NOTTINGHAM TRENT UNIVERSITY

ARES Research and Innovation Conference 2019

Speaker Abstracts

Session 1 – Ecology and Conservation Research Group

Livestock guarding dogs – A conservation tool

Dr Katherine Whitehouse-Tedd, Nottingham Trent University

Livestock guarding dogs (LGDs) have been used to protect livestock from depredation by free-ranging carnivores across the world. They function primarily as a deterrent, preventing livestock-carnivore interactions through their vocalisations and protective behaviours. Originally their use was advocated as a non-lethal alternative to traditional carnivore control methods such as shooting, poisoning or trapping and they have achieved a high success rate in terms of reducing livestock losses. However, recently their use has sparked academic debate regarding the impact these dogs may have in the environment, from both an animal welfare and ecological perspective. To begin to address these concerns a number of studies were undertaken in order to; (1) determine the prevalence and characteristics of LGD-wildlife interactions, (2) understand the influence of LGD presence on carnivore occupancy in agricultural lands, and (3) explore stakeholder perceptions of the LGD programme and factors relating to programme sustainability. Findings will be discussed in the context of the use of LGDs for carnivore conservation and stakeholder engagement.

Katherine Whitehouse-Tedd

Speaker Biography:

Kat has been a lecturer at ARES for the past 6 years, where she teaches on undergraduate and postgraduate courses in the animal sciences, including anthrozoology, zoo conservation & education, and captive breeding & husbandry. Prior to this, Kat worked for a number of zoo and conservation organisations. Kat's research focuses on human interactions with both free-ranging and captive wild animals, and she has specialised in the use of Livestock Guarding Dogs as a tool to facilitate human-wildlife coexistence.

Long-term invertebrate community responses to and recovery from drying in the 'winterbourne' streams of south-east England

Romain Sarremejane, Nottingham Trent University

Most river networks include reaches with perennial flow, near-perennial reaches that dry during drought disturbances, and intermittent reaches that dry seasonally. The frequency, duration and regional extent of drying drive aquatic community composition, though studies combining these multiple aspects of drying across streams with different flow regimes remain rare, especially in cool, wet temperate regions. We explored the response of aquatic invertebrate in relation to discharge data at 46 sites over a 25-year period encompassing 'normal' and drought years, to assess how hydrological metrics characterizing different aspects of drying affected invertebrate richness and community spatial variability (β diversity). Richness decreased with drying duration in the preceding summer and increased with the time since the most recent drying event, decreasing more steeply and taking longer to recover at near-perennial than intermittent sites. β diversity increased with the spatial extent of drying, reflecting increases in environmental heterogeneity among sites. Contrasting community responses to drying at sites with different flow permanence regimes promoted persistence of the regional species pool and thus post-drying recolonization. However, predicted increases in drought duration and frequency may threaten biodiversity if disturbance intensity exceeds community resistance and recovery capacities.

Romain Sarremejane

Speaker Biography:

I am a post-doctoral Research Fellow based at Nottingham Trent University (NTU). My current research focuses on understanding the effects of connectivity (dispersal) and flow disturbances (droughts and floods) on river network (meta)communities. In my current contract, I work in collaboration with the Environment Agency and aim to better characterize the effects of droughts on chalk stream ecosystems.

Ecology of grey wolves and brown bears in human dominated landscapes

Dr Antonio Uzal, Nottingham Trent University

This short talk will summarise my collaboration with Scandinavian colleagues studying the ecology of grey wolves (*Canis lupus*) and brown bears (*Ursus arctos*) and how they interact in human dominated landscapes. In a first article we tested whether exposure to humans in the natal habitat helps understand why some adult wolves may approach human settlements more than other conspecifics, a question of both ecological and management interest. In a second article we analysed differences in habitat selection by wolves in areas sympatric and allopatric with brown bears. In a third article we investigated potential shifts in temporal range and habitat use by brown bears as part of an active hunting strategy of reindeer and moose calves. I will finally introduce current work investigating individual variation in habitat selection by bears and wolves as a driver of apex predator coexistence.

Dr Antonio Uzal

Speaker Biography:

Dr. Antonio Uzal is a Senior Lecturer in Wildlife Conservation and course leader of the MSc/MRes Biodiversity Conservation. Dr Uzal's current research areas of interest include landscape and spatial ecology, animal movement ecology, population dynamics, the use of telemetry techniques to study animal populations and the wider topics of human-wildlife conflict and how to conserve biodiversity.

Fitness and breeding performance of raptors in agricultural landscapes

Shashank Balakrishna, Nottingham Trent University

Raptor populations have suffered greatly in the past because of the use of organochlorine pesticides in farming. At present, agricultural intensification because of growing economic interest in natural resources threaten the survival of raptors worldwide. Despite these threats, raptors have continued to utilise agricultural landscapes for sustenance. Raptors typically adapt to agricultural landscapes by choosing habitats suitable for foraging and nesting. However, it is still unclear how land use affects the fitness and breeding performance of asynchronous raptors, which I aim to investigate in my doctoral research.

Falconiformes (E.g. falcons) and Accipitriformes (E.g. sparrowhawks), and Strigiformes (E.g. owls) are asynchronous raptors as they are diurnal and nocturnal, respectively. I hypothesise that all groups experience different selection pressures and environmental stressors, and consequently one group is more successful than the other. Regardless of the difference in activity time, all groups of asynchronous raptors might show decline in numbers with an increase in agricultural intensification. This research undertaking will be one of the very few to assesses the fitness of breeding raptor populations in the UK. Furthermore, the results of this research would assist in the management of agri-environmental schemes that are required for the maintenance of farmland raptor diversity.

Shashank Balakrishna

Speaker Biography:

Shashank Balakrishna is a field biologist, with a MSc in biology from the Vrije Universiteit Brussel, Belgium. He is an active member of the Centre for Ecological Sciences at the Indian Institute of Science. Previously in his research, he has examined the effects of anthropogenic disturbance on life-history strategies of lizards. His research interests are eclectic, the main ones being the behaviour, physiology, and conservation of urban adapter species. For his PhD at Nottingham Trent University, he is studying the fitness and breeding performance of raptors in agricultural landscapes of the United Kingdom.

The impact of estuarine squeeze on the structure and functioning of tidal freshwater ecosystems

Helen Pietkiewicz, Nottingham Trent University

The tidal freshwater zone (TFZ) is the upper section of an estuary, characterised by freshwater chemistry but subject to tidal action. The ecology and function of the TFZ is under-researched and poorly understood, yet it is thought to be a highly productive zone which provides an important habitat for a distinct community of tolerant freshwater species. This unique habitat risks being severely degraded or lost completely due to the effects of climate change and sea level rise. Understanding the impact of this in terms of biodiversity, ecosystem function and estuarine dynamics is an urgent research priority.

