



**UNIVERSITY OF
STIRLING**

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

SCHOOL OF NATURAL SCIENCES

WINTER SYMPOSIUM

3RD AND 4TH DECEMBER 2013

LOCATION : LOGIE THEATRE

PROGRAMME and ABSTRACTS

WINTER SYMPOSIUM

The winter symposium will all be based in and around the Logi Lecture Theatre. Our first year PhD students will be presenting posters and our second and third year PhD students will be giving talks. PhD talks will be for 12 minutes, with 2-3 minutes for questions at the end. We also have a number of other talks (see below)

Teas and coffees, as well as the buffet lunch on Tuesday 3rd will be served in the foyer of the Logi Lecture Theatre.

Poster Session

Please remember the poster session that will run during the lunch break on Tuesday 3rd, come along and eat the FREE lunch, and talk to our first year PhD students about their projects and plans for the future.

Plenary Addresses

We will start each day with a plenary address. Prof Andrew Tyler and Prof Mike Billet have kindly agreed to talk about their research and pass on some lessons for us all to learn from.

Stirling University PhD Alumni Lecture

Dr Karen Spencer began her PhD at Stirling University in 1996; after graduating she continued working in research and is now based at The University of St Andrews. Karen's talk should offer inspiration to all our PhD students for their future careers.

Best PhD Student Publication Address

Publishing research papers during a PhD before thesis submission provides a huge advantage for getting a first job after graduating. To support and encourage early publication of results, all the papers written by our current PhD students have been judged – the winner will receive a prize in exchange for talking about their paper.

Guest Lecture

Dr Gordon Buchanan received his honorary degree from Stirling this summer. Gordon has had a varied career in wildlife documentary filming including 'The bear family and me' and 'the polar bear family and me'. He will be awarding prizes for the best poster and talk before bringing the symposium to a close with a talk called 'The value of nature'. Undergraduates and other members of the university will join us in Logi for this final talk.

Feedback

Could all staff and PhD student please fill in the feedback sheets for PhD posters and PhD talks – this is a really useful opportunity to offer and receive constructive feedback.

PROGRAMME

Tuesday 3rd December 2013

Session 1		Chair: Matt Tinsley
09.30 – 10.00	Prof Andrew Tyler	The long-term impact of a failed NERC grant: <i>A particular tale of beaches, bombs and bloody-mindedness</i>
10.00 – 10.15	Zarah Pattison	Assessing the impact of changing river flows on the distribution and abundance of riparian, invasive alien plant species
10.15 – 10.30	Lucinda Kirkpatrick	How do silvicultural practices affect bat plantations in coniferous plantations
10.30 – 10.45	Claudia Mansilla	Late - glacial/Holocene vegetational history of Fuego_Patagonia, southern South America (53-54°S).
10.45 – 11.15	Break for tea and coffee	
Session 2		Chair: Kirsty Park
11.15 – 11.45	Dr Karen Spencer	Developmental programming in birds: integrating behaviour brain and physiology
11.45 – 12.00	Anna Doeser	Investigating the responses of aquatic macroinvertebrates to the hydromorphological modification of river channels: a case study of the remeandering of the Rottal Burn.
12.00 – 12.15	Helena Stewart	Peat's secret archive: reconstructing the North Atlantic storm frequency and volcanic eruption history of the last 10,000 year
12.15 – 12.30	Paul Lintott	Sexual differences in foraging behaviour and habitat selection in temperate bats
12.30 – 14.00	Poster Session A buffet lunch will be served in the Logi Lecture Theatre foyer	
Session 3		Chair: Richard Quilliam
14.00 – 14.30	Prize winner	Talk on outstanding PhD Publication
14.30 – 14.45	Anwen Bill	Investigating the responses of aquatic biota to hydromorphological modifications of lakes
14.45 – 15.00	Adam Varley	Spectral unfolding of borehole measurements taken at a ²²⁶ Ra contaminated site
15.00 – 15.15	Caroline Griffin	Blue flags or red herrings?
15.15 – 15.45	Break for tea and coffee	
Session 4		Chair: Nils Bunnefeld
15:45 – 16.00	Junyao Sun	Can hydrological connectivity and landscape diversity be used to explain patterns in macrophyte species richness and diversity in UK lakes?
16.00 – 16.15	Tom Parker	Snow in treeline ecosystems: important influences all year round
16.15 – 16.30	Elizabeth Herridge	What explains mating system diversity in dance flies?
End of day one		

