PRIFYSGOL BANGOR UNIVERSITY

Master of Science by Research (MScRes) in the Biological Sciences – Current opportunities

Introduction

In this booklet you can find out more about current opportunities to undertake **a self-funded Master of Science by Research (MScRes) in Biological Sciences** degree (https://www.bangor.ac.uk/courses/postgraduate-research/biological-sciences-mscres) at the School of Environmental and Natural Sciences of Bangor University.

The MSc by Research (MScRes) is a **one-year full-time research programme (or 2 years part-time)** that differs from a taught Masters programme by placing more emphasis on research (there are no taught modules), and by being examined much more like a PhD, by an internal and an external examiner, rather than by grading of coursework and dissertation. This degree will equip you with confidence and competence in the latest research skills (including generic skills such as literature searching, legal and ethical aspects, project planning, grant proposal writing, and statistical analysis of data) and allow you to apply for further research training (PhD) programmes, or to directly apply for research positions in universities or research institutes.

The variety of advertised projects in this booklet reflects the diversity of research that is conducted by the staff in our School. The list is not exhaustive; please feel free to contact individual members of staff whose research aligns with your own interests to discuss additional possibilities.

In addition to working on your research projects, as postgraduate researchers at Bangor you will have access to a range of research skills and professional development training opportunities as well as the chance to develop your teaching skills by undertaking paid demonstrating opportunities for modules on our undergraduate curriculum.

You will also present your work at the annual School and College Postgraduate Conferences and become part of the vibrant research community of the College of Science and Engineering. There are multiple research seminars that run in the College, and you'd be able to join any that relate to your research interests.

Successful applicants typically have a good first degree in a relevant subject (2:1 or above). While the minimum qualification that would allow you to apply for this programme of study at Bangor University is a 2:2, if that is the case we strongly encourage that you discuss your academic background with a potential supervisor before applying. If you have valuable non-academic experience that is relevant to your research plans, you may be in a good position to secure a place on this course, even if you do not have a First or a 2:1 degree from your undergraduate studies.

You would also need to have identified a way to fund your studies (tuition fees, bench fees, living expenses). Some projects may also involve additional costs which you'd

have to meet (e.g., overseas fieldwork) so make sure you discuss all the details with your potential supervisor before applying.

How to apply: The first step is to identify a project you are interested in then and contact the member of staff who is advertising it. They will then advise you if and how you should make a formal application to the University. When contacting potential supervisors, you should briefly outline your academic background and explain your interest in the project you are contacting them about, as well as attach a CV.

Do not submit a direct application for a postgraduate research degree to Bangor University without first identifying a potential supervisor and discussing your research interests with them first.

In addition to contacting the individual members of staff who have advertised specific projects here, you may also contact the following staff with general inquiries:

School Director of Postgraduate Research Studies (School of Environmental and Natural Sciences): Dr Aaron Comeault (a.comeault@bangor.ac.uk)

College Director of Postgraduate Research Studies (College of Science and Engineering): Dr Alexander Georgiev (a.georgiev@bangor.ac.uk)

Animal Behaviour, Ecology and Evolution: General

Understanding how bats and birds respond to a changing landscape

Subject area: BioAcoustics, Animal Behaviour, Spatial Ecology

Supervisor(s): Luci Kirkpatrick

Contact: l.kirkpatrick@bangor.ac.uk

Project description:

Passive acoustic monitoring (PAM) is rapidly transforming how ecologists study wildlife, offering high-resolution, long-term insights into how species use and respond to changing landscapes. This project will explore how bats and / or birds (key indicators of ecosystem health) respond to habitat change in the Nant Ffrancon valley, an area undergoing restoration to a more natural, tree-rich state.

A network of acoustic devices (covering both ultrasonic bat detectors and audible-range recorders for birds) can be deployed across restoration gradients in Nant Ffrancon. These devices will provide continuous, non-invasive monitoring of species presence, behaviour, and temporal patterns.

The student will analyse acoustic datasets to address questions such as:

- How do bat and bird activity levels vary across habitats and over time?
- Do restoration actions influence species richness, call diversity, or site use?
- Can specific species or guilds be identified as indicators of ecological recovery?

There is flexibility to tailor the project around the student's interests—for example, focusing on bat assemblages, exploring diurnal bird vocalisations, or examining methodological questions related to acoustic detection.

This project is ideal for students interested in landscape ecology, conservation technology, biodiversity monitoring, or bioacoustics. Optional fieldwork placements will be available for those wishing to gain hands-on experience with acoustic device deployment. Access to own vehicle will be necessary for fieldwork.

Start date: Flexible, open to discussion

Small Sharks, Big Signals: Unravelling the role of GnRH in Juvenile Elasmobranchs

Subject area: Marine Endocrinology

Supervisor(s): Jo Hoppes

Contact: jo.hoppes@bangor.ac.uk

Project description:

Elasmobranchs are some of the most ancestral vertebrates and therefore present an ideal model for exploring the fundamental development of a multitude of physiological systems, such as endocrinology and reproduction. Gonadotropin releasing hormones (GnRHs) are the primary modulators of the gonadotropins luteinising hormone (LS) and follicle stimulating hormone (FSH), critical for reproductive development. Three GnRHs have been identified in most vertebrates with distinct expression patterns in the brain. GnRH1 is essential for sexual maturation and but our understanding of the functional roles of GnRH2 and GnRH3 are still in their infancy. They have so far been implicated in regulating reproductive and feeding behaviour with most studies to date being carried out in adults, though we know that all GnRHs have some expression in recently emerged juveniles.

Using in situ hybridisation, immunohistochemistry and qPCR, this project will explore the expression of the three known GnRHs during early development of the lesser spotted catshark *Scyliorhinus canicula*. *S. canicula* is an abundant elasmobranch native to North Wales and will function as a model system to improve our knowledge and understanding of development and reproduction in all shark species, providing much needed detail to enhance conservation efforts for more cryptic and endangered species.

Start date: Jan / Apr / Oct

Keeping Their Cool: Temperature and Social Behaviour in Lizards

Subject area: Behavioural ecology, animal behaviour, thermal biology

Supervisor(s): Dr Kirsty MacLeod (www.macleodlab.weebly.com)

Contact: k.macleod@bangor.ac.uk

Project description:

Temperature plays a fundamental role in shaping animal behaviour, particularly in ectotherms such as lizards whose physiology and activity are tightly linked to the thermal environment. While much research has explored how temperature affects individual performance and energetics in this group, far less is known about its influence on social interactions, mirroring a general lack of understanding of social behaviour in reptiles. As climate change alters both mean temperatures and thermal variability, understanding how these shifts affect social dynamics is key to predicting future population and community outcomes. This project will investigate how variation in thermal conditions influences social interactions and aggregative behaviour in

lizards. Depending on the strengths and interests of the student, the project could involve behavioural observations, experimental manipulations of temperature, integration of physiological and ecological data, and/or meta-analysis. This work will contribute to our understanding of how the social lives of ectotherms may respond to a warming world, and offers valuable training in behavioural ecology, experimental design, and statistical analysis.

Start date: Jan / Apr / Oct

Palaeogenomics of the extinct giant deer (*Megaloceros giganteus*)

Subject area: Palaeogenomics, evolutionary biology, bioinformatics, extinct mammals

Supervisor(s): Johanna Paijmans (https://www.bangor.ac.uk/staff/sens/johanna-paijmans-682198/en), Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: j.paijmans@bangor.ac.uk

Project description:

The Giant deer (*Megaloceros*) was a giant species of deer that roamed Eurasia during the Late Pleistocene, with antlers that could span almost 3.5 metres across. It went extinct around 10,000 years ago, and some even suggest that increasing forest cover when climate became warmer meant that the giant deer simply became unable to move in the trees due to its antlers. The exact reason for its extinction remains unclear, as does its evolutionary relationship to extant deer species. Using palaeogenomic techniques, this project will aim to recover genomic data from a Megaloceros fossil and compare them to existing data from modern deer species. Prior coding and lab experience is preferred, but a strong commitment to learn is critical. Training will be provided.

Start date: Jan / Apr / Oct

Adaptive evolution in extinct cave bears

Subject area: Evolutionary biology, molecular ecology, palaeogenomics, bears

Supervisor(s): Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en), Johanna Paijmans (https://www.bangor.ac.uk/staff/sens/johanna-paijmans-682198/en)

Contact: a.barlow@bangor.ac.uk

Project description:

A tremendous diversity of mammalian megafauna was lost during the Late Pleistocene mass extinction event. However, we are only beginning to scratch the surface of understanding the genetic underpinnings of the unique phenotypes and morphologies of these extinct species. Among these are the cave bears: giant herbivorous bears that differed from their nearest relatives, brown bears and polar bears, in a range of morphological and ecological traits. Although cave bears are among the most genetically studied Pleistocene animals, all previous studies have been based on neutral genetic markers and we have no understanding of the genetic basis of their unique adaptations. You will investigate this question using palaeogenomic data of cave bears. By carrying out genome scans for selection against their extant relatives, you will undercover genes under selection in the cave bear lineage. This work will for the first time help us to understand, genetically, what makes a cave bear a cave bear. More broadly, a better understanding of cave bear adaptation may shed light on the genetic changes underpinning the evolution of herbivory, body size and hibernation, and help quantify the loss of adaptive genetic diversity associated with the Pleistocene extinction.

