

BIOL6051 research project briefs for 2020-21 entry

Indicative costs are provided as 3 cost bands (actual costs may vary, depending on choices made by the student, however the 3 bands provide guidance based on the research project experience of the programme team):

A = £1,800.00

B = £2,700.00

C = £4,300.00

Carbon sequestration in mixed lowland landscapes in U.K.

Location: UK (desk-based with optional fieldwork components), Cost band: A

In much of the world, landscape 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 mixed-used lowland agricultural landscape, balancing the needs of both people and wildlife. Working with partners such as the local Wildlife Trusts, this project will take 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.

Assessing the large-scale grazing pressures in complex multi-functional grassland systems in Kenya

Location: Kenya; Cost band: C

Land use, specifically under varying grazing practices, is a complex issue in African grasslands. In Kenya, the mosaic of cultural, socio-economic, political and conservation orientated perspectives means that there are varying intensities acting on sometimes fragile grassland systems, and changes to extent, plant diversity and structure is being widely observed. Based north of Mt. Kenya, on the border of Meru County, the landscape is a complex of grasslands and other transitional habitats under varying land uses with grazing as a major factor. A large scale assessment of the response of these grasslands to different grazing intensities, derived from varying human pressures and land uses, is required in order to understand the long-term resilience of these grasslands for local biodiversity and people. This study will incorporate remote-sensing techniques, on-the-ground assessments and existing data to quantify the response of vegetation and soil across the complex landscape surrounding Lewa. The study will be part desk-based and part field-based. The candidate should be adaptable, field-prepared and solution-conscious, able to work in sometimes challenging environments. The study forms part of a broader piece of research which will model the ecological response of global grasslands to human pressures.

Modelling the extensive grazing pressures and the spatially-variable response of temperate grasslands in Kazakhstan
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Location: Kazakhstan; Cost band: C

<p>The temperate grassland and sand plains of south-central Kazakhstan have suffered declines in recent decades owing to a number of factors including high climatic variability, increasing agricultural conversion and expansion of livestock farming. As observed in other grasslands around the World, increasing pressure from grazing, at varying intensities, on the rough semi-arid grasslands of the region is becoming a major issue. This study, in concurrence with the large-scale study in Kenya, will model some of the pressures acting on these low-stability habitats, and assess the variable response of vegetation and soil within the landscape. Using multi-scale techniques on the ground and remotely, the study will provide baseline data for evaluating the resilience of these habitat systems to continuing human pressures. The study will be part desk-based and part field-based. The candidate should be adaptable, field-prepared and solution-conscious, able to work in sometimes challenging environments. The study forms part of a broader piece of research which will model the ecological response of global grasslands to human pressures.</p>
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Examining ecosystem resilience by determining the functional response of below-ground invertebrates to a grazing pressure gradient

Location: UK; Cost band: A

<p>Among complex grassland systems in the UK, conservation grazing is adopted as a solution to maintaining and enhancing local biodiversity. In protected area management, grazing can be employed at varying densities, having differing impacts on wildlife communities and the subsequent recovery of the ecosystem. The role that invertebrates play in maintaining ecosystem functioning in response to grazing pressure is important because of the diverse functions they have for ecosystem productivity. In unimproved grasslands increased abundance and diversity of insect communities supports the concept that these systems are resilient to environmental change, but grazing may become detrimental if not managed at the right level. This study explores the functional diversity of below-ground invertebrates in response to human pressure. The study forms part of a broader piece of research which will model the ecological response of global grasslands to human pressure.</p>
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Ecosystem functioning beyond protected areas in North African Sahelo-Saharan landscapes (Tunisia)
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Location: Desk-based in UK with optional fieldwork component in Tunisia; Cost band: A/B

