



UCD Earth Sciences Institute

## Earth & Natural Sciences PhD Programme 2011

### Strand 2: **Ecology & Evolutionary Biology**

### Project Descriptions (v4)

**Please Note:**

While every effort has been made to ensure that the information contained within this document is accurate, it is possible for errors and omissions to have occurred. It is strongly recommended that potential students make contact with the Principal Investigators directly, should they have any questions about the projects.

Introduction	4
Information on the Application Process	5
List of Projects	
1 <i>Advance warning indicators for the vulnerability of Cold Water Coral ecosystems to environmental change: a basis for sustainable resource management</i>	6
2 <i>Impacts of changing biodiversity and environmental stressors on ecosystem functioning in intertidal sedimentary systems</i>	7
3 <i>Characterising the dynamics and environmental impact of sub-surface peat fires by controlled experiments</i>	8
4 <i>Modelling past and future fire regimes in the Irish uplands</i>	9
5 <i>Impacts of climate change on marine ecosystems: simulated disturbance regimes based on regional climate models</i>	10
6 <i>Assessing and limiting the environmental impact of wind energy installations in Ireland</i>	11
7 <i>Novel methods to quantify differences in community structure: development of stable isotope metrics in a Bayesian framework</i>	12
8 <i>Impact of past and future climate change on the spread of agriculture and the ecology of European grasslands</i>	13
9 <i>Patterns and drivers of seafood mislabelling in the European Markets</i>	14

*Introduction***The ENS PhD Programme**

The global change in climate and energy supplies will have a major impact on the island of Ireland, on how our economy evolves and the need for measures to protect our environment.

UCD is harnessing its considerable resources to address the challenges by developing an Earth Sciences Institute (ESI). The proposed ENS PhD programme building on the concept that energy and environment are co-dependent, draws on the unique range of disciplines and technologies of UCD, ESI and its partners to create new programmes in Earth and Natural Sciences education. The proposed ESI PhD programme will create a cohort of graduates with a strong background in Energy and Environmental studies, imbued with the innovation and entrepreneurial skills to develop an emerging green technology sector. In addition to a core of postgraduate students specialised in key elements of earth sciences, the programme will impact across a wide range of undergraduate and graduate programmes. It is only by influencing the collective skills of future graduates emanating from a range of disciplines that we will as a society adapt to the national and global challenges and opportunities in agriculture, energy, food, forestry, green technology, land resources, nanoscience and water.

This Strand – *Ecology & Evolutionary Biology* – aims to train graduates in ecosystem functioning, management, evolution and structure prediction that inform sustainable use of the Earth's resources.

*Strand Keywords: zoology, ecology, botany, paleoecology, computational and molecular biology, microbiology, comparative genomics, Programme for Experimental Atmospheres and Climates, UCD Metagenomics Centre, TCD Centre for the Environment, Centre for Irish Bat Research, Quercus QUB*

## Information

# The Application Process

Please read the following section very carefully. It is of the utmost importance that all the relevant documents are submitted as part of a single email application. Incomplete applications will not be reviewed.

If you have any specific questions about the project or the application, please contact the Principal Investigator directly (details are available in this booklet).

Applications should be emailed to both the Principal Investigator for the specific project and to [ens\\_phd@ucd.ie](mailto:ens_phd@ucd.ie). The subject line should contain the word "Application" followed by the project number followed by the applicant's name (e.g. Application BIO 4 Joe Bloggs).

Mislabeled applications may not be processed.

All applications must include the following documents:

1. A completed Application Cover Form (download)
2. A complete Curriculum Vitae
3. A Letter of Motivation outlining your interest in the specific project
4. Certified copies of academic transcripts

and, where appropriate,

5. Evidence of proficiency in English

All documents should be typeset or scanned, as appropriate. Please provide PDF format documents where possible.

Please note that all elements of the application must be included in one email. It will not be possible to process incomplete applications and we will not be in a position to collate applications sent in separate emails.

Failure to include all of the documentation listed above will result in your application being rejected.

Applications received before **13 May 2011** will receive full consideration, and the positions will remain open until filled.

*Project BIO 1*

## **Advance warning indicators for the vulnerability of Cold Water Coral ecosystems to environmental change: a basis for sustainable resource management**

*Principal Investigator: Dr Carlos Rocha (TCD) – [rochac@tcd.ie](mailto:rochac@tcd.ie)*

*Collaborators: Dr Tasman Crowe (UCD); Professor Mark Johnson (NUIG)*

Cold water coral (CWC) reefs along the Irish continental margin are part of the largest barrier reef system on the planet and biogeochemical hotspots hosting the most complex deep ocean habitats. Links between CWC occurrence and the depth of the Aragonite Saturation Horizon (ASH) suggest that global ocean carbonate chemistry is a palimpsest for CWC biogeography and hence put CWC vulnerability at the centre of the earliest predicted Earth Systems response to shifts in the global carbon cycle. CWC reefs are major speciation centres supporting deep-sea fishing stocks, but their food-web structure and its functional role within the marine ecosystem is poorly understood. For example, whilst the role of echinoids as ecosystem engineers in shallow coral ecosystems is known, their role in deep-sea systems remains obscure.