Start date: Jan / Apr / Oct

Foraging of carrion by vertebrate scavengers

Subject area: Ecology, ecosystem functioning

Supervisor(s): Dr Mark C. Mainwaring (https://www.bangor.ac.uk/staff/sens/mark-mainwaring-023874/en), Dr Craig Shuttleworth (https://www.bangor.ac.uk/staff/sens/craig-shuttleworth-082156/en)

Contact: m.mainwaring@bangor.ac.uk

Project description:

The foraging of carrion by scavengers is a crucial ecosystem service that improves the health of ecosystems and helps prevent human illness, yet the ‘cleaning’ services provided by scavengers is often disregarded as being unimportant. A few studies have

examined the consumers of carrion within agricultural landscapes and found that carrion crows (*Corvus corone*) are important consumers of carrion, yet our understanding of the foraging of carrion in marine and urban environments remains poor. Pertinently, it may be that gulls, which are often viewed as being a nuisance by many people, may perform a valuable ecosystem service by consuming carrion in marine and urban environments. This project will entail the placement of commercially bought dead rats along an urban-rural gradient in a marine environment in northwest Wales throughout the course of an entire year and use camera traps to establish the species that consume the rats. Rats will be secured to boards with nails so that scavengers cannot rapidly remove them, meaning that the cameras are more likely to identify the scavenger. Rat carcasses will be left in the field for seven days and rats remaining on the boards will be removed, and safely and clinically disposed of, via Bangor University. All photos from the camera traps will be checked to identify the scavengers and the time taken to find and scavenge the carcasses will also be recorded. This study will therefore help establish the identity of the foragers of carrion in marine and urban environments and may help establish that gulls, which are abundant in the study area, consume carrion and thus perform a valuable ecosystem service.

Molecular dietary analysis of red squirrel, *Sciurus vulgaris*

Subject area: Metabarcoding / Mammal Ecology

Supervisor(s): Dr. Amy Ellison (https://www.bangor.ac.uk/staff/sens/amy-ellison-495358/en), Dr. Craig Shuttleworth (https://www.bangor.ac.uk/staff/sens/craig-shuttleworth-082156/en), Dr. Peter M. Haswell (https://www.bangor.ac.uk/staff/sens/pete-haswell-097853/en)

Contact: a.ellison@bangor.ac.uk

Project description:

A highly motivated and capable student is sought to apply metabarcoding approaches to squirrel stomach contents for dietary analysis. Potential exists to explore and contribute broadly, but with a predominant focus on species ecology and trophic interactions. Understanding dietary composition (plants, fungi, invertebrates & vertebrates), and the impact of variables such as age class, sex, geographic or temporal context, and cause of death (road traffic casualties, sudden deaths, vs those found in woods/gardens, natural causes), are variables of interest and relevance.

Additional research funding has been raised by Dr. Shuttleworth to help cover laboratory costs. Samples are already collected. Access to necessary equipment through Dr. Ellison. Students may need to fundraise for any beyond scope costs.

Upstairs – Downstairs: Bat behaviour and movement when transitioning between maternity and hibernation roosts

Subject area: Ecology

Supervisor(s): Lucinda Kirkpatrick (https://www.bangor.ac.uk/staff/sens/lucinda-kirkpatrick-672983/en), Sam Dyer (NRW)

Contact: l.kirkpatrick@bangor.ac.uk

Project description:

Explore the fascinating ecology of Lesser Horseshoe bats (*Rhinolophus hipposideros*) in the Conwy Valley. This protected species moves between maternity and hibernation roosts, with some staying local and others traveling to more distant mines. This project will investigate what drives these movements and how climatic variables influence roost selection. Using advanced remote monitoring tools (camera, acoustic, environmental) and GIS, you will study the bats' movement, behaviour, and demography. Working closely with Natural Resources Wales and local bat groups, your research will contribute valuable insights into bat conservation. The role involves independent, physically demanding fieldwork in a dynamic setting. Access to a car is desirable but not essential for this unique opportunity to make a meaningful scientific impact for bat conservation.

Start date: October ideally but April can also be considered

Shark evolution and development

Subject area: Evolutionary developmental biology

Supervisor(s): John Mulley (https://www.bangor.ac.uk/staff/sens/john-mulley-067365/en)

Contact: j.mulley@bangor.ac.uk

Project description:

The cartilaginous fish (sharks, skates, and their relatives) occupy an important phylogenetic position as the oldest extant group of jawed vertebrates. They can provide insights into key events in vertebrate evolution, and can inform our understanding of general vertebrate anatomy, development, and physiology.

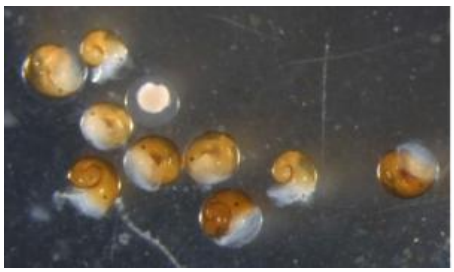
In this project, students will study the development of one of a number of shark organ systems in the lesser spotted catshark (*Scyliorhinus canicula*), a model chondrichthyan, with a view to informing our understanding of processes associated with human health issues. Techniques will involve bioinformatic identification of candidate genes from genomic and transcriptomic resources, and determination of temporal and spatial distributions of mRNA and proteins using RNA-Seq, immunohistochemistry, *in situ* hybridisation and hybridisation chain reaction.

Birth by Bacteria: Microbiome Shifts in a Live-Bearing Marine Snail

Supervisor(s): Dr. Aaron Comeault (https://www.bangor.ac.uk/staff/sens/aaron-comeault-485161/en) & Dr. Amy Ellison (https://www.bangor.ac.uk/staff/sens/amy-ellison-495358/en)

Contact: a.comeault@bangor.ac.uk

Project description:



Live birth has evolved repeatedly across the tree of life, representing a key reproductive strategy that can open new ecological and evolutionary opportunities. While significant energy has been devoted to the study of live birth in vertebrates, factors contributing to live birth in invertebrates remain relatively unexplored. One factor that may contribute to successful live birth in invertebrates are the interactions that occur between the tissues of reproductive organs and the microbial communities that colonise them. *Littorina saxatilis* is a marine snail that has recently evolved live-bearing (from an egg-laying ancestor), providing an ideal model to investigate the processes underpinning this major shift. This project will test whether the microbiome of the *L. saxatilis* brood pouch represents a case of recent host-mediated niche differentiation and is distinct from microbiomes found in other organs and analogous tissues in closely related egg-laying species. By characterising the

bacterial communities of the brood pouch, the student will gain experience and skills in microbiology and metabarcoding. Results from this project will increase our understanding of how bacteria contribute to the function of *L. saxatilis's* brood pouch, and the roles that microbes can play in reproduction.

Start date: Any time

Concrete coastlines: Littorina's Evolutionary Race Against Coastal Development

Subject area: Evolutionary biology, marine biology, anthropogenic change

Supervisor(s): Dr. Aaron Comeault (https://www.bangor.ac.uk/staff/sens/aaron-comeault-485161/en) & Dr. Katie Dubois (https://www.bangor.ac.uk/staff/sos/katie-dubois-683533/en)

Contact: a.comeault@bangor.ac.uk

Project description:

Human changes to natural environments are widespread and can negatively affect biodiversity. A recent report by the RSPB highlights that between 25 and 75% of UK coastlines have been modified by seawalls and other man-made structures. These changes present unique evolutionary pressures to intertidal species, such as the diverse periwinkles found along the UK coast. Understanding how species adapt to these 'human' environments is therefore essential for predicting the impact of human actions on biodiversity. This project will use a combination of field surveys, lab-based morphological and physiological measurements, and genetics to: (1) measure adaptations in shell morphology and thermal tolerance in periwinkles from the genus Littorina and (2) determine the genetic basis of successful adaptation to artificial intertidal habitats. You will gain experience and training in ecological field methods, experimental biology, evolutionary genetics, and data analysis. This research will contribute to a better understanding of how species adapt to human-modified environments and inform future coastal management strategies.

