

# MRes Wildlife Conservation

## Research Project List; Academic Year

2023/24



### Preamble

The MRes Research Project List for the academic year 2023/24 is divided into three sections.

#### **1) Desk-based projects**

#### **2) Desk-based projects, but with the potential to build in a fieldwork component**

#### **3) Projects that are exclusively fieldwork-based**

In recent years, the MRes has worked around uncertainty resulting from the Coronavirus pandemic, and with the conflict in Europe it is possible that travel and fieldwork complications may continue to be a feature of 2024. MRes research projects are undertaken from February to September and may be affected by these ongoing issues. Some degree of contingency planning is always necessary for conservation research, and so for those candidates who select an exclusively field-based project, please also select a project that can be desk-based as a back-up.

As a part of the interview process, programme leaders will assess candidate's interests, experience and strengths, with reference to available research projects, and there is an opportunity to discuss this more fully at interview.

## **Desk-based projects**

### **1) Assessing Long-term Vegetation Change in Dghoumes National Park, Tunisia**

**Purpose:** This project will critically evaluate the long-term habitat changes of Dghoumes National Park in Tunisia since large ungulates have been reintroduced. This will help us formulate management actions to support biodiversity.

**Pathway to conservation impact:** These data will enable us to assess the efficacy of park management, identify management priorities and model potential future changes under different management and climate scenarios. Outputs from the project will help inform the biodiversity management and post-release evaluation of reintroduced ungulate populations in Tunisia. It is anticipated that this project could lead to a peer-reviewed paper.

**Conservation context:** Dghoumes National Park supports several threatened species, including reintroduced populations of IUCN listed Extinct-in-the-Wild scimitar-horned oryx (*Oryx dammah*) and Vulnerable dorcas gazelles (*Gazella dorcas*). This project will assess the impact of various factors on vegetation change both within and outside the park to evaluate the role of protected area management on biodiversity conservation. This will provide a long-term, objective and robust method for detecting temporal and spatial trends in vegetation cover within and outside of the park. Factors such as elevation and climatic variables (e.g. BIOCLIM data available from <https://worldclim.org/bioclim>) could be used to model drivers behind vegetation change.

**Skills/ background/ interests required:** An interest in ecology and some experience with GIS is an advantage. The project will employ various techniques including NDVI imagery (freely available to download from <https://earthexplorer.usgs.gov>) to create a time-series of vegetation change in Dghoumes National Park from 1998 to present day.

**Technical skills and other opportunities to be gained from this project:** It is envisioned that this project will develop advanced skills in data management, manipulation and analysis, and statistical modelling, alongside competency in remote sensing technologies, GIS, and geo-spatial modelling.

**Indicative costing band:** Band A, desk-based within the UK, drawing on some pre-existing datasets

**Marwell Supervisor:** Dr Tania Gilbert

## **2. The influence of habitat on faunal biodiversity in Tunisian protected areas**

**Purpose:** This project will critically evaluate how habitat features influence biodiversity in an arid landscape, providing critical information for conservation management.

**Pathway to conservation impact:** This project will develop and provide important information for protected area planning and management in this climate-sensitive arid landscape. We anticipate that this project could lead to a published paper.

**Conservation context:** Long-term landscape degradation has led to the need to recover ecosystems in North Africa, through establishing protected areas and reintroducing wildlife species previously driven to extinction in the wild. Reintroduction projects, such as those for the scimitar-horned oryx *Oryx dammah*, have provided important drivers for wider biodiversity conservation efforts. The success of these interventions should be evaluated in terms of their long-term impact on the environment and the functioning of restored ecosystems.

Ongoing monitoring data provide an opportunity to address fundamental ecological questions in a real-world context. Data will be derived from an existing camera-trap database, combined with habitat maps, remote sensing data and ground survey results. Priority species within the mammalian and avian assemblage include scimitar-horned oryx, dorcas gazelles, African golden wolves, red foxes, African wildcats, hares, hedgehogs, wild boar, porcupines, striped hyena and North African ostrich. Camera trap data were collected from geographically independent protected areas, with similar features and reintroduction histories, allowing the candidate to explore the ecological consequences of conservation action.

**Skills/ background/ interests required:** This project would suit a candidate with expertise and interests in Community ecology; niche theory; ecosystem assessment; GIS; statistical modelling.

**Technical skills and other opportunities to be gained from this project:** It is envisioned that this project will develop advanced skills in data management, manipulation and analysis, and statistical modelling, alongside competency in camera trap analysis, GIS, geo-spatial modelling, and science communication.