This research project will provide the first functional assessment of the TFZ and attempt to predict and quantify the ecological impact of its future destruction. It will contribute to work around the global issue of coastal habitat loss, and the mitigation of the effects of climate change and human activity on the functioning of coastal systems.

Helen Pietkiewicz

Speaker Biography:

I studied Geography at University College London, before working as a field assistant for various conservation organisations. During my MSc in Biodiversity Conservation at Nottingham Trent University, I developed an interest in aquatic ecology, studying the macroinvertebrate communities of saline marshes. I began my PhD in October 2018, looking at estuarine ecology and the structure and functioning of tidal freshwater ecosystems.

Session 2 – Animal Behaviour Performance and Welfare Research Group

Social networks and welfare in captive Livingstone's fruit bats

Dr Christina Stanley, University of Chester

Captive breeding programmes are an essential management tool for conserving endangered and threatened species. This is especially true for the Livingstone's fruit bat *Pteropus livingstonii*; this Critically Endangered species is highly threatened by changes in land use and vulnerability to tropical cyclones in its natural habitat, meaning its ex situ population is potentially an extremely important resource for the future. Various effects of the social environment on individual reproductive success have been recently highlighted in a number of species; however, relatively little is known regarding social dynamics in the Livingstone's fruit bat and instances of infanticide have historically been reported in this species in captivity.

Here we apply social network analyses to explore female social relationships in a key breeding group at Jersey Zoo to determine how individual social experiences vary, and thus how individual welfare can be quantified and maximised in captivity. We found that females with dependent offspring were more highly central in terms of aggression received, yet more peripheral in terms of affiliation received. We suggest management changes to safeguard the welfare of breeding females and maintain population reproductive success and discuss how these techniques could be beneficial to inform management of other captive breeding groups.

Dr Christina Stanley

Speaker Biography:

My main research interest is in the drivers of animal social structure, particularly in the strength and diversity of inter-individual relationships. I am also interested in novel applications of social network analysis to behavioural ecology and in the practical applications of behavioural research to conservation and animal welfare. I am currently a Senior Lecturer at the University of Chester, a position I commenced in August 2015 after completing my PhD at the University of Manchester. Prior to this I read BA Natural Sciences (Zoology) at the University of Cambridge and MSc Behavioural and Evolutionary Ecology at Manchester Metropolitan University.

A preliminary investigation into the analysis of spermatozoa motility using tail oscillation frequency

Felicity Couldwell, Nottingham Trent University

Artificial insemination (AI) is widely used in modern animal breeding programmes. In the equine industry, cryopreservation of spermatozoa for AI removes time constraints and allows for valuable genetics to be preserved indefinitely. For optimal fertility to occur during the process of AI, sufficient numbers of progressively motile spermatozoa must be deposited into a mare's uterus. Accurate analysis of sperm concentration, total motility and progressive motility is fundamental to this process. Studies have found that cell motility can be a useful factor in predicting sperm fertility potential. Currently, motility can be assessed manually or using computer aided sperm analysis (CASA) software. Disadvantages with these methods include the fact that manual assessment is a subjective observation and that although highly accurate the initial cost of a CASA system often limits its use across the industry. Using MATLAB, tail oscillation frequencies of sperm cells can be measured. This study aims to develop software that will provide a useful tool for the assessment of sperm cell motility over the course of my PhD. Furthermore, the study will highlight the potential application for this technology to be applied commercially. Further work will be required to fully validate this method of analysis compared to other techniques which are common practice in the industry alongside running a larger sample of stallions.

Felicity Couldwell

Speaker Biography:

Felicity graduated from the BSc (Hons) Equine Sport Science in 2017. During her placement year in 2015, Felicity started working for Stallion AI Services, where she developed her interest in equine reproduction. From this placement, Felicity completed her undergraduate dissertation "A preliminary investigation into the effect of a phosphatidylcholine-cholesterol complex as an artificial egg yolk on post thaw parameters of equine spermatozoa.". Following this, a research partnership grew between NTU and Stallion AI Services leading to Felicity's PhD project: "Improving the cryopreservation of animal semen for artificial insemination purposes."

A systematic review of social and environmental factors and their implications for indoor cat welfare

Rachel Foreman, Nottingham Trent University

Cats are one of the world's most populous companion animals, yet little is known about how home environments are adapted to their needs. Outdoor access is thought to be beneficial for both the physical and mental wellbeing of cats, yet as urbanisation increases, reducing owner access to outdoor spaces, increasing numbers of cats are kept strictly indoors. This study used a systematic review to assess scientifically validated knowledge concerning social and physical environments and their implications for indoor cats. 61 papers were analysed. Only n=21 papers addressed home scenarios with the remainder consisting of shelters or laboratories. Methods frequently used cat-stress-scores (CSS) and ethograms, neither of which were standardised. Numerous studies explored similar variables (i.e. provision of hiding space (n=9)) yielding little additional knowledge. Measures of welfare and behaviour were often assessed using single parameters in controlled environments. These findings do not necessarily translate to dynamic and variable household environments. Additionally, despite social environments being likely to have a substantial effect on cat welfare, it is under-studied in the home, especially in terms of its complexity (e.g. presence of young children or dogs). Overall, the review identified substantial gaps relative to cat experiences and welfare in multifactorial home environments.

Rachel Foreman

Speaker Biography:

I have an MSc in Animal Welfare, Ethics and Law which I gained in order to switch my career path from my BSc in Medical Biochemistry. Following my MSc, I worked in a Cats Protection adoption centre for a year before commencing my PhD. My PhD is 'An investigation into the behaviour and welfare of indoor only cats', and I have just completed my first year.

Session 3 - Natural Environment Research Group

Climate, history and society in southern Africa

Matthew Hannford, University of Lincoln

Climate has taken centre stage in scholarship assessing the decline or 'collapse' of historical state structures across the globe, with notable examples including the Norse settlements in Greenland and the Classic Maya. One example falling outside of popular histories are the pre-colonial African states that developed in parts of present-day Zimbabwe, Mozambique and South Africa from the thirteenth century onwards and persisted in one form or another until the eve of colonial rule in the late-nineteenth century. This presentation will summarise ongoing efforts to re-analyse the role of climate in historical societal change in this region by bringing together data, methods and theories from historical and palaeo climatology, African economic and environmental history, and climate change vulnerability, impacts and adaptation. Drawing on historical documentary records in particular, the research finds that while in certain cases climate formed part of a multi-causal pathway to state growth and decline, societies' engagement with the environment and the persistent hazards of drought was largely one of adaptation and resilience rather than decline and collapse.

Matthew Hannaford

Speaker Biography:

Matthew Hannaford is a lecturer in historical geography and environmental history in the School of Geography at the University of Lincoln. Matthew is a graduate of BSc Geography from Nottingham Trent. He then went on to do his PhD in Geography at the University of Sheffield and thereafter spent three years as a postdoc at Utrecht University. His research focusses on long-term human-environment interactions over the period 1500-1800 in southern Africa and northwest Europe, while he is also involved in efforts to evaluate the relevance of historical research for present-day climate change adaptation.