Wednesday 4th December 2013

Session 5		Chair: Daisy Dent
09.15 – 09.45	Prof Mike Billett	Fast-tracking carbon to the atmosphere - the role of peatland streams
09.45 – 10.00	Cerian Tatchley	Turbine in your backyard: What does the public think about small wind turbines?
10.00 – 10.15	Rebecca Barclay	Histosol-andosol interfaces as human eco-dynamic records: formation and cultural use of wetland areas, vatnsfjörður, Northwest Iceland
10.15 – 10.30	Jessica Scriven	Distribution and ecology of a cryptic bumblebee species complex
10.30 – 11.00	Break for tea and coffee	
Session 6		Chair: Peter Hunter
11.00 – 11.15	James Blaikie	Palaeoecological reconstruction of rapid Late Glacial - Holocene environmental change for Patagonia, southern South America
11.15 – 11.30	Jennifer McKeown	Is timing of arrival a key factor in migration?
11.30 – 11.45	Renee Hermans	A study of greenhouse gas fluxes during blanket peat bog restoration from forestry plantations in the Flow Country of Northern Scotland
11.45 – 12.00	Pause	Prize committee meets
12:00 – 13:00	Dr Gordon Buchanan	Prize giving for best presentations. Guest lecture: 'The value of nature'
End of day two		

First Year PhD Students – Poster Presentations

Contaminant uptake by benthic microalgae in the intertidal zone

Amani Becker

Dr David Copplestone, Prof Andrew Tyler and Dr Nick Smith (National Nuclear Laboratory)

Microphytobenthos, a mixed community of microscopic algae inhabiting the top few millimetres of bottom sediment in the intertidal zone, is a key component of the estuarine ecosystem. Estuarine sediments are a significant sink for contaminants from both fluvial and marine sources.

Algae are known to have the capacity to take up contaminants, and the phytoplankton has been well studied in this respect, however there has been little research involving benthic algae. It is probable that this is due to complexities of bioavailability of contaminants in the intertidal zone coupled with the difficulties of separating microalgae from the sediment.

A mesocosm (or experimental enclosure) is being constructed to replicate the natural system and enable manipulation of conditions of interest. This will attain greater realism than laboratory toxicity tests, with more statistical power than can be achieved through field studies.

By gaining a better understanding of processes governing contaminant bioavailability and mechanisms for uptake by microphytobenthos it will be possible to relate these to projected climate change effects and ascertain potential consequences for contaminant redistribution.

Informing long-term strategic planning for environmental management in a complex socio-ecological system, the tropical forests of Gabon.

Emma Bush

Dr Nils Bunnefeld, Dr Kate Abernethy, Dr Daisy Dent and Prof Al Jump.

The land cover of Gabon is over 80% tropical forest and alongside the rest of the Congo basin demonstrates the lowest deforestation rate of all the major tropical forest regions. In 2002, 10% of the country was protected under the National Park system with the ambition of developing Gabon as a future ecotourism destination. However threats to the forest remain as ivory poaching and bushmeat hunting increase and logging roads open access to forested areas. We present our anticipated “plan of action” to explore the links between climatic variation, tree phenology and primate and large herbivore abundance to inform on the sustainability of tourism and long-term strategic planning within this socio-ecological system.

Data available include a unique long-term landscape-scale dataset of tree phenology (collected over 30 years), data on abundance of primates (gorillas, mandrills), large herbivores (elephants) and local and pan-African climate. Data to be collected include social survey with people living locally to Lopé National Park, tourism operators who seek to sustainably exploit the natural “spectacles” of Gabon and National Park Management to assess the economic and social sustainability of the National Park system under future climate scenarios and to identify key ecological information needed to develop successful ecotourism.

Seabird Mediated Impacts of Marine Environment Changes on Agri-Ecosystem Productivity

Lee Dark

Dr. Kirsty Park, Dr. David Johnson and Dr. Lucy Gilbert

Seabirds are a key vector of allochthonous material to islands upon which they roost and nest. By feeding in the productive marine environment, seabirds transfer energy and biomass to relatively unproductive and nutrient-limited island food-webs. Here we present preliminary evidence to test the hypothesis that great skua (*Stercorarius skua*) activity can influence wider ecosystem processes. We sampled three separate skua colonies comprising breeding mounds, club sites and minimally occupied intra-colony areas and matched control sites. The results showed that plant species richness was greater in areas that experienced higher nutrient input. Plant productivity was also significantly greater, probably as a result of higher concentrations of NO₃, NH₄ and total nitrogen and phosphorus from guano inputs to soils. The study suggests that great skuas have an important effect on the local island ecosystems; modifying plant species richness and productivity as well as plant and soil nutrient composition. The research highlights the importance of understanding the balance of nutrient flows, trophic linkages and the potential for anthropogenic activities to disrupt these balances e.g. through industrial fisheries. Subsequent work as part of a PhD will focus on nitrogen dynamics in this system, and its role in driving plant productivity and plant community differences in great skua colonies.

Understanding earth mortars in Scottish vernacular built heritage: conservation and repair in a period of environmental change

Niamh Elliott

Dr Paul Adderley and Dr Alasdair Ross

This project seeks to use both historical and process-based research to investigate and analyse the history, the material properties and in holistic terms, the functioning and performance of the earth-built vernacular heritage at a study site in Moffat. Considering this study site and its context as part of the Annandale Estate the project combines aspects of heritage climatology and, building materials science, and places these within the framework of cultural and economic development seen in the built heritage of Scotland from the mid-18th century to the present day.

