# Opportunities for Master of Science by Research (MScRes) study at the School of Ocean Sciences at Bangor University

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# Introduction

In this booklet you can find out more about current opportunities to undertake a self-funded Master of Science by Research (MScRes) degree at the School of Ocean Sciences, entirely focused on a research project of your choice.

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, 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 list or projects in this document 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 College research community. There are multiple research seminarsthat run across the three Schools within the College of Science and Engineering, 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).

**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 Ocean Sciences): Dr James Waggitt (j.waggitt@bangor.ac.uk)

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

# MScRes in Ocean Sciences

<https://www.bangor.ac.uk/courses/postgraduate-research/ocean-sciences-mscres>

## Benthic Ecology

### Impact of future sea bottom heatwaves on benthic organisms

**Subject area:** Oceanography (modelling, climate projection, heatwaves)

**Supervisor(s):** **Soizic Garnier** (https://www.bangor.ac.uk/staff/sos/soizic-garnier-658279/en), Peter Robins (https://www.bangor.ac.uk/staff/sos/peter-robins-011021/en), Luis Gimenez (https://www.bangor.ac.uk/staff/sos/luis-gimenez-noya-016503/en)

**Contact:** s.garnier@bangor.ac.uk

**Project description:**

This project investigates the combined effect of a long-term projected warming as well as the behaviour and evolution of sea bottom heatwaves on benthic species. Using hydrodynamic outputs from a high-resolution climate model of the northwest European shelf seas under the high-emission RCP8.5 scenario (1991–2099), the research will analyse projected warming trends and heatwaves using a shifting baseline climatology approach. The student will identify focal benthic species with well-documented temperature sensitivities/thresholds and spatial distributions and explore how warming and heatwaves may impact them over varying timescales. Addressing the research gap in how marine heatwaves influence deeper water regions, the study aims to provide critical insights into benthic species’ ecological responses, with findings intended for publication.

Reproduction in shallow water Antarctic marine invertebrates

**Subject area:** Marine ecology

**Supervisor(s):** **Dr Laura Grange** (<https://www.bangor.ac.uk/staff/sos/laura-grange-479754/en>) and Professor Lloyd Peck (British Antarctic Survey)

**Contact:** l.grange@bangor.ac.uk

**Project description:**

Human driven environmental forcing is producing broad-scale change in marine ecosystems. Although climate change affects marine organism physiology and behaviour, the impacts of environmental variation on fundamental biological functions such as reproduction remain poorly understood. The waters round the Antarctic Peninsula are the most rapidly warming marine environments on Earth, with many shallow-water species nearing the upper limit of their thermal tolerance. For 20 years we have collected samples of the sea star *Odontaster validus*, brittlestar *Ophionotus victoriae*, and sea urchin *Sterechinus neumayeri* to examine the long-term reproductive biology of these species. Using this globally unique time-series, this project aims to use gonad index and standard wax histology techniques to elucidate how environmental variability has impacted the reproductive success of these shallow-water, marine invertebrates.

Investigating reproductive trait variability in Arctic benthic marine invertebrates

**Subject area:** Marine ecology

**Supervisor(s):** **Dr Laura Grange** (<https://www.bangor.ac.uk/staff/sos/laura-grange-479754/en>), Professor Lis Jorgensen (Institute of Marine Research, Norway) and Dr Terri Souster (UiT, The Arctic University of Norway)

**Contact:** l.grange@bangor.ac.uk

**Project description:**

Interest in trait-based approaches – such that consider morphological, physiological, behavioural, and life history characteristics – in the marine environment has grown over recent decades. Against a backdrop of rapid environmental change, these methods present opportunities to inform our understanding of a species’ potential vulnerability to change and climate impacts on ecosystem function. Environmental forcing in the northern high latitudes is now widely acknowledged as driving rapid change in Arctic marine ecosystems, but the effects of climate variability on the persistence of species in the Arctic is lacking. By quantifying a range of morphometric and reproductive traits across a collection of pan-Arctic marine invertebrates, this study aims to determine whether a species’ reproductive traits are phylogenetically constrained or vary with environmental forcing.

Reproduction in an Antarctic ascidian

**Subject area:** Marine ecology

**Supervisor(s):** **Dr Laura Grange** (<https://www.bangor.ac.uk/staff/sos/laura-grange-479754/en>), and Professor Lloyd Peck (British Antarctic Survey)

**Contact:** l.grange@bangor.ac.uk

**Project description:**

Human driven environmental forcing is producing broad-scale change in marine ecosystems. Although climate change affects marine organism physiology and behaviour, the impacts of environmental variation on fundamental biological functions such as reproduction remain poorly understood. The waters round the Antarctic Peninsula are the most rapidly warming marine environments on Earth, where the inability to move and avoid local stress conditions renders sessile, suspension feeding organisms particularly vulnerable to ongoing environmental forcing. Suspension feeders are also constrained in respiration and growth succumbing to die outs owed to sedimentary smothering of their filtration surfaces caused by climate-induced glacial melt. Using a globally unique time-series of ascidians, this project aims to use wax histology to elucidate how environmental change has impacted long-term reproductive success.