The impact of windfarms on peatland geomorphology and carbon storage

Guaduneth Chico, Nottingham Trent University

Peatlands represent the largest store of terrestrial carbon and can act as carbon sinks when in pristine or restored condition. Blanket bogs are a rare type of peatland protected in Europe and common in the United Kingdom, Ireland and Norway, with some occurrence in France, Sweden and Spain. In Spain these areas are geographically significant as they represent the southernmost European range of this habitat; however, they are exposed to high anthropogenic pressures from peat extraction, burning, grazing and windfarm development. This research aims to quantify the extent of windfarm infrastructure constructed over blanket bog in northern Spain and evaluate the impact on peatland morphology and carbon storage.

Windfarm infrastructures were mapped from aerial imagery for all known blanket bogs in northern Spain (including protected and unprotected areas). The loss of peat from these areas as a result of windfarm infrastructures was determined by comparing Digital Elevation Models (DEMs; years 2000 and 2019), supplemented by GNSS and TLS surveys. The carbon content of a peat core was used to determine the loss of carbon.

Protected blanket bogs in Galicia were found to be the most affected by windfarms, followed by recently mapped unprotected areas located between Cantabria and Castilla y León regions. A total of 235 turbines and 60.1 km of tracks have been constructed over protected blanket bog in Galicia. Tracks and turbine installations over unprotected areas have modified both the geomorphology and hydrological function of blanket bogs, displacing significant amounts of long-term carbon storage.

This research highlights a significant impact of windfarm development on blanket bogs in Spain, even in protected areas recorded under NATURA 2000. Urgent protection under EU legislation is needed to preserve this habitat and mitigate climate change through peatland restoration.

Guaduneth Chico

Speaker Biography:

I am a geographer graduated in 2014 at Plymouth University (England) and La Laguna University (Tenerife – Spain). In 2016, I was awarded with an EU studentship to do a MSc in Climate Change and Geographical Information at Swansea University.

Currently I am in my final year PhD where I have studied the significance of blanket bogs in northern Spain evaluating and identifying the edge of range of this habitat in Europe.

I have been awarded with several grants from Bizkaia Provincial Government and British Society for Geomorphology to study the restoration success in peatland and complete the blanket bogs inventory in Spain.

Libation with palm wine: it may not make sense, but it works

Udeme Dickson, Nottingham Trent University

Libation is a sacramental pouring of a liquid, or grains such as rice, as an offering to a god or spirit and is common in many African cultures. Various substances have been used for libation, most commonly wine and particularly palm wine. A study was carried out on the use of fermented palm wine for the treatment of petroleum-contaminated soils and sediments. Soil samples and sediments were obtained from various locations of Tibshelf, United Kingdom and Ogoniland, Nigeria and used for the remediation study.

Results obtained revealed up to 369 and 525 g of TPHs per Kg dry weight of the sediments and soils, respectively. Treatment with the fermented palm wine achieved up to 70 % reduction in Total petroleum hydrocarbons within 90 days, and a 100% when the palm wine was supplanted with Tween 80. Further investigations also revealed that complete remediation of Total petroleum hydrocarbons in the contaminated soils and sediments can be achieved within 48 days. Thus, there is an unconscious treatment of organics in soils during libation with palm wine.

Udeme Dickson

Speaker Biography:

Udeme Dickson obtained his BSc in Pure Chemistry at the University of Uyo, and an MSc in Industrial Chemistry at University of Benin, both in Nigeria. He is currently finishing a PhD in Analytical Chemistry and Environmental Sciences at Nottingham Trent University, UK. His expertise cuts across areas of Physical Chemistry especially Kinetics, Analytical Chemistry, Petroleum Analysis, and Environmental monitoring and remediation. Currently, his research focus is on development of analytical, phyto-and myco-remediation techniques to manage petroleum-contaminated soils. He is currently engaged as a researcher and associate lecturer in Analytical Chemistry and Forensics at Nottingham Trent University, United Kingdom.

Socio-cultural valuation of urban parks

Dalton Erick Baltazar, Nottingham Trent University

Socio-cultural valuation has rarely been applied to urban parks. This might be the reason why their value has not been articulated thoroughly, and thus, they suffer from the pressure of being converted into other more economically productive land uses. In my study, I aim to assess how stakeholders value the ecosystem services (ES) and disservices (EDS) they associate to urban parks through a case study in the Philippines. Results of this research will help reveal the value of urban parks to people and should therefore help cities in assessing the need and demand for open and green spaces. This research will also contribute to the development of methods for the emerging field of socio-cultural valuation of ES and EDS.

Dalton Erick Baltazar

Speaker Biography:

Dalton obtained his undergraduate degree in Biology (Ecology) and Master's in Environmental Science (Restoration) from the University of the Philippines Los Baños. He also completed a Master's in Global Environmental Studies (Environmental Management) at Kyoto University before working with Ritsumeikan University for a project called Sustainable Waste Management Network. At NTU, he is working on a unique way of assessing how people value ecosystem services and disservices from urban parks.

Session 4 - Sustainable Agriculture and Food Security Research Group

Nano-Rust: From Therapeutic Vectors to Potatoes

Gareth Cave, Nottingham Trent University

Well it's not quite rust but it nearly is… Iron oxide comes in a variety of different forms but the one we have been experimenting around with for the last few years is Magnetite, Fe_3O_4. It is naturally occurring and is in fact the most magnetic of all the naturally occurring minerals on Earth; the other nice thing is that it is FDA approved. So how can we take a material as old as the earth and do something new and exciting? In three words, "make it nano". By controlling the size of the Magnetite particles, we can control its magnetic behaviour, switch it on, and off *i.e*. make it paramagnetic or even better, super paramagnetic.

Our first adventures with super paramagnetic iron oxide, SPIO, started with utilising them as magnetic resonance imaging (MRI) contrast agents to non-invasively monitor therapeutic delivery systems in real time. But we soon realised that this was only the tip of the iceberg. The problem with SPIO is that, like rust, it does not dissolve up in water, so the first thing we had to do is come up with a method for coating or capping the SPIO with something that would help solubilise it in water and other solvents. The answer was to grind, grind and then grind some more. Once we nailed that we started to explore the properties of these new materials including their applications in MRI, micro arrays, therapeutic vectors, magnetic hyperthermia, transdermal delivery, food and drink supplements, cosmetics, magnetic yarn and potatoes…

Gareth Cave

Speaker Biography:

Dr Gareth Cave is a Principal Lecturer at Nottingham Trent University. His research interests are in application of nanoparticles in therapeutic transport devices, MRI/NMR contrast agents, supramolecular chemistry and feed additives in plants, animals and humans.