By seeking to understand the significance and performance of the indoor climate in earth-built architecture the project will inform conservation and repair of the vernacular built heritage and contribute to a greater understanding of traditional materials and context. Furthermore, It will inform care, maintenance and restoration of the historic built heritage in both private and public ownership and provide a platform for developing contemporary innovations in sustainable heritage management.

The effects of hydroelectric dams on tree communities and carbon storage in the Brazilian Amazon

Isabel Jones

Dr Daisy Dent, Carlos Peres (UEA), Henrietta Boyd (Permian Global)

Tropical forests are valuable for biodiversity and ecosystem function, yet are undergoing high rates of loss. Hydroelectric projects are an emerging driver of loss, particularly in lowland Amazonia. In Brazil alone ~662,000 ha of primary forest have been removed through reservoir creation; ten additional dams are planned for development by 2022. Shallow topography of the Amazon basin results in low ratios of hydropower per unit of flooded area. Some dams emit more carbon (C) than they offset through 'green' energy production. The Balbina Hydroelectric Dam is responsible for 3% of total CH₄ released across the Amazon floodplain, and produces <50 % of its expected energy at the expense of 236,000 ha of primary forest. Flooding created an archipelago of ~3,500 isolated forest islands. Such forest communities are poorly studied, however edge effects are expected to cause an increase in early successional species; erosion of old growth communities is likely to have implications for long-term C storage. Using 87 0.25 ha forest plots, this PhD focuses on tree community change, differential responses of functional groups, and implications for long-term C storage in island forest communities. This is currently neglected in policy and environmental impact assessments for hydroelectric project development in the Amazon, and globally.

Reconstructing past landscapes in the Scottish Northern Islands

Melanie Kingsbury

Dr Bob McCulloch and Dr Eileen Tisdall

The Northern Scottish Islands are located in a unique transitional area between the Atlantic and the North Sea, on the edge of deep ocean and the European continental shelf, and are heavily influenced climatically by the North Atlantic Current and the Shelf Edge Current (Biglow et al. 2005). Research into past climates in this region has been constrained to archaeological sites and can be discontinuous due to the episodic nature of study sites (Biglow et al. 2005) or at a low temporal resolution which would not detect changes over shorter time-scales (Nesje et al. 2006).

For this study, lakes from Shetland, Orkney and possibly the Western Isles will be sampled for pollen, diatoms, and geomorphological variables. Pollen and diatoms have established sensitivities to different indicators and will be used in conjunction with other variables to: i) Provide more detail to the timing of events determined by pollen records by using different proxies, and to determine what dominant environmental variables may be driving these responses; ii) Determine if changes correlate to sea ice cover, alterations of sea currents or storm events from published data; iii) Provide a continuous palaeoenvironmental record to reconstruct the changing physical and cultural landscape in the region.

Development and Adaptation of Algorithms for the Estimation of Global Carbon Budget in Lakes

María Encina Aulló Maestro

Dr Peter Hunter and Prof Andrew Tyler

There is increasing evidence that lakes play an important role in regional and global biogeochemical cycling, particularly in the storage, transport and transformation of carbon. However, there is much uncertainty about how the role of lakes in carbon cycling is likely to be modified under future climate change. The estimation of global carbon stocks in lakes is hampered by the fact that there are over 305 million lakes on Earth and the vast majority of these systems, particularly those in remote and inaccessible locations, have never been previously studied or monitored.

The forthcoming generation of Earth-observing satellites, such as the European Space Agency's (ESA) Copernicus programme, will provide new capabilities for observing lakes at a global scale and at high spatial and/or temporal resolutions. In this framework it is needed to develop and validate algorithms for estimating lake biogeochemical properties applicable to these new sensors.

The overall aim of this project is to develop and adapt algorithms for the estimation of carbon-relevant metrics, for application to ESA's forthcoming Sentinel-3 OLCI satellite (300-1200m spatial resolution). The further application of these algorithms to Sentinel-2 MSI and the recently launched Landsat-8 satellite (10-60m and 30m spatial resolution respectively) will extend observations to finer scales allowing measurements on even small lakes.

The role of parasites in biological invasions

Katie Murray

Dr Matt Tinsley, Dr Helen Roy (CEH) and Dr Luc Bussiere

Biological invasions can have huge impacts on biological diversity in an invaded range. The enemy release hypothesis suggests that invasive species spread so rapidly because of the lack of parasites, predators, pathogens and disease in their invaded range. However, over time parasites of native species in the invaded range may adapt to utilise a novel host and influence the overall strength of the invasion. Invasive species also have the potential to bring with them biological weapons, in the form of pathogens and disease, which can contribute to the decline of native species. The Harlequin ladybird has been described the most invasive ladybird on earth. Arriving in the UK in 2004, it has since become the most common ladybird in areas of South East England. This invader has caused worrying declines in native ladybird species in the UK and Europe. My PhD will aim to investigate the role of parasites in biological invasions, focusing on the Harlequin ladybird and its invasion in the UK. I aim to answer questions relating to parasite host switches, parasite adaptation to novel host species and biological weapons.