**Indicative costing band:** Band A, desk-based in the U.K. using camera-trap images from Tunisia.

**Marwell Supervisor:** Dr Tania Gilbert

## **Desk-based projects, with optional fieldwork**

### **3. Quantifying Impacts of supplementary feeding on endangered Grevy's zebra in Kenya: Can camera trap data enable assessment of individual health and population dynamics?**

**Purpose:** Use of camera trap images and data to assess the impact of providing hay for a wild population of the critically endangered Grevy's Zebra, during the worst drought facing Kenya in decades.

**Pathway to Conservation Impact:** Provision of hay to support critically endangered Grevy's Zebra may be continued, increased or decreased based on our understanding of its impact on the population. This project will provide a critical step in the evaluating this impact, and contribute to evidence based decision-making about scale and longevity of continued support of Grevy's Zebra. There is also scope to contribute to ongoing monitoring of Grevy's numbers.

**Conservation Context:** Kenya, along with neighbouring countries, are experiencing the worst drought in decades. In Kenya alone 2.4 million livestock have died as a result of deteriorating conditions for grazers. The critically endangered Grevy's Zebra is native to northern Kenya and Ethiopia and herd dynamics, including reproductive behaviour, are highly associated with water sources. Out of concern that diminishing water sources may edge the species over a tipping point toward extinction, with dire consequences for ecosystem health and services for people living within these landscapes, The Grevy's zebra Technical Committee in Kenya provides supplementary hay to Grevy's Zebra during times of prolonged drought. The aim of this intervention is to support Grevy's health and survival, particularly females engaged in parental care of foals, and thus mitigate detrimental drought-effects on recruitment in these important populations. As with all conservation interventions, evaluation of impact is critical to informing next steps, and as collaborative monitoring and research efforts across Grevy's range are ongoing, questions persist about the effect of hay provision on population dynamics and individual health. It is vital these questions are addressed and this project will, for the very first time, seek to assess body condition of Grevy's zebra, generating and trial a novel method for interpreting impacts of conservation interventions in terms of both population dynamics and

individual health. A pre-existing and established network of camera traps, including at supplementary hay provision sites, combined with stripe identification technology provides a large photographic dataset for this research project.

**Skills/ background/ interests required:** Data management, -organising, mining, and analysis, particularly with software including R and GIS, (optionally, fieldwork skills)

**Technical skills and other opportunities to be gained from this project:** Network opportunities e.g. Kenya-based NGOs and policy makers, animal identification skills and technology.

**Indicative costing band:** Band A desk-based in UK (Optionally, Band C inc. Kenya-based fieldwork)

**Marwell Supervisor:** Dr. Heidi Mitchell

#### **4. Apply a novel method of population network analysis using sharing of viral infections as a proxy for contact between individuals**

**Purpose:** Utilize non-invasive samples such as faeces (in wild populations where samples are already available or can be easily collected, or captive populations where there is inconsistent contact between individuals and faeces, or saliva can be easily sampled) to understand viral transmission between individuals.

**Pathway to Conservation Impact:** This work will have implications beyond the species and ecosystem studied, developing techniques applicable to other species and populations. Also, the samples collected could be part of wider objective: non-invasive monitoring of wildlife population health, combined with analysis of the microbiome, stress indicators, antimicrobial resistance, and toxins from the same samples.

**Conservation Context:** Host genetics gives population structure at a macro scale, but finer detail is needed to infer contact between individuals of a species in a timeframe meaningful for disease transmission. Disease causing organisms themselves are often rare or difficult to detect but studying other viruses in healthy individuals has great potential to inform population-level

risks. Working with University of Surrey School of Veterinary Medicine, the virome of a subsample of individuals will be analysed to detect candidate viruses that occur in the population at high prevalence and are frequently shared. Proof of principle has been demonstrated with adenoviruses in bat populations (Li et al. 2010). Crucially we do not need pathogenic viruses for these investigations, but instead viruses that are ubiquitous and whose evolution can be reliably studied. Virus specific PCRs will then be developed and used -for targeted testing of samples from the population. Detected viruses will be sequenced, and the relationship of the viruses inferred using Bayesian phylogeny. The resulting analysis will inform the level and frequency of interaction between individuals in the population.

**Skills/ background/ interests required:** wildlife surveys, lab work, data analysis packages ideally including R and GIS, confidence with or willing to learn network analysis and Bayesian phylogeny techniques.

