling, and core body temperature (1)

Anatomical and physiological influences on pharmacodynamics and pharmacokinetics in wild animals (1)

Investigating the pharmacokinetics of therapeutic agents in wild animals (1)

Restraint and Anaesthesia

Physical restraint and administration of medicines to reptiles (1.5)

Reptilian therapeutics (1)

Hepatic and renal diseases in reptiles (1)

Chemical restraint and surgical anaesthesia of reptiles (administration, suitable agents, pre-operative management, monitoring of anaesthetic and recovery) (1)

Chemical restraint and surgical anaesthesia of birds (1.5)

Chemical restraint and surgical anaesthesia of marine mammals (1)
Chemical restraint and surgical anaesthesia of carnivores (1)
Chemical restraint and surgical anaesthesia of rhinos and elephants (1)
Physical and chemical restraint and surgical anaesthesia of artiodactyls and capture myopathy in ungulates (2)

Pathology

Post-mortem examination rotation groups (10)

Clinical pathology rotation (2)

Clinicopathological skills (2)

Anaesthesia, euthanasia and *post-mortem* examination of fish (1.5)

Anaesthesia, euthanasia and post-mortem examination of fish practical (1)

Zoo Animal Management

Zoo Animal Management Rotation Groups (80 maximum) - Curators, Team Leaders and Keepers

Zoo Animal Management rounds (25) - Curators, Team Leaders and Keepers

Wild Animal Conservation and Management

Selected Conservation Management Rotations (80 maximum)

Capture and Handling of Free-living Wild Animals

Attachment, analysis and conservation implications of remote tracking (2)

Amphibian and reptilian field techniques – Site visit (3)

Remote monitoring and tracking of wild animals (1) -

Dentistry

History, treatment, objectives and ethics of veterinary dental treatment of wild animals (1)

Dental and surgical equipment in veterinary dentistry - an overview - and, the principles of dental and oral surgical techniques relevant to veterinary dentistry (1)

Elephant dental surgery video and discussion (1)

Dental disease in captive wild animals and its treatment - part I - developmental conditions (0.5)

Chemical restraint and surgical anaesthesia of marine mammals (1)

Chemical restraint and surgical anaesthesia of carnivores (1)

Chemical restraint and surgical anaesthesia of rhinos and elephants (1)

Physical and chemical restraint and surgical anaesthesia of artiodactyls and capture myopathy in ungulates (2)

Pathology

Pathological investigations rotation groups (30)

Clinical pathology rotation (2)

Anaesthesia, euthanasia and *post-mortem* examination of fish (1.5)

Anaesthesia, euthanasia and post-mortem examination of fish practical (1)

Clinical rotations

Clinical rotations at Regent's Park and Whipsnade (90)

Clinical rounds (25)

Surgery and Imaging in Wild Animals

Specialist surgical skills are required when working with wild animals and these are covered in our surgery module.

Surgical skills technique (1) - Clinical Skills Centre

Aspects of reptile surgery (1)

Surgery of the reproductive tract of the iguana (1)
Practical on surgery of the reproductive tract in the iguana (4)

Reptilian endoscopy (1)

Reptilian endoscopy videos (1)

Aspects of avian surgery (2)

Practical - Diagnostic laparoscopy and surgical sexing of birds (2)

Practical - Orthopaedic surgery in birds (fracture repair, amputations and surgery to prevent flying) (2.5)

Reptilian radiology (1)

Dentistry

History, treatment, objectives and ethics of veterinary dental treatment of wild animals (1)

Dental and surgical equipment in veterinary dentistry - an overview - and, the principles of dental and oral surgical techniques relevant to veterinary dentistry (1)

Elephant dental surgery video and discussion (1)

Dental disease in captive wild animals and its treatment - part I - developmental conditions (0.5)

Dental disease in captive wild animals and its treatment - part II - traumatic and degenerative conditions (1)

Dental disease in captive wild animals and its treatment - part II - traumatic and degenerative conditions (1)

Management of stranded cetaceans

Introduction to the biology and ecology of cetaceans (1)

Veterinary management of cetacean strandings (1)

Practical - management and veterinary care of cetacean strandings (2)

Examination Planning

Preparing for your examination (1)

Master of Science in Wild Animal Biology / Wild Animal Health

A graduate of the **Master of Science** in Wild Animal Health/Biology must demonstrate (in addition to the achievements of the PG Certificate and Diploma):

- A comprehensive understanding of research and inquiry including (i) critical appraisal of the literature, (ii) scientific writing and (iii) scientific presentation
- The ability to design and analyse hypothesis-driven laboratory and/or field studies

MScWAH and MScWAB Assessment Planning

Scientific reading (2)

Scientific writing (2)

Evidence-based medicine (2)

Producing and presenting a poster (1)

Introduction to the Case Report (1)

Introduction to the Management Case Report (1)

Research Planning

Data Collection and Analysis (12- six sessions)

Research planning, project preparation and grant writing (2)

Developing ideas for research projects at ZSL (1)

Optional special lecture: Field study design and data collection (1)

Addressing health and safety requirements for research projects (1)

Designing a behavioural research project (2)

What's the point of ethical review for research? (1)

Effective interactions with the media in wildlife health and conservation (1)

Tutorial 4 - Planning your MSc research project

Tutorial 5 – Discussion: how to write a grant application

Tutorial 6 – Planning for a Career in Wild Animal Biology / Health

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