Ecological genomics of *Mimulus guttatus*

Pauline Oliveira Pantoja

Dr Mario Vallejo- Marin and Dr Timothy Paine

Many plants have the capacity to reproduce sexually and asexually and the allocation pattern between both modes of reproduction can vary with environmental conditions. A phenotypic trade-off between sexual and asexual reproduction has been demonstrated to occur because of limited resources although few information is available whether this trade-off exists at genetic level. The aim of the study is to analyse the existence of trade-offs at genetic level between sexual and asexual reproduction in different environments and understand the importance of these modes of reproduction to population success and genetic diversity of the herbaceous plant *Mimulus guttatus*. I will determine the correlation between ecological success and the contribution of both modes of reproduction of *Mimulus* across the United Kingdom. I will use microsatellites markers to identify whether plants were produced by sexual or asexual mean and the ecological success will be estimated as the average of phenotypic traits. I will conduct a SNP genotyping using a F2 generation grown in seasonally and permanent wet conditions. F2 individuals will be used for GWAS mapping in order to determine whether similar or different genome regions are involved with the relative investment in sexual vs. asexual reproduction, and whether environment mediate this investment.

Long-term environmental and health implications of morphological change and sediment transport with respect to contaminants

Christopher Sneddon

Dr David Copplestone and Prof Andrew Tyler

The EPSRC-funded Adaptation and Resilience of Coastal Energy Supply (ARCoES) project encompasses four research strands, involving 14 institutions and five PhD studentships. ARCoES aims to determine the threats posed to future energy generation and the distribution network by flooding and erosion, changing patterns of coastal sedimentation, water temperature and the distribution of plants and animals in the coastal zone. As well as having important consequences for the operation of coastal power stations, these climate change impacts also affect the neighbouring coastline and coastal waters. The ARCoES project also aims to provide a framework for evaluating the impact and alternative responses to the threats identified.

As a key contribution to the ARCoES research aims, the University of Stirling is researching the long-term environmental and health implications of remobilisation and transport of contaminated sediments around the UK coastline. Using a synergy of hyperspectral and topographic information the mobilisation of sediment bound contaminants within the coastal environment will be investigated. Potential hazards posed by contaminants are determined by pathway availability, one being variation in source burial depth. This will be investigated temporally to establish how the hazard varies for differing energy environments. Weather data and dosimetry will be used to achieve an understanding of the variation in hazard seasonally and under 20, 50, 100 year storm conditions.

Second and Third Year PhD Students – Oral Presentations

Histosol-Andosol Interfaces as Human Eco-dynamic Records: Formation and Cultural Use of Wetland Areas, Vatnsfjörður, Northwest Iceland

Rebecca Barclay

Prof Ian Simpson and Dr Eileen Tisdall

Because of their development in-situ over extended time periods, organic soils are an important record of the intimate relationship between societal and environmental change. In this paper we offer new insights into land management adaptations as Norse settlers arrived and colonised the previously pristine landscapes of Iceland. Our soil record from Vatnsfjörður, NW Iceland is chronologically constrained through a combination of tephrochronology and radiocarbon measurement, and is associated with a tenth century long house and subsequent settlement into the medieval period as the locality emerged as one of the richest by the late Icelandic Middle Ages. Integration of field survey, thin section micromorphology and pollen analyses together with documentary records indicates human involvement in the creation of wet meadows in Iceland, enhanced to give sustained fodder production for over-wintering livestock in an environment that inherently had a short growing season and lacked soil fertility. The findings have wider implications for understanding the emergence of resilient and sustainable communities in agriculturally marginal environments.

Investigating the responses of aquatic biota to hydromorphological modifications of lakes

Anwen Bill

Dr Nigel Willby and Dr Chris Bromley (SEPA)

The importance of European lakes for conservation and resource use is widely recognised. Hydromorphological modifications impact lake littoral zones, affecting macrophyte structure and composition of macrophyte and littoral invertebrate communities. Such alterations are considered to be a major pressure on lakes, second only to eutrophication.⁵⁰

The EU Water Framework Directive (WFD) requires a more holistic assessment of freshwater environments, within which the hydromorphological attributes of standing waters are a key consideration. This obligation has revealed key knowledge gaps involving the interactions between the morphodynamics of lake littoral habitats, habitat quality and the integrity of lake flora and fauna and the effect that water level regulation or shoreline modification can have on these interactions. Though the stresses imposed by these activities are understood in principle, empirical research is sparse. For example little is known regarding the extent and scale of damage caused, which mechanisms are key and which system properties may offer resilience or impart sensitivity.

My research, aims to improve understanding of the empirical relationships between hydromorphological pressures and loch ecology. The implications of this work will be discussed along with an overview of the main research avenues and the progress completed to date.