Marine underwater monitoring in the 21st century

**Subject area:** marine ecology, marine monitoring, machine learning, bivalves

**Supervisor(s): Dr Svenja Tidau (**<https://www.bangor.ac.uk/staff/sens/svenja-tidau-497222/en>), Dr Marianna Chimienti <https://www.bangor.ac.uk/staff/sos/marianna-chimienti-684036/en> , Dr Christian Berger (industry partner) [www.pebl-cic.co.uk](http://www.pebl-cic.co.uk)

**Contact:** s.tidau@bangor.ac.uk

**Project description:**

Sessile marine invertebrates like corals and bivalves are important ecosystem engineers and build biogenic reefs that provide habitats and ecosystem services like food provisioning and water filtration. Understanding their behaviour, species-specific traits, population dynamics, and the community they support is vital for marine conservation. Traditionally, these animals have been studied through labour-intensive and disruptive manual surveying with low temporal resolution. Advances in automated underwater imaging and passive acoustics now enable more feasible, affordable, and non-intrusive monitoring, allowing detailed data collection over long periods. This project will use high-resolution underwater imaging systems and passive acoustic monitoring to explore sessile invertebrate communities over 24-hour cycles, providing insights into night-time ecology and environmental factors influencing ecosystem services.

### Quantifying the role of natural and anthropogenic light and sound on temperate marine ecosystems

**Subject area:** marine ecology, global change research, sensory pollution, larval ecology

**Supervisor(s): Svenja Tidau** (<https://www.bangor.ac.uk/staff/sens/svenja-tidau-497222/en>), Stuart R Jenkins (<https://www.bangor.ac.uk/staff/sos/stuart-jenkins-008971/en>)

**Contact:** s.tidau@bangor.ac.uk

**Project description:**

Sessile marine invertebrates are crucial ecosystem engineers. They develop through complex life cycles, with larvae relying on environmental cues like light and sound for movement and settlement. While the importance of natural light cycles is well-known, studies on natural soundscapes are rather recent. Anthropogenic light (ALAN) and noise can disrupt these processes, yet their combined effects are rarely studied.

This project will experimentally quantify the impact of natural and anthropogenic light and sounds on benthic fauna. We will measure settlement success, growth, biomass, and community composition of sessile invertebrates in manipulated light and sound conditions.

Understanding the combined effects of ALAN and noise can inform aquaculture, shellfish industries, and the restoration of benthic habitats, benefiting native oysters, and horse mussels.

## Marine Top Predator Ecology

### Alcidae foraging strategies in north-western Iceland

**Subject area:** Marine Top Predator Ecology, Oceanography, Ecological Niche.

**Supervisor(s):** **James Waggitt** (<https://www.bangor.ac.uk/staff/sos/james-waggitt-107382/en>), Marianna Chimienti (<https://www.bangor.ac.uk/staff/sos/marianna-chimienti-684036/en>), Peter Robins (<https://www.bangor.ac.uk/staff/sos/peter-robins-011021/en>), and Norman Ratcliffe (<https://www.bas.ac.uk/profile/notc/>)

**Contact:** j.waggitt@bangor.ac.uk

**Project description:**

Understanding differences in foraging strategies amongst similar and sympatric seabird species can explain variation in population success or predict variances in population responses to climate change and anthropogenic activities. A comprehensive identification and comparison of foraging strategies requires concurrent physical and biological datasets that simultaneously measure oceanography, prey, and seabirds in foraging areas. This project exploits an extensive and unique dataset collected in NW Iceland (seabird observations, echosounder, CTDs, trawls, GPS tracking). Analysis will focus on describing and comparing habitat associations of guillemot species (Brunnichs guillemot *Uria lomvia,* common guillemot *Uria aalge)* with a particular emphasis on the water-column properties and prey communities in foraging areas.

### Comparing shearwater foraging strategies amongst European regions

**Subject area:** Marine Top Predator Ecology, Oceanography, Biologging, Habitat-Use

**Supervisor(s):** **James Waggitt** (<https://www.bangor.ac.uk/staff/sos/james-waggitt-107382/en>), Marianna Chimienti (<https://www.bangor.ac.uk/staff/sos/marianna-chimienti-684036/en>), Peter Robins (<https://www.bangor.ac.uk/staff/sos/peter-robins-011021/en>), and William Schneider (<https://www.bangor.ac.uk/staff/sos/william-schneider-541586/en>).

**Contact:** j.waggitt@bangor.ac.uk

**Project description:**

Shearwater are considered particularly vulnerable to fisheries bycatch in European waters. However, there appears to be considerable variation in vulnerability amongst species. These differences could relate to variation in foraging behaviours amongst regions and species, which itself could relate to variation in oceanographic conditions across scenarios. Disentangling relationships between physics and predators demands a multi-disciplinary approach, combining biological and oceanographic datasets, and collating datasets across different scenarios. This project uses existing biologging and oceanographic model / remote sensing datasets to compare foraging behaviours across 5 European shearwater species, exploring relationships between foraging behaviours and oceanographic conditions in different scenarios. By better establishing connections between oceanographic conditions and foraging behaviours, scenarios which may promote fisheries interactions can be better identified.