**Technical skills and other opportunities to be gained from this project:** Network opportunities e.g. epidemiology specialists, lab-based skills, fieldwork skills, species identification skills.

**Indicative costing band:** Band B, field and lab-based in the U.K.

**Marwell Supervisor:** Dr. Philip Riordan

## **5. Assessing change to ecosystem services resulting from conservation management in Kenya**

**Purpose:** Quantify change in value of ecosystem services, as a result of conservation intervention, to determine impact for wildlife and people.

**Pathway to Conservation Impact:** Evaluation of conservation interventions is essential to quantify and articulate impact. Taking an ecosystem services approach will align conservation evaluation with the mission of community conservancies in Northern Kenya that seek to find balance between the, sometimes, conflicting requirements of people and wildlife. Outcomes of this ecosystems services assessment accessible and usable on the ground, supporting management of a diverse and ecologically valuable protected area.

**Conservation Context:** The human pressure exerted on fragile grasslands can often be detrimental to ecosystem function, to wildlife populations and for the human wellbeing of the communities living within these landscapes in Kenya. Conservation management is a fundamental part of the cultural and economic security of these areas, and protected area management aims to ensure longevity and availability of resources for humans and wildlife. Based north of Mt. Kenya, on the border of Meru County, the landscape is a complex of rich savannah grassland, with forest and riparian habitats and other transitional habitats under varying land uses with grazing as a major factor. These and other human pressures, such as climate change, are adding to the ongoing challenges to the conservation of local biodiversity faced by land managers on the ground. In northern Kenya, community conservancies have been established to find a balance between often conflicting requirements of people and wildlife. The study uses the TESSA toolkit (developed at Cambridge University by Dr Kelvin Peh and colleagues) to assess the changes to ecosystem services and quantify the biological impacts.

**Skills/ background/ interests required:** Ecosystem services assessment, conservation evaluation, overseas fieldwork, including challenging environments, wildlife surveys, data analysis packages ideally including R and GIS

**Technical skills and other opportunities to be gained from this project:** Network opportunities e.g. Kenya-based NGOs, conservation evaluation and impact assessment fieldwork skills, Species identification skills, wildlife survey skills.

**Indicative costing band:** Band A (optionally band C), desk-based in the U.K., with optional Fieldwork component in Kenya.

**Marwell Supervisor:** Dr. Heidi Mitchell

## **6. Carbon sequestration in mixed lowland landscapes in U.K.**

**Purpose:** Take South of England as an example and seek optimal solutions for carbon sequestration across a complex mixed-use lowland agricultural landscape, balancing the needs of both people and wildlife.



**Pathway to Conservation Impact:** Marwell's own land is a small-scale proxy for the wider regional effects this project will explore, hence this project will contribute to the development of a new master plan detailing how Marwell land can be used, and will inform a systems-based approach to regenerative land use, sustainable production of browse and hay, and 'zoo poo' to generate heat and energy.

**Conservation Context:** In much of the world, landscapes are increasingly required to provide multiple benefits and ecosystem services, such as water security and flood prevention, food security and sustainable agriculture and ecosystem-based mitigation or adaptation solutions for climate change and biodiversity loss. In the south of the U.K., the land available is restricted by human activities and options such as rewilding are not viable. Taking the south of England as an example, this project will seek optimal solutions for carbon sequestration across a complex mixed-use lowland agricultural landscape, balancing the needs of both people and wildlife. Working with partners such as the local Wildlife Trusts this project will utilise existing data and produce spatial models that explore the trade-offs and synergies between different goals. Future scenarios will be developed that elucidate pathways under different policy directions, including emerging changes to agriculture following the U.K.'s departure from the European Union.

**Skills/ background/ interests required:** Carbon accounting, ecosystem services, conservation evaluation, analysis packages ideally including R and GIS

**Technical skills and other opportunities to be gained from this project:** Network opportunities e.g. UK-based NGOs, conservation priority planning and evaluation, fieldwork skills.

**Indicative costing band:** Band A, desk-based in the U.K., with optional Fieldwork component in Kenya.

**Marwell Supervisor:** Dr. Duncan East

## **7. Health of reintroduced ungulate populations in Tunisia**

**Purpose:** Evaluate the potential of assessing health of aridland ungulates using camera traps.

**Pathway to Conservation Impact:** Evaluating the health of reintroduced populations within fenced protected areas in Tunisia is an essential part of informing appropriate management interventions in a challenging aridland environment. To date, we have used camera traps to evaluate biodiversity in protected areas, but they offer an opportunity to examine ungulate health, whilst minimising disturbance to the wildlife populations. This project will evaluate potential methods for health monitoring and apply them to threatened ungulate species in their natural habitat.