Genome-wide epigenetic analysis defines novel molecular markers for improving drought tolerance in crops through biostimulant (Seaweed extract)

Sulochana Gunasena, Nottingham Trent University

Drought is one of the major constraints to crop production and to food security. There are over 9800 varieties of seaweeds and mainly they can be classified as Brown, Red and Green seaweed. Biostimulants can act as stimulators to stimulate natural processes to enhance tolerance to abiotic stress and to improve crop quality. Recently seaweed based biostimulants have gained more attention, but its exact mode of action is still a mystery. Due to the phytogenic differences red seaweeds *(Solieria chordalis)* and brown (*Ascophyllum nodosum*) are known to express different biostimulant activities.

The project aims to identify the effects of brown and red seaweed-based biostimulants on plants morphological/physiological characteristics and molecular markers that affect epigenetic changes during drought stress. The molecular markers and their effects on the phytohormones and the epigenetic changes will allow us to understand the mechanism of drought resistance in crops on a genome-wide basis. Also, biostimulant formulation in terms of molecular plant responses will be identified for commercial use. The work will highlight innovative concepts and give a clear commercial impact for future development of biostimulant science. The project is joint with MicroMix Plant Health Ltd.

Sulochana Gunasena

Speaker Biography:

I am a 1st year PhD student in ARES at NTU. I completed my previous studies in plant biotechnology and in plant genetics. Further, have gained work experience in synthetic biology. My main research area is effect of biostimulant on drought resistant. I enjoy working with plant, especially in plant genetics.

Comparison of broiler performance and digestibility using standard wheat and a novel strain of wheat called HIGHPHY Wheat

Sumaiya Afrin, Nottingham Trent University

In the present study, the effect of using 60%, 40% and 20% HIGHPHY wheat with same level of standard wheat were compared in broiler chickens. Diets were compared by evaluating the following parameters; broiler performance, intestinal mucin layer thickness, gastrointestinal pH, protein solubility, ileal inositol esters concentration and ileal digestibility of amino acids, Ca and P. Male Ross308 broiler chicks were reared on a standard commercial diet before experimental diets were fed from day 14 -20. Each pen of birds was allocated to one of the 6 diets (20, 40 or 60% of standard of HIGHPHY wheat with 8 replicate pens per diet. There was no effect of feed type on BWG and FCR but BWG and FCR were improved with higher inclusion level ($p<0.01$) of both of the wheats. Standard wheat and HIGHPHY wheat diet had similar effect on mucin layer thickness and gastrointestinal pH, but both the wheat form ($p<0.05$) and their inclusion level ($p<0.01$) had significant effect on the protein % of ileal digesta. Protein % of ileal digesta was increased with increasing level of wheat in broiler diet and HIGHPHY wheat diet showed higher % compared to the standard wheat.

Sumaiya Afrin

Speaker Biography:

I have worked as an academic in the Department of Poultry Science, Faculty of Animal Husbandry, Bangladesh Agricultural University, Mymensingh-2202. While working there I was also a Co-PI in Ministry of Science and Technology project entitled 'Evaluation of production potentiality, egg quality, and hatchability of chicken feed potato tuber meal' until June 2015. Before starting my PhD, I completed an MSc in Animal Nutrition at the University of Nottingham. I also did another Masters in Poultry Science and B.Sc. in Animal Husbandry from Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

Evolution in ecological timescales: A threat to food production and sustainability

Helen Hicks, Nottingham Trent University

Repeated use of chemicals has selected for the rapid evolution of resistance, threatening health and food security at a global scale. Strategies for preventing the evolution of resistance include cycling and/or mixtures of chemicals and diversification of management. Until now we have lacked large-scale studies that evaluate the efficacy of these different strategies for minimizing the evolution of resistance. Here we use a national-scale data set of occurrence of the weed Alopecurus myosuroides (black-grass) to address this. Black-grass densities are correlated with assays of evolved resistance, supporting the hypothesis that resistance is driving weed abundance at a national scale. Resistance was correlated with the frequency of historical herbicide applications, suggesting that evolution of resistance is primarily driven by intensity of exposure to herbicides, but was unrelated directly to other cultural control techniques. We find that populations resistant to one herbicide are likely to show resistance to multiple herbicide classes. Finally, we show that the economic costs of evolved resistance are considerable: loss of control through resistance can double the economic costs of weeds. This research highlights the importance of managing threats to food production and healthcare systems using an evolutionarily informed approach in a proactive not reactive manner.

Helen Hicks

Speaker Biography:

Helen's research interests centre on sustainable agricultural practices and balancing food production with biodiversity conservation. Her PhD research modelled farmland bird populations and assessed how 'wildlife-friendly' agri-environment schemes could contribute to reversing population declines of 19 bird species. More recently, Helen has been looking at the causative factors in the evolution of herbicide resistance in arable weeds in the UK, and the likely management implications for the agricultural sector. The work she presents today is a whistle-stop tour through the last five years of a BBSRC project.

Sustainable Food for the Future: Developing Sustainable Alternatives to Agrochemicals for Commercial Vertical Farming

Steven Grundy, Thomas Orridge, and Chungui Lu, Nottingham Trent University

In collaboration with Growing Underground Ltd, a commercial vertical farm in London, this project seeks to improve the productivity, sustainability and scalability of commercial hydroponics through identifying novel sustainable solutions to agrochemicals in commercial hydroponics. The sterilisation of water and seeds are vital part of the hydroponic growing process, helping prevent the build-up of dangerous diseases and bacteria that thrice in warm, wet environments (E-Coli, Pseudomonas and Phytophthora) that may cause human disease or reduce yield and increase spoilage of crops. Current commercial practise involves using the agrochemicals, primarily chlorine dioxide, to sterilise hydroponic nutrient solution. However, with European and UK government legislation (EU Biocides Regulation 528/2012) reducing the maximum limits of chlorine allowed in food production, there is a need to find alternative solutions to reduce or replace chlorine use in commercial hydroponics. Using non-pathogenic E.coli (K12) as an indicator organism, the germicidal effect of UV-C, electrolyzed water, and ozone has tested to evaluate its efficacy in the purification of nutrient solution and seed sterilisation. In batch experiments, ozonated sterile nutrient solution with a dissolved O3 concentration of 3mg/L, a 100-fold reduction in viable E.coli was achieved through incubation for 30minutes. For the evaluation of electrolysed water, a multi-tiered hydroponic systems with a 50L nutrient tank growing Pisum sativum and Mustard wasabina microgreens was inoculated with E.coli (2x104 CFU/ml), and then 1L of varying dilutions of electrolysed water were added (60, 23, 6, 0 mg/L FAC) daily. Microbial analysis of water samples found all electrolysed water concentrations reduced E.coli concentration below detectable limit after two days, compared to the control which maintained a stable E.coli concentration. Furthermore, no effect on yield was observed in neither the yield or biomass of pea or mustard microgreens at harvest. In seed sterilisation experiments, the efficacy of electrolysed water and ozone was compared to sodium hypochlorite at sterilising pea and mustard seeds inoculated with E.coli. A 99.998%, 94.15%, and 99.92% in E.coli concentration on pea seeds was achieved using electrolysed water, ozone, and sodium hypochlorite, respectively. Current results indicate that both ozone and electrolysed water have potential to replace traditional chlorine chemical treatment in purification of hydroponic systems and seed sterilisation.