Palaeoecological reconstruction of rapid Late Glacial - Holocene environmental change for Patagonia, southern South America

James Blaikie

Dr Robert McCulloch, Dr Eileen Tisdall and Dr Andrew Dugmore

This project will provide a high-resolution record of climatic and environmental change for the southern hemisphere region of Patagonia. The palaeoclimatic history of southern South America (also known as Patagonia), is dominated by the strength and latitudinal position of the Southern Westerly storm tracks, which are presently centred on ~50°S. Patagonia lies along this zone of high precipitation and past migrations of these storm tracks can be mapped through fluctuations of the Patagonian ice fields and the response of the surrounding vegetation cover.

To reconstruct the Late Glacial and Holocene environments of this region the project will produce records of vegetation change using pollen analysis (Palynology) from lake and peat sites. Pollen analysis remains the most powerful technique for the reconstruction of past landscape change due to the spatial nature of the data and the temporal continuity in the records. Deep basin sediments (both lacustrine and peat) have been identified along an north-south transect between 47°S and 55°S to provide temporally high-resolution sediments. These records will be reinforced through lithostatigraphic analyses (organic content, peat humification and geochemistry) and constrained in time using radiocarbon dating and tephrochronology.

It is anticipated that the palaeovegetation records, focusing on the latitudinal shifts in ecotones, from the warmer climate of the north to the sub-polar regions in the south, will circumscribe the timing and extent of temperature changes during the Late Glacial/Holocene transition and shifting focus of precipitation during the Holocene at sub-centennial scale.

Investigating the responses of aquatic macroinvertebrates to the hydromorphological modification of river channels: a case study of the remeandering of the Rottal Burn.

Anna Doezer

Dr Nigel Willby

In line with advances in river science and approaches to river management, environmental policy has begun to adopt more a holistic and multi-disciplined approach to water body assessment and classification, with statutory requirements introduced through the EU Water Framework Directive (WFD).

In stream aquatic macroinvertebrate communities are commonly studied to infer the presence or functioning of wider scale resources or hydromorphological processes and structures that are assumed to support their biological requirements. This makes the study of aquatic macroinvertebrates well suited as a proxy for environmental conditions that would be difficult and time consuming to measure directly, thereby allowing efficient and biologically meaningful monitoring.

This presentation outlines the methods and case studies employed in year one of a study to investigate biotic - abiotic relationships and response to change in river systems. Two aspects of our current understanding are questioned. Firstly the scales of survey and investigation commonly used, and secondly the nature of the relationships and response itself. Preliminary results from a case study of an upland stream subjected to restoration, by remeandering a previously straightened channel, are presented. The key drivers of community composition are evaluated within and between disturbance treatments for Ephemeroptera and Plecoptera.

Blue Flags or Red Herrings?

Caroline Griffin

Dr Andre Gilburn and Dr Daisy Dent

Many popular tourist beaches in Scotland, and indeed the rest of the world, often try to attain a beach award in order to try and attract more tourists to their beaches. The promise of high levels of water quality, facilities such as café's, toilets and shops and the promise of clean sand which is free from litter are used as a marketing tool to try and entice tourists to spend money in the local area.

But how relevant are these awards? Do people make choices based on the awards or are they simply a way for beach managers to increase their spending power? Are people more interested in the natural resources available at beaches and the ecosystem services that they provide?

One way that economists can try to value an environmental good or attach a value to unpriced services provided by the natural environment (i.e. those provided by a beach) is to find out peoples willingness to pay for those services. One such technique is called a Choice Experiment. I am currently designing and carrying out both revealed and stated preference choice experiments to try and assess peoples' preferences for certain attributes when they choose to visit a certain beach. This presentation will introduce the concept of choice experiments and explain the two different experiments I am currently undertaking.

A study of greenhouse gas fluxes during blanket peat bog restoration from forestry plantations in the Flow Country of Northern Scotland

Renée E. M. Hermans

Dr Jens-Arne Subke, Neil Cowie (RSPB), Yit Arn Teh (St. Andrews), Roxane Andersen (Environmental Research Institute/UHI).

The Flow country in the far North of Scotland has the largest expanse of blanket peat bog in Europe. With peat depths of up to several metres, this area represents a significant carbon store. Large parts of the Flows were drained for afforestation with non-native conifers during the 1980s, which resulted in considerable damage to the peat and leading to significant carbon loss. To restore the peats, the Royal Society for the Protection of Birds (RSPB) started in late 1990s to fell trees and block drains. Over 2000 ha of forestry are already felled and in the next few years a further 200 ha will be felled within a newly acquired plantation. The main objective of my PhD is to measure the impact of forest removal on the budget of three main greenhouse gases, CO₂, CH₄ and N₂O. For this, I am using closed chambers to be able to look into the local variations of the fluxes. In order to partition different sources of the fluxes, I record water table depth as well as soil moisture and soil temperature (both measured at two different depths) in order to capture abiotic conditions likely to determine microbial activity and therefor CO₂, CH₄ and N₂O production. Further I monitor plant species (particularly bryophytes) change over time at the research locations; different species create different micro environments and have different effects on the fluxes. Measurements will be done over two to three years, allowing an investigation of temporal variations. These measurements will be done in open, undisturbed bog (control plot), in forest (control plot), in recently felled areas and in areas that were felled up to 16 years ago, creating a chronosequence to follow the effects of restoration. I here present the overall experimental structure and preliminary results of the first fluxes.