<p>For many wildlife species, protected areas (PAs) are often simply not large enough for them to reach sustainable population levels, with sufficient connectivity to ensure long-term resilience. Marwell Wildlife started a reintroduction programme for scimitar-horned oryx (<i>Oryx dammah</i>) in Tunisia over 20 year ago, reinstating this previous extinct species into national parks. This has been highly successful and today the species has reached carry capacity in most of the protected areas in which they occur. Options to extend existing PAs or create new ones are not feasible and so we are working with the Tunisian government authorities to develop extended landscapes beyond PAs into which oryx can disperse. A case study area has been identified between two PAs in Tunisia and a feasibility assessment is in progress.</p>
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<p>As part of this assessment, there is a need to understand the current ecosystem status within the interstitial landscape and develop models of habitat suitability, dispersal and landscape permeability for scimitar-horned oryx. This project will use existing data sets, with the option to conduct fieldwork to collect new data.</p>

Herd dynamics and social behaviour of goitered gazelle (<i>Gazella subgutturosa</i>) in eastern Kazakhstan

Location: Kazakhstan; Cost band: C

<p>Goitered gazelle (<i>Gazella subgutturosa</i>) populations have declined across their range in Central Asia and the Middle East. The biggest declines are thought to have occurred in the largest remaining population in Kazakhstan, which was previously estimated to number 20,000 animals. Pressure from illegal hunting, habitat degradation, competition with livestock and commercial developments are all likely to have contributed to this decline. Thus far, monitoring has been inconsistent and relatively little information about the species exists. A recent project started by Marwell Wildlife and partners in Kazakhstan is seeking to understand the status of the goitered gazelle population, identify the causes of decline and provide mitigation measure for the protection of the species and their ecosystems. One concern is that the population is becoming fragmented and there is an urgent need to understand the social biology of the species to provide unpinning data that can be used to model future scenarios and develop forward-facing plans.</p>
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<p>The project will examine the behaviour and ecology of goitered gazelle in different populations (e.g. Altyn-Emel and Charin Canyon National Parks) to understand the social dynamics of the species and identify critical biological consequences of different social contexts, such different group sizes and compositions and the drivers of change.</p>

Comparative assessment of big cat diets using stable isotopes
Location: Zoo and laboratory based in U.K; Cost band: A
In the Himalayan mountain region of Bhutan, three species of pantherine big cat coexist: snow leopard (<i>Panthera uncia</i>), common leopard (<i>Panthera pardus</i>) and tiger (<i>Panthera tigris tigris</i>). Snow leopard and tiger may have co-occurred for millions of years, given their divergence from a common ancestor, whereas recent climate change effects in the region have now shifted the range of common leopard into the region as well. All three species are implicated in livestock depredation in the area and are consequently subject to wildlife conflict pressures. The extent of their overlap, especially in terms of resource use and potential effects on human-wildlife conflict through predation of livestock, is unknown. Stable isotope analysis of cat faeces provides a powerful and non-invasive method to fill this knowledge gap. Options for using stable isotopes include providing quick and basic analysis of niche overlap, through to development of novel methods to obtain detailed space-use and dietary information from faeces collected in the wild. This project will undertake captive feeding experiments in established collections to explore the utility of this method for these species. Working with partners, you will gain experience of laboratory techniques and design of experiments. Results from this study will be published and applied directly to an ongoing field study being undertaken by Marwell Wildlife and partners in Bhutan.

Developing Theory of Change models for conservation of goitered gazelle (<i>Gazelle subgutturosa</i>) in Kazakhstan
Location: Desk based in U.K with optional fieldwork component in Kazakhstan; Cost band: A/C
Goitered gazelle (<i>Gazelle subgutturosa</i>) populations have declined across their range in Central Asia and the Middle East. The biggest declines are thought to have occurred in the largest remaining population in Kazakhstan, which was previously estimated to number 20,000 animals. Pressure from illegal hunting, habitat degradation, competition with livestock and commercial developments are all likely to have contributed to this decline. To be able to develop effective conservation plans for the species, it is essential to understand the relationships between stakeholders and their values and attitudes. Conservation planning increasingly uses logical models (e.g. Theory of Change) to identify the pathways and actions necessary to achieve positive outcomes. A recent project started by Marwell Wildlife and partners in Kazakhstan is seeking to understand the status of the goitered gazelle population, identify the causes of decline and provide mitigation measure for the protection of the species and their ecosystems. A vital part of this project is developing effective species planning that has the support of as wide a range of stakeholders as possible. To achieve this, the project here will use information collected during planning meetings and workshops and develop a logical model to highlight critical pathways towards agreed goals. This project will be largely desk-based, although there may be an opportunity to work with the team in Kazakhstan and optionally conduct follow-up meetings with stakeholders.