**Conservation Context:** Marwell Wildlife has delivered conservation projects in Tunisia for over 25-years, including the reintroduction and post-release monitoring of scimitar-horned oryx and addax. In line with our new conservation strategy focusing on Conservation Health, we plan to evaluate the efficacy of using camera traps to monitor wildlife health across multiple sites in Tunisia. Validation of this approach may utilise *ex situ* populations in the UK as well as data from Tunisia. The understanding wildlife health is a core part of evaluating reintroduction success and planning for population management in aridland ecosystems.

**Skills/ background/ interests required:** An interest in One Health and wildlife populations; Data analysis packages ideally including R and GIS

**Technical skills and other opportunities to be gained from this project:** It is envisioned that this project will develop advanced skills in data management, manipulation and analysis, and statistical modelling, alongside competency in handling camera trap data, GIS, and geo-spatial modelling.

**Indicative costing band:** A/B, data collection within UK zoos and camera-trap imagery already compiled from Tunisia

**Marwell Supervisor:** Dr. Tania Gilbert

## **Fieldwork-based projects**

### **8. Population health as an indicator of species response to conservation: Adapting a welfare-based approach for use at population level**

**Purpose:** Adapt a welfare approach based on observations carried out at individual level, for use at a population level. By developing a pre-existing welfare tool for use in wild populations, where reliable individual samples are not possible, we seek a novel indicator of population-wide health, enabling a new dimension to conservation evaluation, prioritisation and planning, using welfare-based data from animals affected.

**Pathway to Conservation Impact:** This project is the first step in adapting a welfare approach, for use in conservation projects where high intensity interventions may occur, e.g. translocations, and where background population monitoring is required. Based on outcomes of this work, next steps will include further refinement of the approach, and roll out to ongoing conservation projects.

**Conservation Context:** Marwell wildlife, like many conservation NGOs engages in and supports active conservation, making interventions in nature with implications for wild populations of animals. The aim of conservation interventions is to create positive and measurable biological change i.e. to have conservation impact, and biodiversity-based indicators typically include changes in population size, number of animals established following reintroduction, demographic data etc. But external environments under conservation management also influence animal health and affective state, and the ability to monitor these responses to short-term interventions such as translocations or releases, as well over the long-term, building up a wider picture of population health, would enable conservation to more fully evaluate conservation impact. There is not currently a method to quickly assess the welfare of animals within natural populations under conservation management, so this critical project will use a model dataset to sensitivity test and validate a population-level approach, and then undertake a real-world pilot study, using a natural population of a native species living in and

around the Marwell site. Taken in broader context, welfare-based assessment of population health may also provide scope to anticipate jeopardy because when scaled up to population-level effects, individual affective states in response to environmental challenge, give rise to mechanisms underpinning evolution and/ or extinction, i.e. the adapt or die principle.

**Skills/ background/ interests required:** Behavioural ecology, population dynamics, wildlife surveys, animal welfare, data analysis packages ideally including R and confidence in using or learning techniques relating to sampling populations e.g. behaviour, abundance, and use of categorical data.

**Technical skills and other opportunities to be gained from this project:** Network connections with UK wildlife and wider species monitoring groups, fieldwork skills, wildlife survey skills, conservation evaluation.

**Indicative costing band:** A, Field-based in the UK, drawing on model datasets

**Marwell Supervisor:** Dr. Heidi Mitchell

## **9. Species distribution, resource use and connectivity within a protected area landscape:**

### **UK woodland fauna**

**Purpose:** Undertake systematic assessment of UK-native animal species within a mixed mosaic of protected woodlands, grasslands, and the zoo, to support development of site-wide conservation plans.

**Pathway to Conservation Impact:** This work will inform landscape conservation plans, currently in early phases of review and development, and support Marwell's regenerative land management actions such as sustainable browse removal from the woods, hay production from lowland meadows, and nature-based solutions for managing species typically classed as pests. This project will establish some key baseline data enabling measurable and visible positive change i.e. conservation impact, across the wider Southern UK woodland landscape.