What explains mating system diversity in dance flies?

Elizabeth Herridge

Dr Luc Bussière and Dr Andre Gilburn

What explains diversity among mating systems is complex and controversial. One important determinant of sex differences in the reproductive behaviour (sex roles) is mating competition, influenced by the relative number of males and females available to mate (the operational sex ratio, OSR). The OSR is the result of sex differences in life history and can be influenced by the adult sex ratio (ASR) and mating latency. However, theory suggests that individuals with short periods of mating latency will be selected to mate more frequently regardless of OSR, and a biased OSR will not always drive a competitive response. There are few empirical studies that assess the relative importance of these factors for predicting transitions in mating system. Dance flies have highly diverse mating systems; with females of closely related species showing strikingly varied levels of sexually selected ornamentation. Adult females in many dance fly species receive all their dietary protein from “nuptial gifts” provided by males during mating. It is thought that competition for male donations has caused sex-role reversal in several lineages. I will present data suggesting that the OSR covaries with sex roles imperfectly in dance flies, and that time away from mating swarms is not the sole driver of sexual differences. Our capture-mark-recapture data reveal sex differences in swarm attendance in several dance fly species and suggest that while females from ornamented species visited mating swarms more frequently than those from unornamented species, male swarm visitation did not differ across mating systems.

How do silvicultural practices affect bat plantations in coniferous plantations

Lucinda Kirkpatrick

Dr Kirsty Park, Dr Daisy Dent and Sallie Bailey from Forestry Commission

Around 80% of the forest cover in Scotland, and 70% of forest cover in England consists of commercial coniferous plantations, with fast growing exotic species such as Sitka Spruce commonly planted. Plantation forests have long been seen as ecological deserts with little value for biodiversity, yet recent studies have shown that coniferous plantations can act as an important habitat for diverse taxa such as fungal or invertebrate species, and act as a vital habitat for charismatic threatened species such as the red squirrel or the capercaillie. Almost all bat surveys carried out in the UK have found active selection against coniferous plantations although both anecdotal evidence and the results of bat box trials have shown that some species of bats are making use of coniferous plantations for both foraging and roosting. Therefore it is clear that plantation forestry could be a useful habitat for bats, but it is unclear how and which species are using the habitat.

Bats have been designated an indicator species by the UK government due to their sensitivity to land use changes and their role as top predator of many nocturnal insects. All UK bat species are protected under Annex IV of the EC directive 92/43/EEC meaning it is a criminal offence to deliberately or recklessly injure or disturb an individual, or to damage or destroy a breeding site or resting place, whether deliberate or not. My thesis aims to address these gaps in our knowledge by establishing which species are using the plantations, how and when species are using coniferous plantations, how this differs to use of surrounding habitats such as deciduous woodland, and how different felling regimes influence bat use of the forest. This will inform the timing and scale of felling practices helping to ensure compliance with EU legislation, and for the benefit of bat conservation. This talk will concentrate on some of the (very!) preliminary results from my first field season and the direction I intend to take for the next two field seasons.

Sexual differences in foraging behaviour and habitat selection in temperate bats

Paul Lintott

Dr Kirsty Park and Dr Nils Bunnefeld

Differences in habitat selection between sexes are widespread amongst vertebrate groups. Behavioural differences between sexes are found in many bat species, including roost selection, foraging activity, and during migration. The high energetic demands of pregnancy and lactation can prevent female bats foraging in sub-optimal locations including marginal upland habitat and arable land. It is well documented that woodland is an important habitat for bats due to foraging and roosting opportunities. Within urban areas, however, woodland is of variable quality, subject to invasive species encroachment and consists of small, fragmented patches. The aim of this study was to examine differential responses of male and female bats to woodland character, patch configuration and the composition of the surrounding landscape in fragmented urban woodland patches. We caught a total of 119 adult *Pipistrellus pygmaeus* within 27 of the 32 urban woodlands surveyed within Central Scotland. Whilst females (n = 52) responded strongly to several local and landscape characteristics (i.e. they were more likely to be found in woodlands with high tree species richness, compact shapes, and with high connectivity to surrounding woodland), male abundance (n = 67) was largely unaffected by these variables. Selective foraging by females within urban woodland may alter our understanding of the adaptability of bat species to urbanisation.

Late - glacial/Holocene vegetational history of Fuego_Patagonia, southern South America (53-54°S).