Steven Grundy

Speaker Biography:

Dr. Grundy is a research fellow in Sustainable Agriculture at Nottingham Trent University whose research interests lie in the area of global food security and sustainable agriculture. His research interests fall into two main areas: Sustainable Agriculture and Molecular Plant Biology. His current project works in collaboration with a large commercial vertical farm, Growing Underground Ltd, with the aim of improving the productivity, sustainability, and scalability of hydroponic growing systems. Dr. Grundy is also interested in investigating potential molecular markers associated with agronomically important traits by using RNA Seq.

Determining the conservation impact of management strategies employed for the Hyacinth macaw

Evangelos Achilleos, Nottingham Trent University

Macaws are globally threatened due to fragmentation of their habitats, the illegal trafficking trade, hunting, feather collections, and deforestation. Population declines have occurred in most of the species, especially the Blue Macaws (Lears Anodorhynchus leari, Glaucus Anodorhynchus glaucu, Hyacinth Anodorhynchus hyacinthinus, and Spix Cyanopsitta spixii). At least 10,000 Hyacinth macaws were taken from the wild in the 1980s, with 50% destined for the Brazilian market. Currently, the wild Hyacinth macaw population comprises approximately 6,500 individuals with 4,300 breeding birds found mainly in Pantanal (5,000) of Brazil. There has been a rapid population decline over the last three generations throughout Brazil; although there has been a stable recovery of the Pantanal population, the East Amazonian population is still declining while being classed as 'Vulnerable'.

The 'One Plan Approach' is a conservation strategy that requires the consideration of all populations of a species in nature and in captivity, by assessing their management through the successful integration of the responsible parties. This method aims to develop relationships and establish partnerships; bridging the intensely managed captive population with the wild; whilst ensuring the captive populations are an authentic representation of their conspecifics with the potential for future reintroduction. Currently this strategy is not employed for the hyacinth macaw thus requiring further research to be able to determine and formulate an appropriate conservation plan which utilises both ex situ and in situ collections. The feasibility of this approach is the focus of this thesis.

Evangelos Achilleos

Speaker Biography:

Evangelos is a part-time PhD student currently researching the impact of management on the conservation of Hyacinth macaws (Anodorhynchus hyacinthinus). Evangelos is currently a HE Team Leader and Programme Manager of the BSc (Hons) Animal Management & Zoology at Capel Manor College and an associate lecturer of the Royal Agricultural University. He specialises in teaching conservation, zoo husbandry/management and reproduction. He has worked and volunteered with wildlife conservation projects in Peru, South Africa, Kenya and the UK. Evangelos' primary research investigates the combined impact of ex-situ reproduction and genetic management and in-situ field management on the conservation status of the Hyacinth macaw.

Comparison of the effect of xylo- oligosaccharide on performance and gut microbiota of broilers raised under optimal and suboptimal conditions

Saba Erum Amir, Nottingham Trent University

Xylooligosacharides (XOS) as prebiotics as a feed additive in poultry feed to improve performance and gut health have recently gained attention. XOS have been shown to induce changes in both the composition and activity of the gastrointestinal microbiota in chickens but results on performance of broilers are contradictory and all studies have been conducted under controlled research conditions. This study aimed to compare the performance and development of microbiota of birds fed diet supplemented with XOS under optimal (NTU research unit) and suboptimal (old farm barn) conditions. To evaluate the effect of XOS on broiler performance, Body Weight Gain (BWG) and Feed Intake (FI) were measured weekly and Feed conversion ratio (FCR) was calculated in trial 1. However, in case of trial 2, the experimental design did not allow measurement of FI, hence performance was assessed on weekly BWG only. When considering the whole trial period (d0 -35) there was no significant effect of XOS on performance of broilers raised under optimal (trial 1) or suboptimal conditions (trial 2) ($P>0.05$) but under suboptimal conditions XOS was shown to improve BWG up to 28 days of age with a significantly higher BWG at d21 ($P<0.05$).

Its effect on modulating gut microbiota and stimulating beneficial gut bacteria is under investigation.

Saba Erum Amir

Speaker Biography:

I started my career working as a Microbiologist working for 2 Sisters Food Group. I then joined Eurofins Food Testing as a Team Leader where I was managing the pathogens laboratory. However, my aptitude for research made me venture for a PhD. In my PhD I am looking at the effect of a prebiotic on gut health of broilers. I had studied Biotechnology during my bachelors and masters degree and had no experience of working with animals. I have now learnt to conduct poultry trials, gained knowledge of poultry nutrition and banked several new laboratory and computational skills. My PhD has made me a multidisciplinary scientist.

Characterising the ecology of a winterbourne chalk stream to inform future biomonitoring

George Bunting, Nottingham Trent University

Winterbourne chalk streams only flow when groundwater levels are high, which is typically in winter months. The dynamic nature of these ecosystems, which may transition between flowing, ponded and dry states, makes them a unique habitat, home to a diverse range of flora and fauna, some of which is not seen in other stream types. Due to the inherent differences between perennial and winterbourne streams they also have a unique set of challenges in terms of their monitoring and restoration, which require a bespoke approach. These types of streams have often not been included in the Environment Agency's Water Framework Directive programme, but the agency is keen to develop new approaches for their monitoring and management. A biomonitoring approach, where the condition of an ecosystem is assessed by monitoring the organisms which live there, has been suggested as one possible solution. This project aims to explore this approach by making a thorough study of the Candover Brook in Hampshire, assessing the potential use of benthic and

hyporheic invertebrates, terrestrial carabids, terrestrial and aquatic plant communities and diatoms as biomonitoring subjects.

George Bunting

Speaker Biography:

George is a Research Assistant working at NTU as part of Dr Rachel Stubbington's Dynamic Streams Research Group. After recently completing a PhD at the University of Worcester examining the effects of fine sediment on aquatic invertebrates George is now focussing his research interests on temporary streams. George has previously worked for the Environment Agency as part of the Analysis and Reporting team where it was his responsibility to carry out monitoring, sample analysis, data interpretation and reporting in relation to the ecological status of freshwater bodies within the East Midlands area.