**Conservation Context:** Marwell Wildlife owns and maintains a landscape of woodlands, grasslands and various 'green areas' across the zoo, with ongoing conservation interventions across the land. Scientific assessment of species distribution and resource use across Marwell's

mixed mosaic of woodlands, grassland and 'green' areas within the zoo is a critical in developing landscape conservation plans. Issues related to connectivity are of strategic importance to Marwell, and by identifying current and future scope for woodland species connectivity, this work stands to make an important contribution in terms of protected area management in Southern England, and within the wider landscape.

**Skills/ background/ interests required:** UK fauna, wildlife surveys, remote sensing techniques, data analysis packages ideally including R and GIS

**Technical skills and other opportunities to be gained from this project:** Network connections with UK wildlife and protected area groups e.g. SDNPA, HBIC, Hampshire Bat Group, ARC, fieldwork skills, Species identification skills, wildlife survey skills.

**Indicative costing band:** A, Field-based, drawing on some pre-existing datasets

**Marwell Supervisor:** Dr. Heidi Mitchell

## **10. Rewilding lowland heathland in Southern England: How do management interventions influence rare botanical communities and ecosystem function**

**Purpose:** Support conservation evaluation of a series of management interventions, designed to open up water courses through a mire landscape, on Eelmoor Marsh (SSSI), a protected area of lowland heath.

**Pathway to Conservation Impact:** To inform conservation planning for the Eelmoor Marsh, Marwell requires evaluation of conservation interventions using biodiversity indicators, enabling assessments of measurable positive biological change i.e conservation impact. For the very first time, we seek to scientifically evaluate the impact of rewetting on rare botanical communities.

**Conservation Context:** Eelmoor Marsh (SSSI) represents one of the longest running rewilding projects in the UK. Throughout Marwell's long history of managing the site, a number of conservation interventions have been undertaken across the landscape, and accompanying wildlife surveys undertaken. Data are compiled to provide systematic evaluation of trends in wildlife communities and of conservation impact, based on management undertaken. Marwell has yet to evaluate rewetting management, but recent surveys have highlighted a number of rare botanical species and communities that appear to be benefitting from these management

interventions. This work will include comparison of botanical communities within areas that have been artificially rewetted, and those with remaining natural water courses, developing ideas about the role of conservation intervention in mires and establishing a framework for ongoing impact assessment.

**Skills/ background/ interests required:** UK flora identification, wildlife surveys, data analysis packages ideally including R and GIS

**Technical skills and other opportunities to be gained from this project:** Network connections with UK wildlife and protected area groups e.g. SDNPA, HBIC, Hampshire Bat Group, ARC, fieldwork skills, Species identification skills, wildlife survey skills, conservation evaluation and impact assessment

**Indicative costing band:** A, Field-based, drawing on some pre-existing datasets

**Marwell Supervisor:** Dr. Heidi Mitchell

## **11. Grevy's zebra social behaviour as a determinant of energetic intake**

**Purpose:** Provide insights about change in behaviour, herd dynamics and ecology as populations become more fragmented, prioritise actions in areas of concern.

**Pathway to Conservation Impact:** Working together with Lewa Wildlife Conservancy, provide support for prioritising actions that mitigate detrimental effects of fragmentation and drought.

**Conservation Context:** The critically endangered Grevy's zebra (*Equus grevyi*) formerly ranged across the arid regions of northern Kenya, southern Ethiopia, and South Sudan. Hunting, competition with livestock and dramatic ecosystem degradation due to human activities and climate change resulted in substantial declines in the Grey's zebra population over the 20th century. With a total global population approaching 3,000 individuals, the Grevy's zebra is now fragmented across what remains of its former range. As a social species, the composition of herds in these fragmented populations will have an impact on survival, either through breeding or foraging. Behavioural changes in response to population changes and consequential network dynamics might therefore be anticipated. The research will explore the impact of social behaviours on individual foraging in Grevy's zebra herds. Developing social interaction matrices,

these will be applied to individual rates of intake and foraging success relative to availability and distribution of resources.

***Skills/ background/ interests required:*** Behaviour ecology, behaviour observations, wildlife surveys, data analysis packages ideally including R and GIS

***Technical skills and other opportunities to be gained from this project:*** Network connections with Kenya-based NGOs, fieldwork skills, wildlife survey skills, conservation planning and prioritising.

***Indicative costing band:*** Band C, Field-based in Kenya

***Marwell Supervisor:*** Dr. Heidi Mitchell