Claudia A. Mansilla

Dr. Robert. D. McCulloch and Dr. Eileen Tisdall

The region of Tierra del Fuego, is an ideal place for the reconstruction of past vegetation communities changes and inferring the climatic conditions under which these changes took place, due to its subantarctic physical setting, topography and climate. Among the different vegetation communities of the Fuegian region, the forests of *Nothofagus* have been the dominant type and were able to survive in refugia during the last glacial period. Moreover, *Nothofagus* forests have historically been an important source of food and shelter for the early inhabitants of this region. Despite their importance, few high resolution palaeoecological records are currently available and as a result, the links between the environmental changes and human settlement and migration across Fuego-Patagonia during the late-glacial and early Holocene are not fully understood.

The goal of the present study is to reconstruct past vegetation communities through the extraction of cores from peatlands and the analysis of high resolution pollen fossil records. Study sites will be located along the present ecotonal boundaries of *Nothofagus* forest and the steppe zone on the island of Tierra del Fuego. Pollen records will be supported by lithostratigraphic analysis, radiocarbon dating and tephrochronology.

The analysis from palaeoecological records performed here will have the potential to help addressing the following issues: i) the timing and rate of vegetation migration and colonization of deglaciated terrain during the Late-glacial/Holocene transition, ii) the establishment and migration of subantarctic *Nothofagus* forest across Fuego-Patagonia, iii) the relationship between fire frequency and changes in vegetation communities and iv) to infer climatic changes from the palaeovegetation record.

Is timing of arrival a key factor in migration?

Jennifer McKeown

Dr Andy Hoyle and Dr Andre Gilburn

Some species, notably avian species, exhibit sex differentiated timing of migration to breeding grounds. If the male arrives first this is called protandry. Today I will present the ideas and results behind a mathematical model of protandry and migration timing I created and use it to explain the theory between some of the main hypotheses for sexually dimorphic migratory arrival timings. I will also explain my plan of using the model to help determine if timing of arrival of individuals is a key factor that can have big effects on a migratory population.

Snow in treeline ecosystems: important influences all year round

Tom Parker

Dr Jens Subke

Arctic regions have undergone unprecedented warming and change in the last 100 years. Plants have become more productive due to warmer temperatures and shrub and tree species have expanded ranges into previously inhospitable tundra ecosystems. This change represents a fundamental change in the structure and the functioning of the ecosystem. One such change is a loss of carbon from soils dominated by trees and shrubs compared with tundra.

We present evidence for snow accumulation as a significant driver of carbon loss in forest ecosystems as forests soils are insulated from air temperature as low as $-30\text{ }^{\circ}\text{C}$. We experimentally increased snow levels at tundra sites to show that decomposition of litter increases when insulated from winter cold.

A second experiment was designed to test whether winter soil temperature, due to different snow levels in forest and tundra, changed summer microbial activity by maintaining different microbial communities. We transplanted soils from forest to heath and *vice versa* to test this hypothesis. Soils transplanted from forest to heath had significantly lower respiration in summer than controls. This therefore showed that the warmer winter temperature in forests maintains active microbial communities which then cycle carbon faster in summer. This work demonstrates that differential accumulation of snow over the forest- tundra ecotone has year-round effects on carbon cycling.

Assessing the impact of changing river flows on the distribution and abundance of riparian, invasive alien plant species

Zarah Pattison

Dr Nigel Willby and Dr Mario Vallejo-Marin

Biological plant invasions pose a major threat to native biodiversity that is reportedly second only to habitat loss. Riparian habitats are dynamic zones with complex disturbance regimes, and riparian vegetation is thought to be highly vulnerable to invasion. As riparian plant species composition is driven in part by flow regime, which can influence the dominance of species with different life history traits, the increasing frequency of high-flow events linked to climate change has the potential to greatly affect the dispersal and success of invasive alien plant species. Much attention has been paid to the negative effects of highly competitive invasive alien plants on the native community. Increased fluvial disturbances could, however, reduce the dominance of stands of invasive plants, albeit also increasing their rate of spread.

In order to assess the effect of flow regime on the abundance of riparian, invasive alien plant species, namely *Impatiens glandulifera*, *Fallopia japonica*, *Heracleum mantegazzianum* and *Mimulus guttatus*, the downstream end of a range of invaded rivers in Scotland that vary in their flow regime were sampled. Surveys were conducted on a much finer scale than those hitherto used in most river survey work. The preliminary findings of my first year's field season will be discussed, along with plans for future work.

Distribution and ecology of a cryptic bumblebee species complex

Jessica Scriven

Dr Matt Tinsley and Prof Dave Goulson

Bumblebees are important pollinators in natural, as well as agricultural, ecosystems. In the UK it has recently been revealed that the common bumblebee species, previously identified as *B. lucorum*, actually represents a complex of 3 morphologically indistinguishable species; *B. lucorum*, *B. magnus* and *B. cryptarum*. Almost nothing is known about how these species differ in ecology or distribution. In this study, RFLP patterns from the mtDNA COI gene are used to differentiate and determine the geographic distribution of these species. This talk will present the results, compare them with previous studies located in the Western Isles of Scotland and Ireland, and discuss the forage and habitat associations of the *lucorum* complex species.