The status of large carnivores in Kasungu National Park, Malawi

Robert Davis, Nottingham Trent University

Estimating the density and distribution of large carnivores is fundamental for conservation management but reliable estimates for many large carnivores are lacking across geographic ranges. There is a paucity of data for carnivore populations in miombo woodlands in Africa and to date no population estimates have been reported from Malawi. Camera trap surveys were conducted annually between 2016 and 2018 in Kasungu National Park, Malawi, to obtain density estimates, using a spatial partial identity model, for leopard (*Panthera pardus*) and spotted hyaena (*Crocuta crocuta*), and to report on the status of other large carnivores. Density estimates were low across survey years, when compared to estimates from sub-Saharan Africa, for both leopard (1.9 (±0.19 SD) adults per 100km^2) and spotted hyaena (1.15 (±0.42 SD) adults per 100km^2). Low densities may reflect low carrying capacity in miombo woodlands or be a result of reduced prey availability from intensive poaching. Lion (*Panthera leo*) and wild dog (*Lycaon pictus*) are likely limited to dispersers, as only individual males were recorded in 2017 and 2018. We provide the first density estimates from a miombo woodland and recommend urgent management interventions to reduce the loss of the carnivore guild in Kasungu National Park.

Robert Davis, Nottingham Trent University

Speaker Biography:

I am currently a part-time PhD candidate at the School of Animal, Rural and Environmental Sciences, Nottingham Trent University. My thesis explores the status of large carnivores in Kasungu National Park, Malawi, and examines the ecology of sympatric large carnivores in a miombo woodland that has been subject to high levels of anthropogenic disturbance. Before, and during, my PhD I worked for several years across Southern Africa in a range of conservation research positions. My research interests are large carnivore ecology and conservation, camera trapping and spatial capture-recapture modelling.

Efficacy of a novel xylo-oligosaccharides in supporting the performance and gut health of broilers

Alexandra Desbruslais, Nottingham Trent University

Xylo-oligosaccharides (XOS) are a class of oligosaccharides that are currently undergoing a large increase in research output in numerous species from humans to chickens (Maesschalck *et al.,* 2015, Mussatto and Mancilha, 2007, Selle *et al.,* 2003, Sun et al., 2013). The fibres of cereal grains are comprised of carbohydrate polymers that remain resistant to digestive enzymes in the small intestine of monogastric species (Maesschalck *et al.,* 2015. However, some or all of these polymers are fermented in the distal gut and as such are thought to have beneficial implications on the gut health of broilers.

Exogenous xylanase has been routinely added to poultry diets for the last 20 years (Cowieson and Masey O'Neill, 2013). Typically, the addition of xylanase improves performance by 2-4% when compared to un-supplemented birds. The mode of action for exogenous xylanase has been debated over the years, with a general consensus that xylanase aids the degradation of long chain polysaccharides by way of hydrolysis of soluble high molecular weight pentosan in highly viscous cereal grains, thus increasing the diffusion of nutrients in the intestine (Bedford, 2000, Cowison and Massey O'Neill, 2013). However, in recent years there has been an increase in interest as to whether exogenous xylanase may also have beneficial effects on the microbial populations of the hind-gut. This study looked at the efficacy of a novel XOS when compared to a commercial XOS, both with and without the addition of exogenous xylonase, when compared to a control diet.

Alexandra Desbruslais

Speaker Biography:

After a 10-year career as a professional cellist, Alex switched fields to focus animal science. Initially working as a veterinary nurse in the USA, Alex then returned to the UK and to education via a Foundation Degree in Animal Science at NTU. During her degree, Alex began volunteering to help with research projects and successfully applied for a WPSA summer studentship award studying the effects of silica on poultry leg health. Alex continued to focus on poultry in her BSc final year, during which time she presented her UG research project at a UK poultry conference. In 2017 Alex was offered a PhD studentship jointly funded by NTU and AB Vista studying poultry gut health.

A Preliminary Investigation into the Effect of Urban Canopy Cover on Red Squirrel (Sciurus vulgaris) Road Traffic Mortality

Kat Fingland, Nottingham Trent University

Urbanisation is rapidly increasing on a global scale, altering available habitats and resources for wildlife. Despite the risks associated with road traffic, predation by pets, and loss of greenspaces, Eurasian red squirrels (Sciurus vulgaris) can thrive in these environments, potentially due to increased food availability.

The red squirrel was once widespread across the UK, but their numbers have crashed following the grey squirrel (Sciurus carolinensis) introduction and decades of habitat loss. It has been estimated that, without active conservation plans, they could disappear from mainland Britain within 30 years.

Using the red squirrel stronghold population in Formby, Merseyside, one aspect of this research aims to investigate causes and patterns of mortality.

By understanding the urban ecology of the red squirrel, an area that is currently lacking in research, long-term conservation strategies for this threatened native species can be developed.

Kat Fingland

Speaker Biography:

Kat is a part-time Academic Associate and part-time PhD student at ARES, researching urban ecology of red squirrels. Kat has a BSc (Hons) in Zoology from the University of Southampton and a MSc in Wildlife Management & Conservation from the University of Reading. Prior to joining NTU, Kat worked as a field research assistant for the James Hutton Institute, assessing mountain hare abundance in the Cairngorms. When she's not teaching or studying squirrels, Kat likes to spend her time scuba diving, climbing, or snowboarding.

Monitoring Equine Sleep Patterns

Kym Griffin, Nottingham Trent University

Recently the prevalence and severity of sleep deprivation in domestic horse populations has been highlighted. Research has shown that an inability of the horse to lie down due to either physical or behavioural deficiencies can result in spontaneous collapse and associated injury. However, it may be that more subtle changes to rest pattern occur long before spontaneous collapse and this could act as an early indicator suggesting the horse needs veterinary or environmental attention. In order to detect these subtle changes in rest we must first have a good understanding of what a 'normal' rest pattern is for a horse and how this may be influenced by daily variation in, for example, exercise. In this study, 15 riding school horses from Brackenhurst Equestrian Centre, Nottingham Trent University of varying breeds and ages were monitored over 7 nights each from 6pm to 6am. Behavioural observations and night time activity, daily level of exercise, and temperament were recorded. Analysis is ongoing and will be presented on the day of the conference.

Kym Griffin

Speaker Biography:

After completing a BSc (Hon) Zoology from James Cook University in Australia I moved to Northern Ireland to do a MSc in Animal Behaviour and Welfare. I then worked for 2 years as a research assistant on a BBSRC funded project looking at the welfare of commercially farmed pigs. In 2016 I started at Nottingham Trent University dividing my time between a part time PhD and work as an academic associate demonstrating and teaching on various equine and animal courses.

Ecological responses to hydrological dynamism in temporary rivers

Chloe Hayes, Nottingham Trent University

Temporary streams are watercourses which dry at a point in space or time, creating a mosaic of aquatic and terrestrial habitats. The dry phases of these ecosystems have been largely overlooked by aquatic and terrestrial science, and it is important the dry phase is studied in order to fully understand the ecosystem and assess the ecological quality. The aim of this section of the PhD is to characterise plant community composition in the dry phase from initial data collection and relate any changes in community composition to habitat qualities. The study sites, located in the Colne catchment, Hertfordshire, have differing environmental conditions. Mean Trophic Rank methodology has been, and will

continue to be used, to collect plant data. Data collected from April and May has been analysed using NMDS plots and PERMANOVA. Results indicated that sediment moisture was the most influential variable upon plant community composition, as would be expected in the earlier months of the study when streams are still drying. It can be expected that as stream drying continues throughout the year, other variables may also influence communities.