Start date: Any time

Conservation

Understanding Black Grouse (*Tetrao tetrix*) habitat use using passive acoustic monitoring

Subject area: Conservation, Ornithology, Bioacoustics

Supervisor(s): Tyler Hallman (https://www.tylerahallman.com) & Lucinda Kirckpatrick

Contact: t.hallman@bangor.ac.uk

Project description:

This project will investigate habitat use of Black Grouse by deploying acoustic monitoring devices in key Black Grouse habitats in North Wales. Lekking activity will be monitored and the effects of habitat and landscape configuration and composition on activity will be analysed. Analysis of the recordings will provide insights into population presence, lek activity, and calling patterns, supporting habitat management and long-term conservation.

This research will be carried out in collaboration with RSPB staff. RSPB partners are deeply involved in the restoration of Black Grouse habitat in North Wales, and the results of this research will directly inform ongoing conservation. This project will give you experience working with passive acoustic monitoring devices and the analysis of their recordings. Further, based on interests, the study can involve GIS and spatial analyses and landscape level analyses. If you have any questions, please do not hesitate to ask.

Requirements include an interest in bird ecology, bioacoustics, or conservation. The student must be comfortable with fieldwork and recording equipment and have a willingness to learn acoustic analysis software.

Start date: Flexible and open to discussion

Understanding invertebrate diversity and abundance in key Curlew (*Numenius arquata*) breeding areas

Subject area: Conservation, Ornithology, Entomology

Supervisor(s): Tyler Hallman (https://www.tylerahallman.com) & Farnon Ellwood

Contact: t.hallman@bangor.ac.uk

Project description:

This interdisciplinary project will assess invertebrate diversity and abundance to understand how habitat restoration supports Curlew conservation. Field data and

existing datasets will be analysed to explore links between habitat quality, prey availability, and breeding success. Under this broad theme, there is room for a student to develop this project based on their own specific interests.

This research will be carried out in collaboration with RSPB staff. RSPB partners are deeply involved in the restoration of important Curlew breeding areas in North Wales, and the results of this research will directly inform ongoing conservation. This project will give you experience working with freely available community science data and coding in R. Further, based on interests, the study can involve GIS and spatial analyses, landscape level analyses, diverse fieldwork, etc. If you have any questions, please do not hesitate to ask.

Requirements include an interest in ecology and invertebrate identification. The student would need their own vehicle as limited public transport is available. Remote field sites require a good level of fitness and suitable clothing and footwear for fieldwork. The student should be comfortable with fieldwork and basic data analysis.

Start date: Flexible and open to discussion

Spatial interactions between global poverty and protected area coverage

Subject area: Conservation Science

Supervisor(s): Leejiah Dorward (https://www.bangor.ac.uk/staff/sens/leejiah-dorward-476984/en)

Contact: l.dorward@bangor.ac.uk

Project description:

Protected areas (PAs) are among the most widely used conservation tools. Considering the overlap between high biodiversity and regions of severe human poverty, understanding the relationship between poverty and PAs is critical for creating conservation strategies that balance ecological goals with social equity. Using existing global datasets this project will investigate the spatial relationship between PAs and the socioeconomic status of adjacent populations, estimating the number of people living near PAs who experience different levels of poverty and exploring how poverty varies by factors such as region, national economic status, and PA type. Results will contribute to discussions on the socio-economic impacts of conservation, particularly in light of international goals to expand PA coverage to 30% of the planet's surface.

Mammal conservation & research, Croatia

Subject area: Interspecific interactions / Human-wildlife coexistence / Mammal conservation

Supervisor(s): Dr. Peter M. Haswell (https://www.bangor.ac.uk/staff/sens/pete-haswell-097853/en), Prof. Josip Kusak; (Zagreb University, Croatia),

Potential co-supervisors / advisors: Dr Simon Valle (https://www.bangor.ac.uk/staff/sens/simon-valle-452728/en)

Contact: p.m.haswell@bangor.ac.uk

Project description:

Highly motivated and capable students are sought to analyse camera trap datasets and/or conduct mammal research in Croatia. Potential exists to explore topics such as interspecific interactions e.g. carnivore or herbivore communities, or predator-prey dynamics, risk/fear ecology, interference competition, drivers of community richness and structure, alongside the impacts of human activity. Free roaming dog interactions with carnivores, particularly wolves & jackal, are of topical interest. Potential exists for students to conduct additional field data collection e.g. foraging experiments, or small mammal survey, pending financial, ethical and legal logistics. Efforts aimed at fostering coexistence and resolving conflicts between herders of free roaming horse/cattle and carnivores is also of high interest. Students will need to meet any beyond scope costs.

Socio-ecological feasibility of mountain hare restoration in North Wales

Subject area: Species restoration / Mammal Conservation / Social sciences / Ecology

Supervisor(s): Dr. Peter M. Haswell (https://www.bangor.ac.uk/staff/sens/pete-haswell-097853/en)

Additional potential co-supervisors / advisors: Dr. Craig Shuttleworth(https://www.bangor.ac.uk/staff/sens/craig-shuttleworth-082156/en), Dr Simon Valle (https://www.bangor.ac.uk/staff/sens/simon-valle-452728/en), Dr Anthony Caravaggi (University of South Wales), Jonathan Hulson (North Wales Wildlife Trust), Dr. Leejiah Dorward (https://www.bangor.ac.uk/staff/sens/leejiah-dorward-476984/en), Dr Tyler Hallman: (https://www.bangor.ac.uk/staff/sens/tyler-hallman-659106/en)

Contact: p.m.haswell@bangor.ac.uk

Project description:

Highly motivated and capable students are sought to explore the socio-ecological feasibility of restoring mountain hare to Wales.

Widespread in post glacial Britain, the population in North Wales is deemed extinct. UK status is generally considered unfavourable with populations deteriorating. Re-establishment of the species in the Welsh uplands could provide an additional safety net, while restoring a species of ecological and cultural significance. Return of mountain hare may, of course, also be deemed undesirable to some. The proposition requires ecological and social evaluation, alongside careful planning.

Potential exists to explore a range of issues, evaluating human dimensions, participatory management planning or co-design, habitat suitability modelling, population viability, translocation methodologies, policy evaluation, baseline data, assessment of potential source populations, etc.

Herpetology: Evolution, Conservation, Ecology

Phylogenomics and systematics of venomous snakes

Subject area: Herpetology; phylogenomics; systematics; bioinformatics

Supervisor(s): Prof. Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en), Dr Axel Barlow (https://research.bangor.ac.uk/portal/en/researchers/axel-barlow(0925aeec-872f-42ce-801e-a5d6f571e945).html)

Contact: w.wuster@bangor.ac.uk

Project description:

The ability to sequence whole genomes at an affordable cost has revolutionised our ability to reconstruct the tree of life and resolve taxonomic problems. In this project, you will be using Illumina sequencing to reconstruct the phylogeny of a group of venomous snakes. Possible taxa could include mambas (*Dendroaspis*), cobras (*Naja*), or various vipers (e.g., saw-scaled vipers, *Echis*). The results could lead to a revision of the taxonomy of the group and may even lead to the discovery of new or overlooked species, or you could use the sequenced genomes to delve into the evolution of venoms or into the history of gene flow between lineages. You will receive training and acquire extensive expertise in phylogenomics, population genomic analyses, and population genetics. More info: http://bit.ly/47Ie7TA

Start date: Jan / Apr / Oct

Microhabitat adaptation in common lizards (*Zootoca vivipara*)

Subject area: Evolutionary biology, molecular ecology, herpetology

Supervisor(s): Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en), Dr. James Hicks (https://www.bangor.ac.uk/staff/sens/james-hicks-069306/en)

Contact: a.barlow@bangor.ac.uk

Project description:

The common lizard is widespread across the UK but is becoming considerably less common. Protected areas are frequently managed for their conservation, however we currently lack knowledge on the extent that local populations may be adapted to their specific microhabitat. This project will build on existing morphological datasets for lizard ecomorphology in North Wales, and use genomic data to test for adaptation to specific microhabitats. This will shed light on the mechanisms underlying adaptation in common lizards, as well as contributing to their future conservation management by guiding conservation practise at a local level.

Start date: Jan / Apr / Oct

Genetic detection of non-native grass snakes in the UK

Subject area: Conservation genetics, molecular ecology, herpetology

Supervisor(s): Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en), Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en)

Contact: a.barlow@bangor.ac.uk

Project description:

Grass snakes (*Natrix helvetica*) are our largest native snake. Together with their sister-species, *Natrix natrix,* grass snakes are widely distributed throughout Western Europe. Several populations of non-native grass snakes are known from the UK. Several of these have been identified morphologically, by the presence of dorso-lateral stripes, and some genetically, using mitochondrial DNA. It is currently unknown what the precise source localities for these introductions were, and whether these populations are admixing with native grass snake populations. You will answer these questions using whole genome sequencing of native and introduced grass snakes. These results will provide deeper information to understand these introductions, and what the conservation implications for native grass snakes could be.