### Energy strategies in swimming and diving in little penguins (*Eudyptula minor*)

**Subject area:** Marine Top Predator ecology, bio-logging, modelling

**Supervisor(s): Marianna Chimienti** (<https://www.bangor.ac.uk/staff/sos/marianna-chimienti-684036/en>), Akiko Kato (<https://www.cebc.cnrs.fr/predateurs-marins/?lang=en>), Yan Ropert-Coudert (<https://www.cebc.cnrs.fr/predateurs-marins/?lang=en>), Andre Chiaradia (<https://www.penguins.org.au/conservation/research/our-team/andre-chiaradia/>)

**Contact:** m.chimienti@bangor.ac.uk

**Project description:**

Energy balances are vital for diving marine predators like penguins, particularly during breeding when energy demands peak, and food availability varies. Penguins use specialized diving and swimming strategies to optimize energy and capture prey efficiently. This project focuses on little penguins (*Eudyptula minor*), the smallest penguin species, endemic to Australia and New Zealand. Phillip Island hosts one of the largest colonies, monitored for over 60 years. Researchers track penguins using bio-loggers and study their foraging strategies. The project primarily involves modelling animal movement and environmental data, with potential fieldwork opportunities in Australia, pending extra funding. Ideal candidates are good at communicating with all supervisors involved, proficient in R, passionate about marine ecology, and eager to participate in conservation and fieldwork.

### New insights into seabird diet from eDNA

**Subject area:** Marine Ecology

**Supervisor(s): Dr. Amy Ellison** (<https://www.bangor.ac.uk/staff/sens/amy-ellison-495358/en>), Professor Simon Creer (<https://www.bangor.ac.uk/staff/sens/simon-creer-008526/en>), James Waggitt (<https://www.bangor.ac.uk/staff/sos/james-waggitt-107382/en>)

**Contact:** a.ellison@bangor.ac.uk

**Project description:**

To aid in the conservation of seabirds we must understand what these birds eat and how that varies in time, and space. In this project you will assist in the development of eDNA to understand the diet of two seabird species. You will use previously collected swabs from European shags (Gulosus aristotelis) and common guillemot (Uria aalge), extract DNA and address the overarching research question of ‘what have these birds been eating’. The use of eDNA to reconstruct diet is non-invasive and relatively new in this context, potentially superior to current approaches. You will not only learn a suite of valuable skills but also contribute to an important ongoing research project. All laboratory and field costs will be covered.

## Oceanography

### Impacts of climate change on estuary water quality

**Subject area:** Oceanography, Ocean Modelling

**Supervisor:** **Peter Robins** (<https://www.bangor.ac.uk/staff/sos/peter-robins-011021/en>)

**Contact:** p.robins@bangor.ac.uk

**Project description:**

Estuaries regulate global nutrient cycles that drive the biodiversity and ecology of coastal wildlife and provide ecosystem services such as food security and tourism that sustain the livelihoods and wellbeing of coastal communities (Fulford 2020). Estuaries are, however, potential pollution sinks for sewage containing water-borne pathogens (Robins 2019) and plastics, and susceptible to environmental degradation from, e.g., harmful algal blooms and hypoxia (Hannaford 2021) that pose serious environmental and human health risks (Freeman 2019).

The aim of this project is to characterise the variability and potential change in estuary health across Welsh estuaries, being the first study to analyse new hourly-resolution climate projections for the UK this century. Changes in water temperatures and salinities will be explored, as well as shifts in the behaviour, timing, and co-dependence of river flows and sea levels, during episodic events and over longer time scales. Indicators and tipping-points of water quality degradation will be identified, for example, the changing behaviour of droughts and heatwaves, residence times, and flash flood events that carry turbid and polluted waters, as well as variabilities due to estuary shape. This project is supported by Natural Resources Wales and compliments a current England-wide study led by the Environment Agency, to deliver a pan England-Wales (~75 estuaries) vulnerability assessment that will inform a UK Government policy gap to manage UK estuaries in the face of climate change.

### Disrupting the Blue Carbon Cycle? Assessing the impact of bottom trawling on carbon-rich sediments

**Subject area:** Oceanography, Ocean Modelling

**Supervisor(s):** **Sophie Ward** (https://www.bangor.ac.uk/staff/sos/sophie-ward-058396/en), Peter Robins (<https://www.bangor.ac.uk/staff/sos/peter-robins-011021/en>)

**Contact:** sophie.ward@bangor.ac.uk

**Project description:**

Marine sediments are essential to the global carbon cycle, storing carbon over long timescales. Bottom trawling, a widespread fishing method, resuspends carbon-rich sediments, but its impacts on shelf sea carbon stocks remain poorly understood.

This project aims to map potential pathways of fine sediments resuspended by trawling on the northwest European shelf seas. Using existing case studies and observational data, relationships between heavily trawled sites and drivers of shelf sea sediment transport will be explored. You will use sediment transport modelling to validate findings and highlight research gaps, providing important insights for sustainable blue carbon management and policy. Where possible, the analysis will use open-source datasets, making this novel research reproducible for shelf seas worldwide.