Chloe Hayes

Speaker Biography:

I am a second year PhD student in the Biosciences department at Clifton Campus. My research is on UK temporary chalk streams in the Colne catchment, Hertfordshire and the communities that occur during drying, with aims to aid the biomonitoring and restoration of these ecosystems. The research is split into analysis of existing aquatic invertebrate data, and the collection of novel data on the terrestrial and persisting aquatic flora and invertebrate communities.

The role of video feedback in equestrian sport

Jess Johnson, Nottingham Trent University

The health and welfare of horses and riders competing in the equestrian discipline of eventing has been a source of debate in recent times due to the number and severity of injuries occurring during the cross-country phase.

Video-feedback in sport has been shown to influence the decision-making process of an athlete, thereby impacting on their performance and competitive success, but it has not been well studied within the context of equestrian sport. Investigations have been conducted into the gaze behaviour of horse riders in terms of where they look and what information they can recall after the event, but these methods are difficult to apply in a competitive situation.

The proposed study aims to investigate visual behaviour of equestrians and non-equestrians when watching eventing video and then investigate whether or not video feedback can influence rider behaviour and, consequently, their performance and safety.

Jess Johnson

Speaker Biography:

Having gained a BSc (Hons) in Zoo Biology and an MRes in Anthrozoology, Jess is now undertaking a PhD in equine sports science investigating the potential for video feedback to improve performance and safety in equestrian sport. Jess is an experienced horse owner but previously had very little experience of eventing, so she brings a fresh perspective to the sport alongside her knowledge of human-animal interactions.

Investigating the relationship between behavioural and physiological responses to stressors in the horse

Aurelie Jolivald, Nottingham Trent University

Domestic horses are routinely exposed to potentially stressful training and management procedures. To safeguard equine welfare and handler safety, easily accessible and reliable indicators of the emotional response must be available to handlers. In both research and industry, behavioural indicators of active resistance to or avoidance of the procedures are used most often. However, emerging evidence suggests a disconnect between the presence or absence of these behaviour and the intensity of the physiological stress response. The aim of this study was to investigate whether behavioural indicators of stress commonly used in equines accurately reflected physiological stress responses in different contexts. To this end, horses were exposed to two mild stressors (novelty and startling stimulus). Adrenal and autonomous responses to each stressor were recorded, as well as context specific behavioural responses. No significant correlations were found between any of the behavioural and physiological indicators of stress used. This may be due to the confounding impact of coping style on the behavioural response pattern to stressors. This study adds to the evidence that behavioural indicators of stress currently used in horses may not accurately reflect emotional states and points to the importance of validating emerging behavioural indicators of stress against physiology.

Aurelie Jolivald

Speaker Biography:

After a degree in bioscience engineering in France specialising in animal welfare and behavioural neuroscience, I worked as a research assistant at the University of Bristol investigating cognitive bias in Drosophila and humans. I then completed an Equine Science MSc. In 2015 I joined NTU to conduct my master's research investigating the impact of bridle design on equine welfare. I then went on to start a PhD at NTU in October 2017 looking at coping styles in horses.

Investigating the relationship between behavioural and physiological responses to stressors in the horse

Alex Kemp, Nottingham Trent University

Skeletal health is a key aspect to maintaining a high standard of laying hen welfare. Calcium from the skeleton of the hen is used to create eggshell in the egg development process. The high rate of lay in modern strains of laying hens means that, overtime, the calcium reserves in the skeletal become depleted, leading to osteoporosis where the strength of the skeleton is reduced. Therefore, skeletal health in layers should be monitored closely to identify when interventions are required to decrease the occurrence of injuries related to poor skeletal integrity. In order to make appropriate interventions, established benchmarks values that indicate good skeletal health are needed. A set of small pilot studies were undertaken to determine which bones could be easily removed via dissection and which bones showed the highest sensitivity when morphometric measurements were taken, in order to quantify skeletal integrity. In previous literature a range of bones and measurements have been reported but there is no definitive bone or group of bones which are consistently used to assess skeletal integrity in laying hens.

Alex Kemp

Speaker Biography:

A 2nd Year PhD student at NTU studying Poultry Nutrition.

Investigating the relationship between behavioural and physiological responses to stressors in the horse

Katie Lee, Nottingham Trent University

Increasing badger numbers have been implicated in the decline of hedgehogs in the UK, although it is unknown whether this is due to direct predation or increased competition for food. To test this, we aim to utilise DNA metabarcoding to compare the diet of badgers and hedgehogs, quantifying both the level of dietary niche overlap and the rate of asymmetrical predation exhibited by these species. In traditional morphological analysis, intra-guild predation (where a predator is also a competitor) often goes undetected due to organisms being heavily digested. However, DNA metabarcoding provides a novel approach to assess diet, where hedgehog DNA could be detected from badger scats, quantifying the level of intra-guild predation. Dietary analysis will be compared with local prey availability across major habitat types, to better understand the dietary preferences of each species in the presence of one another and in relation to local prey availability. This study is necessary to improve specific management actions for conservation of the hedgehog.

Katie Lee

Speaker Biography:

After completing a degree in biology at the University of Hull, I continued on to study an MSc in Environmental Change, Management and Monitoring. My research project focused on utilising molecular methods to investigate the Intra-Guild Predation (IGP) relationship between the invasive Killer shrimp (Dikerogammarus villosus) and UK native freshwater shrimp. I then went on to start a PhD at NTU in October 2017 looking at IGP between the European badger (Meles meles) and European hedgehog (Erinaceus europaeus).

Evaluating Human-Carnivore Coexistence Using a Multi-Stakeholder Socio-Ecological Approach

Chloe Lucas, Nottingham Trent University

As the human population continues to expand, competition between humans and wildlife for resources increases. Depredation of livestock by carnivores inflicts significant socio-economic costs, whilst simultaneously threatening biodiversity when carnivores are excluded from these areas. Although a range of mitigation strategies are deployed to reduce this competition the success of these interventions is typically assessed using crude measures of perceived livestock losses. However, the perceptions of the people who live and work alongside carnivores (stakeholders) are not shaped by livestock loss alone. For people and carnivores to coexist, mitigation strategies that address the cause of conflict must be perceived as successful by all stakeholders. However, the extent of this human behaviour change is rarely included in mitigation evaluations.

This holistic investigation of stakeholder perceptions explores how successful coexistence or conflict-mitigation is understood by those stakeholders and elucidates the relationship between perceptions of coexistence and stakeholder behaviour towards carnivores in

South Africa. A range of methods from the social and natural sciences, including semi-structured interviews and camera trapping, is used to generate recommendations for improving the efficiency of coexistence interventions. This poster conveys the preliminary findings of the project to date and highlights current areas of ongoing research.