Start date: Jan / Apr / Oct

Conservation genomics of introduced sand lizards in the UK

Subject area: Conservation genetics, molecular ecology, herpetology

Supervisor(s): Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en), Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en)

Contact: a.barlow@bangor.ac.uk

Project description:

Sand lizards (*Lacerta agilis*) are the rarest lizard in the UK and have suffered substantial declines over the past century. A successful captive breeding and release programme has repopulated sand lizards in several areas where they had previously become extinct. These populations remain small and isolated, however, and our ongoing work has revealed the occurrence of substantial inbreeding. In this project, you will generate and analyse whole-genome sequencing data of reintroduced sand lizards to assess their genetic health. You will mine their genome data to determine the presence of deleterious or defective gene variants that may cause inbreeding depression. You will also determine whether functional gene copies exist in

other populations which may provide source populations for future translocations and genetic rescue.

Start date: Jan / Apr / Oct

A cunning plan: evolution of melanism in the adder (*Vipera berus*)

Subject area: Evolutionary biology, molecular ecology, herpetology

Supervisor(s): Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en), Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en)

Contact: a.barlow@bangor.ac.uk

Project description:

Black adders are culturally iconic venomous snakes. The typical adder colour pattern involves a dark dorsal zig-zag on a paler brown or grey background colour. In addition, melanistic or partially melanistic individuals frequently occur in many populations. The evolutionary processes maintaining this colour polymorphism is still uncertain, however, with both positive selection for thermoregulation and negative frequency-dependent selection for predator avoidance invoked. In this project, you will screen population genomic datasets from normal and melanistic adder populations to detect signatures of selection around key genes controlling colour pigmentation. This project will reveal the evolutionary basis for arguably the most well know phenotype among venomous snakes.

Start date: Jan / Apr / Oct

No snakes in Ireland: Environmental drivers of herpetofauna biogeography of the British Isles

Subject area: Evolutionary biology, ecology, biogeography, herpetology

Supervisor(s): Johanna Paijmans (https://www.bangor.ac.uk/staff/sens/johanna-paijmans-682198/en), Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: j.paijmans@bangor.ac.uk

Project description:

Biogeography of the herpetofauna of Ireland has long puzzled herpetologists - many of the species present in Britain are not present in Ireland, without a clear explanation. This phenomenon has fascinated people for so long that it has even found a place in myth and legend, describing that St Patrick banished all snakes from Ireland after attacking him. This project will investigate the past biogeography of herpetofauna of Ireland and Britain using climatic reconstructions to investigate the habitat suitability for select species through time. This will start to shed light on the underlying mechanisms of the colonisation and/or post-glacial persistence of herpetofauna in Ireland, and the potential reasons for the absence of many British herpetofauna species from Ireland.

Start date: Jan / Apr / Oct

Beyond the "Big Four": Species Distribution Modelling of Indian venomous snakes for designing effective snakebite treatment

Subject area: Herpetology

Supervisor(s): Anita Malhotra (https://www.bangor.ac.uk/staff/sens/anita-malhotra-009176/en), Isabelle Winder (https://www.bangor.ac.uk/staff/sens/isabelle-winder-113705/en)

Contact: a.malhotra@bangor.ac.uk

Project description:

The World Health Organisation aims to halve global mortality from snakebite (a "Neglected Tropical Disease") by 2030. Known as the snakebite capital of the world, India produces a large amount of pan-India antivenom for the "Big Four" species (common krait, spectacled cobra, saw-scaled viper and Russell's viper) yet still has over 60,000 deaths annually. The Big Four are widely distributed and considerable geographic venom variation is present within apparently well-defined species. However, recently acquired genetic data suggests that all show marked phylogeographic structure. This project will integrate phylogeographic information with occurrence and climatic information for the Big Four and related species to obtain co-distribution maps to help define boundaries and species coverage for new regional antivenoms.

Assessing the genetic diversity of adders in the Somerset Levels

Subject area: Conservation genetics; genomics; herpetology; bioinformatics

Supervisor(s): Prof. Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en), Dr Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: w.wuster@bangor.ac.uk

Project description:

Population fragmentation is a key factor imperilling many species: small, isolated populations are liable to inbreeding, leading lead to loss of fitness and population extinction. The adder (*Vipera berus*) is widespread but declining in the UK, and we have demonstrated inbreeding in many UK populations (https://doi.org/10.1101/2023.09.19.557540). In this project, you will investigate the genetic health and connectivity between isolated populations of adders in Somerset. You will carry out whole genome sequencing of a series of adder samples and then use advanced bioinformatic tools to assess levels of heterozygosity, inbreeding, and population genetic structure. Through this project, you will receive training and acquire extensive expertise in modern population genomic analyses, phylogenomics and population genetics. More info: http://bit.ly/47Ie7TA

Using genomics to solve the mystery of the Walser Viper

Subject area: Herpetology, Population Genomics, Bioinformatics

Supervisor(s): Prof. Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en), Dr Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: w.wuster@bangor.ac.uk

Project description:

The Walser viper (*Vipera walser*), described as a brand new species from northwestern Italy only in 2016, is notable for looking like an adder (*Vipera berus*), but its mtDNA places it with a group of Caucasus vipers. Preliminary research showed that the genome of the species has been swamped with genes from neighbouring adder populations. But how did the Caucasus-clade mtDNA get to northern Italy?

Here, you will sequence the genome of a Walser viper and determine what proportion of its genome reflects its Caucasus ancestry. Scanning our extensive portfolio of adder genome sequences to test for genetic traces of the Caucasus lineage will indicate its origins and former distribution. You will receive training and acquire extensive expertise in population genomic analyses, phylogenomics and population genetics. More info: http://bit.ly/47Ie7TA.

Using Whole Genome Sequencing to understand hybrid zones between snake species

Subject area: Herpetology, Genomics, Bioinformatics, Taxonomy

Supervisor(s): Prof. Wolfgang Wüster (https://www.bangor.ac.uk/staff/sens/wolfgang-wuster-007198/en), Dr Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: w.wuster@bangor.ac.uk

Project description:

Hybrid zones constitute "natural laboratories" for studying speciation and evolutionary processes, and can resolve taxonomic questions, e.g., whether two populations constitute different species. In venomous snakes, hybridisation has been suggested to explain the phylogenetically incongruous distribution of toxin genes among species.

There are multiple work possibilities in this project, e.g., rattlesnakes, saw-scaled vipers, or European vipers.

You will carry out Illumina genome sequencing. You will then use your data to test for the extent of genetic exchanges across the hybrid zone, and whether genes of particular interest (e.g., toxins) are more likely to cross hybrid zones than others. As part of this work, you will receive training and acquire extensive expertise in population genomic analyses, phylogenomics and population genetics. More info: http://bit.ly/47Ie7TA.

Admixture effects on thermal performance traits in the invasive Common wall lizard

Subject area: thermal biology, behavioural ecology, genomics, herpetology

Supervisor(s): Dr Kirsty MacLeod (https://www.bangor.ac.uk/staff/sens/kirsty-macleod-571963/en), Dr Aaron Comeault (https://www.bangor.ac.uk/staff/sens/aaron-comeault-485161/en)

Contact: k.macleod@bangor.ac.uk

Project description:

Invasive species have profound consequences on ecosystems, but what makes a species a "successful invader"? Thermal performance traits (i.e., thermoregulatory behaviour and thermal preference/tolerance) could be key to invasion success, with populations able to tolerate a wider range of temperatures more likely to survive in new niches. Broader thermal tolerance in invaders may go hand in hand with genetic traits associated with invasion, such as high levels of admixture (genetic mixing of previously isolated lineages) in invasive populations. The invasive common wall lizard (*Podarcis muralis*) is ideally suited to investigate links between thermal performance traits, genetics, and invasion success: UK populations were founded by individuals from multiple isolated lineages from mainland Europe, providing a unique opportunity to test how admixture, which is likely to vary across UK populations, has affected traits important for an organism's survival across different climates.

This project will integrate behavioural and genomic data to test whether genetic mixing of previously isolated populations is linked to thermal performance traits in the common wall lizard, *Podarcis muralis,* an invasive species in the UK. Results will increase our ability to predict species' responses to climatic change and better understand how populations of *P. muralis* might spread within the UK.

Who's your daddy? Tracing the origin of parthenogenetic hybrid rock lizards (*Darevskia* spp).

Subject area: Phylogenetics, hybridisation, evolution, herpetology

Supervisor(s): Darren Parker (https://genestobehaviour.co.uk/news) and Susana Freitas (https://genestobehaviour.co.uk/people)

Contact: d.parker@bangor.ac.uk

Project description:

In vertebrates, parthenogenesis (asexual reproduction) is typically a rare outcome of frequent hybridisation. What influences why new parthenogenetic species arise is unknown, however, one important factor is the genetic make-up of the parental species. Often it is easy to identify the maternal parent but a challenge to identify the paternal parent. This project will address this gap by on identifying the paternal species' responsible for producing six species of parthenogenetic lizard in the genus *Darevskia*. This will be done by using sequenced markers from 120 individual sexual and parthenogenetic lizards to construct phylogenies to determine the paternal contributions. This work is entirely computer-based, however, there is potential for the successful student to amplify and sequence additional markers in the lab.