Linking logical (Theory of Change) and biophysical modelling to understand the challenges and opportunities for wildlife corridors between protected areas in the Sahelo-Saharan region of Tunisia.

Location: Desk based in U.K with optional fieldwork component in Tunisia; Cost band: A/B

For many wildlife species, protected areas (PAs) are often simply not large enough for them to reach sustainable population levels, with sufficient connectivity to ensure long-term resilience. Marwell Wildlife started a reintroduction programme for scimitar-horned oryx (*Oryx dammah*) in Tunisia over 20 year ago, reinstating this previous extinct species into national parks. This has been highly successful and today the species has reached carry capacity in most of the protected areas in which they occur. Options to extend existing PAs or create new ones are not feasible and so we are working with the Tunisian government authorities to develop extended landscapes beyond PAs into which oryx can disperse. A case study area has been identified between two PAs in Tunisia and a feasibility assessment is in progress.

In conjunction with ecosystem assessments of the interstitial areas, there is an urgent need to determine the necessary actions required by multiple and diverse stakeholders in the region. The plausible threats to scimitar-horned oryx in this area include illegal hunting, commercial development, competition with livestock and habitat degradation. A vital part of this project is developing effective species planning that has the support of as wide a range of stakeholders as possible. To achieve this, the project here will use information collected during planning meetings and workshops and develop a logical model to highlight critical pathways towards the agreed goal of a sustainable population of oryx existing beyond PA boundaries. This project will be largely desk-based, although there may be an opportunity to work with the team in Tunisia and optionally conduct follow-up meetings with stakeholders.

Assessing Long-term Vegetation Change in Dghoumes National Park, Tunisia.

Location: Desk based in U.K with optional short-term fieldwork component in Tunisia; Cost band: A/B

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. The project will employ various techniques including using MODIS MOD13Q1.006 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. 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 and interpretation of results would benefit from ground-truthing in the field. This information can then be used to assess efficacy of park management, identify management priorities and model potential future changes under different management and climate scenarios.

The evolution of life-history traits in captive scimitar-horned oryx populations
Location: Desk based in U.K; Cost band: A
<p>The scimitar-horned oryx is an 'extinct in the wild' aridland antelope that is reliant on an integrated strategy of captive breeding and reintroduction for its continued survival. The species has been reintroduced to Tunisia, Senegal, Morocco and Chad utilising the European Ex-situ Population (EEP) as a source of animals for release. Over generations in captivity, we have observed genetic and morphological changes in the European population, and will now investigate if there are corresponding changes in life-history traits that may impact on the success of reintroduction projects. This desk-based project will utilise existing data sets to model changes in captivity for this flagship species, with the aim of improving the success of ungulate reintroduction projects.</p>

Grevy's zebra metapopulations
Location: UK; Cost band: A
Student: Chelsea Smith
MW Supervisor: Tania Gilbert



The 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 population of approximately 2,000 individuals, the Grevy's zebra is now fragmented across what remains of its former range. Understanding the limits to movement between sub-populations and the consequential risk for small and isolated fragments, this desk-based project will use existing dispersal, population and movement data to evaluate the viability of Grevy's zebra populations in Northern Kenya. It is hoped that this research will also explore various scenarios in the region to provide policy-relevant information on the plausible future options for the species.