Peat's secret archive: reconstructing the North Atlantic storm frequency and volcanic eruption history of the last 10,000 year

Helena Stewart

Dr Robert McCulloch, Dr Tom Bradwell (British Geological Survey) and Prof Joanna Bullard (University of Loughborough)

The world's largest sources of dust are found in low latitude arid regions and this is where most aeolian research has been focused. However the processes of dust production and emissions may still be found in higher latitude and colder climatic regions such as Iceland. Dust emission and deposition rates in active glacial catchments are very high, and in some cases exceed the rates measured in lower latitudes. The main sources of North Atlantic dust are the expansive unvegetated Sandur plains of southern Iceland and areas close to the glaciers. Glaciers cover approximately 10% of the country and create high levels of physical weathering. Therefore, the sediment load of glacial rivers is high and large quantities of sediments are deposited on floodplains and at the glacial margins creating large sources of windblown dust. During high-magnitude storms this dust is remobilised in the lower atmosphere and carried further afield by strong winds and is often deposited over Scotland and the British Isles enabling a chronology of this process to be developed from peat cores. Iceland is also a highly volcanic area therefore tephra can be identified alongside the glacial dust in the peat cores and can be used as a chronological tool. This project focuses on producing a high-resolution, age-constrained index of Icelandic dust storm and volcanic eruption frequency spanning the past 10,000 years, through detailed analysis of terrestrial peat cores from northern Scotland and assessing the long term frequency of these events.

Can hydrological connectivity and landscape diversity be used to explain patterns in macrophyte species richness and diversity in UK lakes?

Junyao Sun

Professor Andrew Tyler, Dr Peter Hunter, Dr Nigel Willby

Macrophytes (aquatic plants) are one of the key biotic elements of lake ecosystems and play a very important role in maintaining ecosystem structure and function in lakes. However, with the increasing human modification to lakes and catchment, degradation of aquatic plants communities within lakes has become a common phenomenon in the world. Most study has focused on the influence of Lake Environment on macrophyte biomass and distribution.

Considering 350 UK lakes as research objects, the study tried to work out some hypothesis such as: which section of river that the lake located has the largest macrophyte species and highest abundance? How the lake type related to the macrophyte species richness? How the lake hydrological connectivity influencing macrophyte beta diversity of each lake? And a model was also built for testing the influence of hydrological connectivity, lake morphology, lake basic environment and management on macrophyte species richness.

Turbine in your backyard: What does the public think about small wind turbines?

Cerian Tatchley

Dr Kirsty Park and Prof Nick Hanley

Small Wind Turbines (SWTs) are a growing micro-generation industry in the UK, officially defined as turbines capable of producing up to 50kW of electricity. Their smaller size leads to their being installed in quite different situations to the larger wind farm turbines which require large open areas, such as in more urbanised environments including on buildings, factories and in gardens, places where the public may be more likely to live or work in close proximity.

There have been many studies of public attitudes towards wind farms, most of which find generally positive attitudes. However, none of this research has focussed on public attitudes towards SWTs. The perception of public attitudes impose pressures on planning officials and may act as a barrier to the expansion of renewable energy production, particularly of micro-generation technologies where the general public form a large proportion of consumers, with implications for the attainment of renewable energy targets.

I will be presenting results from a postal survey to investigate whether attitudes towards SWTs differ from that towards wind farms. I will also explore factors that may be important influences on attitudes towards SWTs such as belief in climate change and the landscape setting of the turbine.

Spectral unfolding of borehole measurements taken at a ^{226}Ra contaminated site

Adam Varley

Prof Andrew Tyler and Dr David Coplestone

Following its discovery at the end of the 19th Century, Radium (^{226}Ra & ^{224}Ra) was quickly exploited for its radioactive properties, especially when combined with ZnS to produce luminescent paint. Radium has now become associated with contaminated land due to its extensive use by the military throughout Europe and the US during and after the 2nd World War. A recent UK Government report (DECC, 2012) conservatively estimated that there are between 150-250 radium contaminated legacy sites across the UK and possibly as many as 1000.

Characterising contamination at depth presents a real challenge at any contaminated site as source signal is increasingly shielded by overburden reducing the value of conventional surface measurements. To address this problem borehole measurements must be undertaken. The rare opportunity was offered to the Environmental Radioactivity Lab to undertake a borehole investigation at Dalgety bay, Fife, Scotland.

To help unfold spectral responses found in the field, an approach was chosen using Principal Component Analysis to extract key features from Monte Carlo simulations. This method of full spectral analysis provided better insight into source distribution, ultimately leading to more reliable estimates of activity and in turn the risk posed by the source.