The eco-evolutionary dynamics of amphibian-microbe interactions

Subject area: microbial ecology, co-evolution, bioinformatics, herpetology

Supervisor(s): Owen Osborne https://www.bangor.ac.uk/staff/sens/owen-osborne-493757/en), Amy Ellison (https://www.bangor.ac.uk/staff/sens/amy-ellison-495358/en)

Contact: o.osborne@bangor.ac.uk

Project description:

The fungal pathogen *Batrachochytrium dendrobatidis* (Bd) is a leading cause of global amphibian biodiversity loss. The amphibian skin microbiome influences Bd infection outcomes, sparking interest in probiotic control strategies. While some Bd-inhibitory bacteria colonise many species, whereas others are extremely host-specific, potentially contributing to differences in Bd-susceptibility and probiotic success between amphibian species. The project will involve mining amphibian microbiome data to analyse host-microbe interactions across the entire amphibian phylogeny. The results will answer fundamental questions – which factors determine the specificity of host-microbe interactions? – while directly contributing to the development of next-generation rationally-designed probiotic treatments for Bd, with potentially important conservation

impacts. Additionally, there is potential for students to contribute to other ongoing amphibian Bd work in our research groups.

Ornithology: Behaviour, Ecology, Conservation

The breeding biology of northern wheatears on Skokholm Island

Subject area: Ornithology; migration; northern wheatears

Supervisor(s): Dr Mark C. Mainwaring: https://www.bangor.ac.uk/staff/sens/mark-mainwaring-023874/en, Ian Beggs (Who spends each summer on Skokholm studying the northern wheatears)

Contact: m.mainwaring@bangor.ac.uk

Project description:

Long-distance migrant birds have undergone dramatic population declines over the past few decades and are of conservation concern. One long-distance migrant on the Afro-Palearctic flyway to have declined is the northern wheatear (*Oenanthe oenanthe*) and so acquiring a better understanding of their biology is a useful step in aiding their conservation. However, we know relatively little about the breeding biology of northern wheatears because their natural nest sites are often located in underground burrows, which makes it very difficult to access their nests. One way of getting around this issue is to provide nestboxes that allow easier access for researchers who can also place cameras inside nests. This project will take advantage of the cameras placed inside custom designed nestboxes provided for northern wheatears on Skokholm Island, off the Welsh coast, to quantify aspects of their parental care and offspring begging. The study of northern wheatears on Skokholm has been going for many years and so there is historical data to work with. However, you can visit Skokholm, an active Bird Observatory owned by the Wildlife Trust of south and west Wales (https://www.welshwildlife.org/nature-reserves/skokholm-island , for a short time. There, you will have the chance to see the northern wheatears, their custom designed nestboxes and the vast array of other wildlife inhabiting the island – such as puffins and dolphins by day and manx shearwaters by night – for yourself.

Start date: Flexible, and thus open to discussion.

The impact of predation risk on faecal sac removal in birds

Subject area: Ornithology; parental care; faecal sac removal; blue tits

Supervisor(s): Dr Mark C. Mainwaring: https://www.bangor.ac.uk/staff/sens/mark-mainwaring-023874/en

Contact: m.mainwaring@bangor.ac.uk

Project description:

Parental care is widespread in animals, including birds, and has important implications for offspring fitness, with parents providing more care raising better offspring. Providing care is therefore beneficial yet it can also be costly if it exposes parents to the risk of predation. When quantifying parental care, the focus has been on the provision of food, yet other forms of care - such as the removal of faecal sacs - has received much less attention. This means that our understanding of the removal of faecal sacs remains relatively poor, and our understanding of parental care remains incomplete. This project will therefore examine how the risk of predation impacts parental care in blue tits (*Cyanistes caeruleus*) breeding in woodlands at Treborth Botanic Gardens. Routine monitoring will establish the bird's breeding parameters and when offspring are ten days old, pairs will be split into 'experimental' and 'control' pairs. Experimental pairs will be filmed for one hour to establish baseline rates of food provisioning and faecal sac removal before being exposed to a predator in the form of a model Eurasian sparrowhawk (*Accipiter nisus*) and associated calls for one hour, whilst control pairs will be exposed to non-predatory song thrush (*Turdus philomelos*) models for the same time. This will test the hypothesis that the higher perceived - but not actual - risk of predation at experimental nests will lead to blue tits provisioning offspring less frequently and removing fewer faecal sacs.

Start date: Flexible, and thus open to discussion.

Museum eggshells as an archive of conservation genetic information

Subject area: Museum genomics, lab work, evolutionary biology, conservation

Supervisor(s): Johanna Paijmans (https://www.bangor.ac.uk/staff/sens/johanna-paijmans-682198/en), Axel Barlow (https://www.bangor.ac.uk/staff/sens/axel-barlow-036245/en)

Contact: j.paijmans@bangor.ac.uk

Project description:

The poaching of eggs from wild birds has historically been a pervasive problem in the UK. Museum collections often hold large collections of these eggs from rare or even extinct species of birds. These eggs often are seen as "loaded" collections, as they were often collected with total disregard on the impact on bird populations. However, there is the potential to turn these resources into good, as they hold an incredible source of information about past bird populations. This project is aimed to evaluate and optimise DNA recovery from museum eggshells, with the goal to recover genomic data from the shells as a resource for use in conservation of bird populations. Some lab work experience would be beneficial, however a strong desire to learn and attention to detail is paramount.

Start date: Jan / Apr / Oct

Effects of Artificial Light at Night (ALAN) on the UK's colony-nesting birds

Subject area: Ecology, Ornithology, Anthropogenic Effects, Artificial Light at Night (ALAN)

Supervisor(s): Tyler Hallman (https://www.bangor.ac.uk/staff/sens/tyler-hallman-659106/en), Svenja Tidau (https://www.bangor.ac.uk/staff/sens/svenja-tidau-497222/en)

Contact: t.hallman@bangor.ac.uk

Project description:

While some threats to wildlife, such as harvest and persecution, have clear and direct effects, the effects of other pervasive environmental change can be much more nuanced. Artificial light at night (ALAN) has caused a major shift in nighttime light intensity and timing around the world. ALAN affects wildlife by altering activity timing, migration and development. In seabirds, the effects of ALAN range from increased nighttime foraging in lit areas to disorientation, grounding, and mortality. The population level effects of ALAN in seabirds are poorly understood. In this study you will use data from the British Trust for Ornithology's (BTO), Seabird Monitoring Programme for colonies across the UK (e.g., common tern, Manx shearwater, etc.) and freely available GIS data to investigate the population level effects of ALAN, including trends

in population size, breeding success, and additional endpoints. If you have any questions, please do not hesitate to ask.

Environmental pollution and avian nest predation rates

Subject area: Ornithology; environmental pollution

Supervisor(s): Dr Mark C. Mainwaring (https://www.bangor.ac.uk/staff/sens/mark-mainwaring-023874/en)

Contact: m.mainwaring@bangor.ac.uk

Project description:

Natural selection favours traits that minimise the risk of predation, including the selection of safe nesting sites. However, nest predation rates may become altered after being exposed to environmental pollution. Pollution is widespread in the Anthropocene, primarily in the form of artificial light at night and the presence of discarded plastic in nests. A better understanding anthropogenic impacts on breeding birds, particularly in urban areas is required. Part 1 will use the nests of Eurasian blackbirds (*Turdus merula*) to examine whether artificial light at night and plastic materials impacts nest predation rates. Part 2 will use artificial nests containing common quail (*Coturnix coturnix*) eggs to test these factors in a controlled manner. Both studies will test the hypothesis that lit areas help predators find nests and thus increase nest predation rates, whilst lit nests containing anthropogenic material will be predated even more frequently because they shine more brightly under artificial light at night. Daily nest checks will determine nest survival rates and camera traps will identify nest predators and to establish the timing of predation events. This project is important as it will help establish the link between artificial light at night, plastic pollution, and nest predation rates of urban birds.

Making community science count: the abundance calibration index

Subject area: Community (Citizen) Science, Ecology, & Statistics

Supervisor(s): Tyler Hallman (https://www.bangor.ac.uk/staff/sens/tyler-hallman-659106/en)

Contact: t.hallman@bangor.ac.uk

Project description:

Community (citizen) science data are collected at a spatial and temporal scale that cannot be matched by professional surveys. These data, however, are not without challenges. Large community science platforms such as eBird (ebird.org) encourage users of all skill levels to participate and guidelines for survey protocols are flexible. Developing methods to address the noise in community science data is essential. While indices that account for an observer's ability to detect and identify a species improve species distribution models, they do not address an observer's skill or experience at counting individuals. Even in observers who are skilled at identification, abundance information from their counts may be unreliable. This study will use community science data to compare the reported abundances of birds at frequently visited sites to create a new observer and species specific abundance calibration index. If you have any questions, please do not hesitate to ask.