Chloe Lucas

Speaker Biography:

Chloe is a PhD student at NTU studying human-carnivore coexistence in South Africa. Chloe has a masters degree in Biological Anthropology from Durham University and has worked in various wildlife conservation projects in Kenya, Malawi and South Africa.

Developing a Sustainability Assessment Toolkit for Abaca Plantation Agriculture

Dinish Nadaraj, Nottingham Trent University

Abaca (Musa textilis Nee) is a tropical plant that is native to the Philippines. It is the source of the biodegradable fibre that is known internationally as Manila hemp. With the rising interest in biodegradable products, there is an increasing demand for this fibre particularly in the manufacturing of specialty papers such as currency notes and tea bags. Although research regarding sustainability in agriculture has been carried out for different types of plantation agriculture, there is a lack of research specifically regarding sustainability in abaca plantation agriculture. Therefore, the aim of this research is to develop a sustainability assessment toolkit for abaca plantation agriculture in Indonesia via a participatory action research (PAR) methodology. A mixed methods approach is taken, combining qualitative (via a systematic review and semi-structured interviews) and quantitative (via the Delphi questionnaire) data to identify sustainability indicators to be incorporated into the sustainability assessment toolkit. A total of 103 sustainability indicators have been identified. Further work will be required to limit and reach a consensus among the stakeholder regarding key sustainability indicators to be used within the toolkit, and to test the practical applicability of the key indicators (and toolkit as a whole) in assessing the sustainability of the abaca plantation.

Dinish Nadaraj

Speaker Biography

Dinish is a second year PhD Student. Dinish has a BSc (Hons) in Biotechnology and Environmental Management at Monash University, and a master's degree in MSc Sustainable Energy at the University of St Andrews. His research interests include sustainable development, sustainability in agriculture and sustainable agribusiness.

Animal movement ecology in urban and rural landscapes

Jessica Schaus-Calderon, Nottingham Trent University

The movement of individuals is a vital ecological process. However, despite advances in movement and urban ecology, our understanding of animal movement in urban landscapes, and its comparisons with rural landscapes, remains limited.

This study aims to investigate the space-use behaviour of the European hedgehog (Erinaceus europaeus) using their movement patterns across urban and rural landscapes.

GPS data from 24 and 13 individuals were collected from five urban and four rural sites, respectively. Hidden Markov models (HMMs) were used to discern movement patterns. HMMs revealed that two behavioural states best describe hedgehog movement: foraging (short step-lengths and large turning angles) and walking (long step-lengths and small turning angles). Male hedgehogs travelled longer distances and moved faster than females. Females spend more time foraging than walking, whether males spend the same time in both states. Urban females spend more time foraging than rural individuals, but no difference was found between urban and rural males.

Differences in space-use and movement behaviour can be explained due to the ecology of the species and the features of each habitat, where females prioritize finding suitable resources. Also, more accessible access to resources in urban habitat may be having an impact on the time females spend foraging.

Jessica Schaus-Calderon

Speaker Biography:

I obtained a BSc Biology in Spain in 2012. I then went on to work in the reintroduction project of the European mink in Germany and as a Zookeeper in England. I enrolled in NTU to complete an MSc Endangered Species Recovery and Conservation in 2015.

In 2017, I started a PhD at NTU investigating the urban ecology of the European hedgehog using animal movement and camera trapping data.

Glacial lakes on an alpine debris-covered glacier

Anne Stefaniak, Nottingham Trent University

The number and size of glacial lakes in the European Alps are increasing in response to warming temperatures and climatic change. Such lakes can store large volumes of water effecting proglacial runoff whilst enhancing ablation patterns. Bathymetric surveys of the glacial lakes at the Miage glacier in the Mont Blanc massif were conducted in June/July of 2017 and 2018 using a remote-control survey boat collecting sonar data, along with terrestrial Structure from Motion (SfM) surveys of the surrounding ice cliffs from which 3D models were generated. The total volume of water stored in glacial lakes at the Miage glacier increased by 46% between 2017 and 2018 of which supraglacial ponds hold 8 % of the water volume stored at the glacier. Growth of supraglacial ponds is predominantly driven by ice cliff surface melt enabling areal expansion, resulting from ice cliff retreat rates of 0.93 m a^{-1} to >8 m a^{-1}, resulting in a total ice volume loss of 39,569 m^3 from the ice cliffs surveyed. The results are consistent with previous studies highlighting the presence of ponds and ice cliffs as 'hot-spots' of melt on such debris-covered glaciers and are important to assess and monitor for future water resource management.

Anne Stefaniak

Speaker Biography:

Anne undertook her MSc in Glaciology at Aberystwyth University having studied at the University centre in Svalbard (UNIS). As well as a keen interest in the outdoors and glaciology, she has completed multiple triathlons including two 70.3 distances including the Outlaw Holkham.

Anne is currently undertaking her PhD investigating controls on the formation of supraglacial ponds with research in the European Alps on the Miage glacier of the Mont Blanc massif, and the Nepalese Himalayas on the Himal Chuli glacier in the Manaslu region.

Whilst doing her PhD part-time, Anne also works as an academic associate teaching on undergraduate geography and environmental science modules.

Natural Flood Management

Joshua Wells, Nottingham Trent University

In July 2013, Southwell (Nottinghamshire) was affected by a high magnitude flood event from a convective storm. The catchment is around 6km2 and dominant soils are clay loams (slowly permeable).

A network of water level monitoring equipment was installed in the catchment. A section of artificially straightened stream was restored to a more natural state. Five bunds (combined storage capacity ~2500m3) were constructed, using earth excavated during the restoration. These retain surface runoff during high intensity rainfall and release it slowly into the stream.

Three bunds had water level monitors installed. Change in water volume was calculated for each time step during high flow events. These data, with the stream discharge, produce a hydrograph representing conditions if overland flow stored within the bund had entered the stream directly. Catchment ratios were used to estimate storage within ungauged bunds. Results show reduction of up to 38% (39.0 l.s-1) in peak discharge of at the slope scale, with discharge delayed from the peak onto the falling limb of the hydrograph. However, reduction at the catchment scale was only 2% (16.7—19.9 l.s-1). Therefore, increasing the amount of storage within the catchment would be necessary for a more significant impact during flood events.

Joshua Wells

Speaker Biography:

Josh Wells is currently a 4th year PhD Student at Nottingham Trent University, using an interdisciplinary approach to assess the wider barriers to the uptake of Natural Flood management (NFM). This includes implementing and monitoring an experimental NFM project in Southwell, Nottinghamshire, as well as interviewing land managers and Flood Risk Management professionals across the UK.

He previously completed an MSc in Environmental Management at the University of Nottingham and BSc (Hons) Geography at Nottingham Trent University. He is now also working for Trent Rivers Trust as a Project Officer, designing and undertaking wider NFM and river restoration work.