Preference-based observer bias in wildlife surveys

Subject area: Community (Citizen) Science, Ecology, & Environmental Psychology

Supervisor(s): Tyler Hallman (https://www.bangor.ac.uk/staff/sens/tyler-hallman-659106/en), Whitney Fleming (https://www.bangor.ac.uk/staff/sens/whitney-fleming-659105/en)

Contact: t.hallman@bangor.ac.uk

Project description:

Community (citizen) science data are collected at a spatial and temporal scale that cannot be matched by professional surveys. These data, however, are not without challenges. Large community science platforms such as eBird (ebird.org) encourage users of all skill levels to participate and guidelines for survey protocols are flexible. These databases may be highly biased as community scientists may be far less likely to start checklists in locations where they detect either 1) no birds or 2) no birds of interest. This study will explore biases associated with when and why observers decide to begin a checklist. Depending on the interest of the student, this can either be from the statistical side of comparing the

prevalence of species and habitats in community science v. standardized surveys, or from the social/psychological side of participant decision making and behaviour. If you have any questions, please do not hesitate to ask.

Primatology: Behaviour, Ecology, Conservation

The function of long-distance calling in the Zanzibar red colobus monkey

Subject area: Primatology, Animal Behaviour

Supervisor(s): Alex Georgiev (https://www.bangor.ac.uk/staff/sens/alexander-georgiev-125564/en)

Contact: a.georgiev@bangor.ac.uk

Project description:

The long-distance vocalisations made by many primates can have multiple, non-mutually exclusive functions related, for example, to resource defence, mate defence, signalling social status, and maintaining contact with other individuals. This project will examine the function of long-distance calls in the Zanzibar red colobus, an endemic and endangered primate, which is non-territorial but engages in frequent intergroup confrontations. You will collect data on the rate of long-distance call by males in different groups and across contexts to test several hypotheses regarding the function of these vocalisations. Costs for three months of field work in Zanzibar with the Zanzibar Red Colobus Project (https://www.zanzibarredcolobusproject.org), would need to be partially self-funded.

Male social relationship in the Zanzibar red colobus monkey

Subject area: Primatology, Animal Behaviour

Supervisor(s): Alex Georgiev (https://www.bangor.ac.uk/staff/sens/alexander-georgiev-125564/en)

Contact: a.georgiev@bangor.ac.uk

Project description:

The nature of social relationships within primate groups are often underpinned by the pattern of dispersal by the two sexes. Red colobus species (*Piliocolobus sp.),* have been typically described as male-philopatric (i.e., males remain in their natal group, while females disperse), however, evidence from some sites suggests that males can also move between groups, creating a complex pattern of relatedness and sociality within some groups. In the Zanzibar red colobus (*P. kirkii*), in particular, previous studies have shown such male dispersal. In this study you will investigate the nature and pattern of male social relations (including, affiliative and competitive interactions) to examine if and how these differ from what we would expect based on a regime of male philopatry in this species. Comparisons between different groups will help identify if this species can be characterised by typical pattern of male sociality or if there is considerable variation between groups in male relations, depending on the number of males present and the level of habitat disturbance. Costs for three months of field work in Zanzibar with the Zanzibar Red Colobus Project (https://www.zanzibarredcolobusproject.org), would need to be partially self-funded.

The ecology of Zanzibar red colobus in heavily degraded coastal forest fragments

Subject area: Primatology, Conservation

Supervisor: Alex Georgiev https://www.bangor.ac.uk/staff/sens/alexander-georgiev-125564/en

Contact: a.georgiev@bangor.ac.uk

Project description:

While most members of the red colobus (*Piliocolobus*) genus tend to be dependent on relatively undisturbed rainforest, the Zanzibar red colobus (*P. kirkii*) has shown considerable ecological plasticity in its habitat requirement and the ability to persist even in heavily modified anthropic landscapes. In this project you will study several groups of Zanzibar red colobus along the southeast coast of Unguja Island, Zanzibar that live in very 'marginal' habitat. Resulting from

deforestation coupled with intense tourist development, these coastal habitats present novel conditions for what is typically a forest-specialised primate. You will first establish the presence and distribution of these groups along an approximately 10-km stretch of coast via ecological surveys and interviews. Then you will also collect baseline data on the feeding ecology, ranging, and interactions with people in the local area for a subset of the groups identified. This project will provide an important insight into the status of Zanzibar red colobus living outside protected areas. Field research will take place along the southeast coast of Unguja, Zanzibar, in the area of Paje and Jambiani villages. Costs for three months of field work in Zanzibar with the Zanzibar Red Colobus Project (https://www.zanzibarredcolobusproject.org), would need to be partially self-funded.

Entomology: Ecology and Evolution

How host plant-induced plasticity jumpstarts speciation: a meta-analysis

Subject area: evolutionary biology, meta-analysis

Supervisors: Dr Benjamin Jarrett (https://www.bangor.ac.uk/staff/sens/benjamin-jarrett-602764/en)

Contact: b.jarrett@bangor.ac.uk

Project description:

Speciation is thought to be a slow process that occurs over thousands, if not millions, of years. And yet the process of speciation begins at some point, and plasticity may play a key role in accelerating speciation at its start. Speciation can be studied by quantifying reproductive isolation—effectively the likelihood of different populations to exchange genes. Within a population, reproductive isolation is zero, but for species, reproductive isolation is complete. A recent meta-analysis (Jarrett et al. (2025) Meta-analysis reveals that phenotypic plasticity and divergent selection promote reproductive isolation during incipient speciation. Nature Ecology & Evolution 9, 833–844) has shown that environmentally-induced plasticity increases reproductive isolation between populations. The project will further this by exploring how host plant-induced plasticity affects reproductive isolation in phytophagous insects. After a literature search, estimates of reproductive isolation will be extracted from relevant papers that estimate reproductive isolation from two populations of invertebrate that have developed on different species of host plant. This data will provide insight into the initiation of speciation in a taxonomic group that is recognised as being very species rich.

Start date: Any

Testing ecological speciation in the laboratory using seed beetles, *Callosobruchus maculatus*

Subject area: evolutionary biology, entomology

Supervisors: Dr Benjamin Jarrett (https://www.bangor.ac.uk/staff/sens/benjamin-jarrett-602764/en); Dr Aaron Comeault (https://www.bangor.ac.uk/staff/sens/aaron-comeault-485161/en); Dr Darren Parker (https://www.bangor.ac.uk/staff/sens/darren-parker-571328/en)

Contact: b.jarrett@bangor.ac.uk

Project description:

How species form is a fundamental question in evolutionary biology. Ecological speciation is one mechanism, where two populations adapting to different environments are more likely to become reproductively isolated (the first step in speciation) than two populations evolving in the same environment. This project leverages an experiment in which populations of *Callosobruchus maculatus* beetles have been evolving in different environments for over 100 generations. By measuring reproductive isolation between populations of beetles that have evolved in different environment, this project will test how ecological adaptation can contribute to the formation of new species. The project will involve mate choice experiments for pre-zygotic barriers, counting offspring and eggs for post-zygotic barriers, and could involve some bioinformatics if this is of interest to the student. This project will contribute to our understanding of how new species form, and the role that ecology plays at the beginning of the speciation process.

Start date: Any

Fighting behaviour and host plant-induced plasticity of male weaponry in the broad-headed bug *Hyalymenus longispinus*

Subject area: evolutionary biology, entomology, behaviour

Supervisors: Dr Benjamin Jarrett (https://www.bangor.ac.uk/staff/sens/benjamin-jarrett-602764/en)

Contact: b.jarrett@bangor.ac.uk

Project description:

Males often compete with other males for access to females, resulting in exaggerated morphologies like horns, antlers, and mandibles that are used in male-male contests. These weapons are functional and are crucial for male fitness. Male weapons are also sensitive to male condition, with larger males having disproportionately large weapons. The project will investigate how the developmental environment of males impacts weapon shape and size, and assess how this plasticity affects selection acting on the weapon, using the broad-head bug*, Hyalymenus longsipinus*, as a model system. *H. longispinus* males have enlarged hind femurs they use to fight each other for territories on host plants, which females then lay her eggs in. Males of the bug *Hyalymenus longispinus* will be reared on different host plants of the family Fabaceae and weapon shape and size will be compared between treatments using morphometrics. Contests will then be performed to assess if host plant-induced plasticity impacts the success of males fighting on different host plants. This project will provide novel insights into how social behaviour and plasticity can affect the rate of adaptation and colonisation of novel niches.

Start date: Any

What's eating invasive species? Community composition changes on *Rhododendron ponticum* in the last 30 years.

Subject area: entomology, plant-insect interactions, invasive species, community ecology

Supervisor(s): Dr Benjamin Jarrett (https://www.bangor.ac.uk/staff/sens/benjamin-jarrett-602764/en), Dr Farnon Ellwood (https://www.bangor.ac.uk/staff/sens/farnon-ellwood-573335/en)

Contact: b.jarrett@bangor.ac.uk

Project description:

Freed from coevolved natural enemies in their native ranges, invasive species flourish and dramatically restructure the trophic links within communities. Invasive species, however, present an ecological opportunity for native species; a novel interaction to which a species can adapt). *Rhododendron ponticum* is a non-native shrub that dominates woodlands and outcompetes many native woodland species. This project will measure herbivory and quantify the herbivore community found on *R. ponticum* a non-native shrub that dominates woodlands and outcompetes many native woodland species at two local sites in North Wales. This project will show how the native

herbivore community has changed in the last 30 years, and provide insight in the taxa that can adapt to utilise an invasive plant as a new host.

The genetic basis of cold tolerance in *Drosophila*

Subject area: Genetics, entomology

Supervisor(s): Darren Parker (https://www.bangor.ac.uk/staff/sens/darren-parker-571328/en)

Contact: d.parker@bangor.ac.uk

Project description:

For many organisms the ability to tolerate the onset of winter has major implications for their fitness, however, little work has been done to understand their underlying genetic basis. We have generated a list of candidate genes for cold tolerance (from gene expression data) and the next step is to experimentally test these genes' role in cold tolerance. To do this we will use the genetic tools available in *Drosophila melanogaster* to manipulate the gene expression of these genes. These experiments will provide valuable insights into the genetic mechanisms that underlie cold tolerance in insects. Training in *Drosophila* husbandry, phenotyping, microscopy, genetic crossing, and data analysis will be given.

Assessing current and historical levels of genetic diversity in North Wales moths

Subject area: Entomology, genetics

Supervisor(s): John Mulley (https://www.bangor.ac.uk/staff/sens/john-mulley-067365/en)

Contact: j.mulley@bangor.ac.uk

Project description:


There are two species of moth in North-West Wales which are found nowhere else in the UK, Weaver's Wave (*Idaea contiguaria)* and Ashworth's Rustic (*Xestia ashworthii*). These populations are likely relics of a wider distribution, and may be cold-adapted. Such populations are extremely susceptible to climate change, as they cannot easily shift their range to more hospitable areas, and small isolated populations typically have low levels of genetic diversity.

The project will include field sampling across the current range of these species; identification of historical samples in UK and European museums; and lab-based determination of current and historical levels of genetic diversity to shed light on what is going on with these species, and what pressures they might be under as our climate changes.

Plant Science

Forests for the Future: Enhancing Upland Water Quality Through Smarter Sustainable Forest Management

Subject area: Forest management water management and upland ecology

Supervisor(s): Dr Tim Peters (https://www.bangor.ac.uk/staff/cse/tim-peters-072185/), Dr Jennifer Williamson (https://www.ceh.ac.uk/staff/jennifer-williamson), Bid Webb (https://www.bangor.ac.uk/staff/sens/bid-webb-115832/en)

Contact: tim.peters@bangor.ac.uk

Project description:

Working closely with the UK Centre for Ecology & Hydrology and the Woodland Trust this project will investigate the impact of changing woodland management on water quality in the Welsh uplands. Testing the hypothesis that continuous cover forestry with the aim of reversion to native broadleaf species will improve water quality compared to conventional conifer plantation management this project will build on over a decade of existing stream chemistry data within a paired catchment experimental design in Cwm Mynach, near Dolgellau in North Wales. The site has been historically managed for commercial conifer plantation and is typical of many upland conifer plantations in Wales, but future management will mean that one sub-catchment will be converted to native broadleaf species, while the other remains as a conventional plantation control. Much of our drinking water in Wales is sourced from these upland catchments and this

study provides an opportunity to understand how changing land management could improve water quality at source. There would be additional opportunities for the student to develop the project into areas of particular interest to them, including biodiversity changes, assessment of carbon fluxes on the site or modelling of catchment hydrology depending on the individual interests of the successful student.

Start date: Any commencement period (Jan / Apr / Oct)

Revisiting Ash Provenance Trials at Henfaes: Phenology, Dieback Susceptibility, and Long-Term Performance

Subject area: Forest genetics, tree health and silviculture

Supervisor(s): Dr Tim Peters (https://www.bangor.ac.uk/staff/cse/tim-peters-072185/), Dr Ashley Hardaker (https://www.bangor.ac.uk/staff/sens/ashley-hardaker-108747/en)

Contact: tim.peters@bangor.ac.uk

Project description:

This project revisits the ash (*Fraxinus excelsior*) provenance plots at Henfaes Experimental Farm to assess their current health status in the context of ash dieback (*Hymenoscyphus fraxineus*). The study will investigate whether phenological traits—such as early autumn leaf senescence and early spring budburst—correlate with tolerance or resistance to dieback, as suggested by recent observations. Students will record phenology, crown condition, and dieback symptoms across multiple provenances and compare these with historical performance data on growth, form, canker resistance, and biomass production. A key question is whether provenance rankings have shifted over time: do provenances that performed well in early trials still maintain superiority under current disease pressure? The project combines field measurements, statistical analysis, and interpretation of long-term genetic and environmental interactions. Findings will inform breeding and conservation strategies for ash in Britain and contribute to understanding adaptive traits under biotic stress.

Start date: Apr

Aspen Agroforestry in Eryri: A Case Study of Natural Regeneration and Grazing Interactions at Hafod Ifan

Subject area: Agroforestry / Woodland ecology / Conservation genetics

Supervisor(s): Dr Tim Peters (https://www.bangor.ac.uk/staff/cse/tim-peters-072185/), Dr Jenny Wong (https://www.bangor.ac.uk/staff/sens/jenny-wong-001711/en)

Contact: tim.peters@bangor.ac.uk

Project description:

Aspen (*Populus tremula*) is a native keystone species with high biodiversity value yet is rarely planted and with sporadic natural seed production in Britain regeneration occurs by suckers. Mapping across Gwynedd/Eryri has identified over 180 aspen locations. Genetic testing of 111 trees at these locations reveal 88 individuals, making it one of the rarest native trees in NW Wales. Aspen is highly palatable to sheep and cattle and has potential in silvopasture. Extensive suckering and subsequent browsing have been observed from hedgerow trees on one site—Hafod Ifan. This lightly grazed site, adjacent to the River Conwy, offers an opportunity to study natural regeneration under low-intensity grazing. The student will investigate the age and spatial structure of several cohorts of suckers, evaluate the impact of browsing and the value of aspen browse to the sheep. The aim would be to explore whether this system functions as an impromptu agroforestry model. The student will conduct field surveys, measure tree and sucker growth, and assess browsing pressure. Interviews with the tenant farmer (via National Trust liaison) will provide insights into management practices. Findings will inform strategies for integrating aspen into farmed landscapes and contribute to conservation and agroforestry policy.

Start date: Jan / Apr / Oct

Improving Vegetative Propagation of Eucalyptus for Commercial Floriculture

Subject area: Tree Nursery Practice/ Plant Science / Horticulture

Supervisor(s): Dr Tim Peters (https://www.bangor.ac.uk/staff/sens/timothy-peters-072185/en), Neil Robertson (Industry Partner,(https://www.uklyptus.co.uk/)

Contact: tim.peters@bangor.ac.uk

Project description:

This project investigates methods to improve the vegetative propagation of eucalyptus species traditionally considered non-clonable. Uklyptus, a specialist grower of eucalyptus foliage for florists, has achieved limited success in rooting and weaning cuttings, with strike rates ranging from 5–50% and high mortality after potting. The research will focus on optimising environmental conditions (ventilation, temperature, humidity), rejuvenation techniques (coppicing, mini cuttings), and treatments such as fungicides, Trichoderma, and rooting hormones. Experiments will be conducted at Treborth Botanic Garden or Henfaes Experimental Farm to compare outcomes against

previous industry results. Success in this area could significantly increase productivity and sustainability in commercial eucalyptus production.

Start date: Apr

Restoration, dynamics and resilience of temperate rainforests and ancient woodland

Subject area: Forest and woodland ecology

Supervisor(s): Professor John Healey (https://research.bangor.ac.uk/en/persons/john-healey), with potential co-supervision (project dependent) by Dr Marielle Smith (https://www.bangor.ac.uk/staff/sens/marielle-smith-593809/en), Dr Bid Webb (https://www.bangor.ac.uk/staff/sens/bid-webb-115832/en), Professor Simon Smart (https://www.ceh.ac.uk/staff/simon-smart; https://www.bangor.ac.uk/staff/sens/simon-smart-719984/en) and Dr Mike Perring (https://www.ceh.ac.uk/staff/michael-perring).

Contact: j.healey@bangor.ac.uk

Project description:

Restoration of temperate rainforests in UK is a conservation priority, while many of our ancient woodlands are in poor condition, with limited resilience due to the effects of past management, and increased disturbance due to tree pathogens, mammals, storms and severe droughts. To address the need for improved ecological knowledge to underpin conservation action, key research questions include: what are the most effective rainforest restoration methods for biodiversity and carbon to overcome specific site constraints; what ecological interactions determine the resilience of tree species mixtures?

To address these questions, we have (i) a new temperate rainforest restoration project in collaboration with the Wildlife Trusts and Woodland Trust; (ii) long-term ecological research (including permanent sample plots of 70- and 20-years duration respectively) in two iconic ancient woodlands: Lady Park Wood in the Wye Valley and Coed Dolgarrog in the Conwy Valley; (iii) close collaboration with the UK-CEH team leading “Fifty years of change across British broadleaved woodlands” based on a survey of 97 sites. Each of these offer exciting opportunities for MScRes research spanning a range from a substantial programme of new fieldwork to analysis and modelling of existing data sets. For further details please contact Professor John Healey (j.healey@bangor.ac.uk).

Start date: Any time

Genomics of longevity: are ancient oaks survivors by chance or genetics?

Subject area: plant genomics, conservation, evolutionary biology, bioinformatics

Supervisor(s): Owen Osborne: https://www.bangor.ac.uk/staff/sens/owen-osborne-493757/en, Alex Papadopulos: https://www.bangor.ac.uk/staff/sens/alexander-papadopulos-128237/en, Ed Pyne (Woodland Trust; https://www.woodlandtrust.org.uk/), Emma Gilmartin (Arboricultural Association; https://trees.org.uk/)

Project description:

Trees are sessile, so must withstand a suite of abiotic and biotic threats across their potentially millennial scale lifespans. In the UK, Ancient oaks are vital ecological and cultural keystones, yet the genomic basis of their extraordinary longevity remains unclear. Are these trees long-lived due to chance, or do they possess unique genomic characteristics that allow them to reach extreme ages? This project will focus on analysing whole genome sequencing data from a cohort of 40 iconic UK oaks, comparing them to publicly available oak genomes from younger individuals. Students will identify unique genetic diversity harboured by ancient oaks, providing insights into the genomic underpinning of tree longevity and informing conservation genomics.

Start date: Apr / Oct

The consequences of hydration status on cactus robusticity

Subject area: Biomechanics, Botany, Engineering, Bioinspiration

Supervisor(s): Dr Kris Crandell (https://www.bangor.ac.uk/staff/sens/kristen-crandell-454344/en), Dr Katherine Steele (https://www.bangor.ac.uk/staff/sens/katherine-steele-008458/en)

Contact: k.crandell@bangor.ac.uk

Project description:

Cacti have a rigid epidermis and thick waxy cuticle to help retain moisture and spines to defend against herbivory. Many species directly respond to environmental conditions by losing 30% of their water while retaining functions. Such changes in hydration can change flesh texture and could affect the epidermis's resistance to herbivory. In this self-funded project, the student will investigate whether changes in plant turgidity can affect resistance to herbivory in living cacti. The student will gain skills in plant husbandry, biomechanics and engineering techniques, including use of a materials tester to quantify strength. Please note that the primary supervisor is on maternity leave during 2025, and the ideal candidate (self-funded) would start in Oct 2025 or January 2026.

The ecological effects of rapid adaptation in plants

Subject area: adaptation, evolutionary ecology, plant science

Supervisor(s): Owen Osborne (https://www.bangor.ac.uk/staff/sens/owen-osborne-493757/en), Alex Papadopulos (https://www.bangor.ac.uk/staff/sens/alexander-papadopulos-128237/en)

Contact: o.osborne@bangor.ac.uk

Project description:

Environmental changes, such as pollution, can trigger rapid evolution and ecosystem shifts. While numerous examples of rapid evolution are known, their ecological consequences remain unclear. This project will examine how plant adaptation to metal-contaminated environments affects interactions with mycorrhizal fungi and soil bacteria. Former metal mine sites, which host locally adapted metal-tolerant plant populations, provide ideal study systems. Mycorrhizal fungi enhance plant metal tolerance, but plant adaptation may reshape these relationships. The project involves fieldwork at former Welsh metal mines, fungal culturing, and DNA sequencing. Recent evidence that adaptation can occur within a few generations has sparked interest in how it interacts with ecological dynamics. This research will advance this emerging field, with implications for agricultural productivity and biodiversity conservation.

Bioinformatics

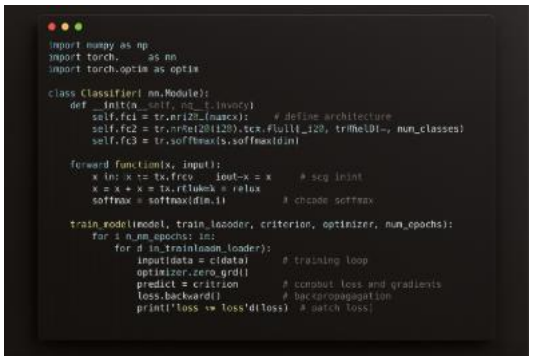
From Sequences to Signals: Machine Learning in Ecosystem Genomics

Subject area: Bioinformatics, evolutionary biology, machine-learning

Supervisor(s): Dr. Alex Papadopulos (https://www.bangor.ac.uk/staff/sens/alexander-papadopulos-128237/en) & Dr. Aaron Comeault (https://www.bangor.ac.uk/staff/sens/aaron-comeault-485161/en)

Contact: a.papadopulos@bangor.ac.uk

Project description:



Machine learning algorithms are increasingly being developed to tackle challenges in the biological and environmental sciences. If you are interested in genomics, machine learning, and biodiversity, the LOCUST (Local Organism Classification Under Spatial Taxonomy) team at Bangor University is looking for a student to help develop a novel unsupervised tool for classifying DNA sequences and extracting population genetic signals from complex genome sequence datasets. The project will involve simulating sequences from collections of available genome sequences and developing a novel tool that uses machine-learning for accurate taxonomic classifications. You'll work with simulated and real-world data to validate the model and quantify its limitations across the Tree of Life. This project offers hands-on experience in bioinformatics, deep learning, and evolutionary biology, with real-world applications in conservation, evolutionary biology, and ecological monitoring. Prior coding experience at some level is required, but more importantly, you should be curious and enthusiastic to learn!

Start date: any time

Environmental Psychology

Exploring Landscape Influences on Nearby Nature Perceptions

Subject area: Ecology, Geography, and Environmental Psychology

Supervisor(s): Tyler Hallman – https://research.bangor.ac.uk/en/persons/tyler-hallman, Whitney Fleming - https://www.bangor.ac.uk/staff/sens/whitney-fleming-659105/en

Contact: t.hallman@bangor.ac.uk

Project description:

This project explores how people's perceptions of "nearby nature" align with the actual environments around them. Building on prior research that examined how individuals define what counts as "nearby" versus "nearby nature," this study links those perceptions with ecological and spatial data. Using measures such as NDVI (vegetation cover), proximity to greenspaces and parks, and local bird diversity, we will test whether perceptions reflect real environmental conditions and how far people believe nature is from their homes.

Access to nature is widely associated with health and well-being, and benefits depend not only on ecological availability, but also on how people experience and interpret their surroundings. By identifying where perceptions match or diverge from reality, this research will reveal the social and psychological factors that shape connections to local environments. Findings will inform urban planning, equity in access to greenspace, and nature-based health interventions.

Start date: Any commencement period (Jan / Apr / Oct)

Exploring wellbeing and access to the outdoors – understanding social and environmental connections in collaboration with RSPB

Subject area: Environmental Psychology, Ecology, & Geography

Supervisor(s): Whitney Fleming - https://www.bangor.ac.uk/staff/sens/whitney-fleming-659105/en

Contact: w.fleming@bangor.ac.uk

Project description:

This project will explore how people experience and benefit from spending time outdoors, focusing on the social and wellbeing impacts of nature engagement. Building on initiatives such as the Cwm Idwal Warden's wellbeing surveys—which assess guided outdoor activities. The study will assess changes in mood and wellbeing linked to time spent in nature. It will also examine barriers to accessing the countryside, including physical, social, and psychological factors, to help identify ways of making outdoor spaces more inclusive and beneficial for diverse groups.

This project is the idea of Mat Brown (RSPB, Assistant Conservation Officer, Y Migneint) and will be conducted in collaboration with RSPB.

Start date: Any commencement period (Jan / Apr / Oct)