Ecosystem research is relevant to the Policy Support Research Measure of Sea Change, including 'Enhance our understanding of marine and coastal ecosystems' as a basis for environmental policy and sustainable resource management. This project develops key findings by the PI's group in 2010, when direct predation of an echinoid (*E. Elegans*) on reef building coral *Lophelia pertusa* was discovered<sup>8</sup>. This trophic link has important consequences for the stability of *L. pertusa* reefs. Combined with ocean acidification, echinoid bioerosion may play a decisive role on the fate of cold coral reefs by modulating the balance between reef accretion and destruction. The biogeochemical axis linking *E. Elegans* to *L. pertusa* may hence constitute an advance warning indicator for the vulnerability of CWC ecosystems to environmental change.

Most deep-sea species appear to reduce competition in the resource-limited deep sea through varied feeding strategies.  $\delta^{15}N$  and  $\delta^{13}C$  stable isotope analysis will be employed in order to quantify energy flow, nutrients consumed, and trophic relationships, thereby providing information about niche breadth contributing to the ecological and biogeochemical role of deep-sea CWC communities.

Project aims:

- To study the transfer of C and N through the detritivore foodweb in CWC reefs in order to comprehend the processes sustaining high levels of biodiversity found in deep-sea coral ecosystems;
- To elucidate the functional role of echinoids in the deep-sea;
- To develop *E. Elegans* as an advance warning indicator for the vulnerability of CWC ecosystems to environmental change.

*There is one PhD Studentship associated with this Project and will be based at TCD*

*Project BIO 2*

## Impacts of changing biodiversity and environmental stressors on ecosystem functioning in intertidal sedimentary systems

*Principal Investigator:* **Professor Nicholas Clipson** (UCD) – [nicholas.clipson@ucd.ie](mailto:nicholas.clipson@ucd.ie)

*Collaborators:* **Dr Tasman Crowe** (UCD); **Dr Evelyn Doyle** (UCD); **Dr Carlos Rocha** (TCD)

Human activities are simultaneously changing ecosystem biodiversity and imposing physical and chemical stressors. This leads to changes in ecosystem function and provision of ecosystem services to society, and has been the focus of intense research and debate over the past two decades (the Biodiversity-Ecosystem Functioning (BEF) debate). Resolution to the debate is hindered because researchers of different disciplines have tended to work in isolation and some critical components of ecosystems have been overlooked. The BEF debate and the research underpinning it have generally been prosecuted by ecologists working on macrobiota, with limited input concerning biogeochemical and microbial processes underpinning ecosystem function. Important breakthroughs could be made if ecological expertise is combined with specialised technical knowledge of biogeochemistry and the application of modern tools in molecular microbial ecology.

This proposal will focus on impacts of invasive oysters (*Crassostrea gigas*) and nutrients on marine intertidal sedimentary ecosystems of high conservation value and of key importance to coastal aquaculture and fisheries. It aims to:

- Test the impact of changes to biodiversity and environmental conditions on ecosystem processes such as productivity, respiration and nutrient cycling in a model system
- Characterise biogeochemical properties and determine effects of environmental changes
- Link microbial community structure of key functional groups to changes in biogeochemical properties, using cutting edge molecular ecology approaches.

We propose to train a PhD student in (a) ecological experimental approaches (b) microbial ecology, and (c) analysis of biogeochemical processes underpinning ecosystem functioning in sedimentary ecosystems. They would undertake experimental manipulations in the field and in laboratory tanks at TCD and UCD. The team would comprise researchers from all three disciplines and from both partners in the TCD-UCD innovation alliance. The team has extensive experience of the study system and the techniques involved and initial collaborative links are already in place.

This project has potential to deliver a step change in understanding of mechanisms underpinning human impacts on ecosystem functioning and the provision of ecosystem services. The findings will be directly applicable to development and refinement of models of carrying capacity of embayments for aquaculture and fisheries and for predicting impacts of changes in biodiversity and human activities. The PIs are already working with a range of state agencies to inform management of fisheries and aquaculture activities, particularly in Special Areas of Conservation where potential conflicts of interest arise.

*There is one PhD Studentship associated with this Project and will be based at UCD*

*Project BIO 3*

## Characterising the dynamics and environmental impact of sub-surface peat fires by controlled experiments

*Principal Investigator:* **Dr Jon Yearsley** (UCD) – [jon.yearsley@ucd.ie](mailto:jon.yearsley@ucd.ie)

*Collaborators:* **Claire** Belcher (University of Edinburgh); **Guillermo Rein** (University of Edinburgh)

Fire is an increasing global threat to the carbon store and ecosystem services provided by peatlands (they contain 1/3 of terrestrial carbon). Peatland wildfires are extreme events that are becoming more frequent both in Ireland and internationally. Smouldering peat produces 5-40% of annual global carbon emissions, but these are presently not accounted for by the IPCC. They threaten the environment (e.g. habitat destruction and greenhouse gas emissions) and human health (e.g. air quality), but our understanding of these smouldering fires is poor compared to flaming fires.

The student will perform experimental peat burns for a range of flow and moisture environments, recreating sub-surface fire behaviour for a range of realistic conditions. The experiments are simple and will be set-up at UCD after they have been developed by the student at UoE. The link between fire dynamics and soil residues would be analysed at UCD. The combustion gases for a subset of experiments will be measured at UoE.

The results will:

- parameterise theoretical models (link with SFI RFP proposal, under review)
- infer the impacts of sub-surface fires at the ecosystem scale.
- quantify the future global risks of sub-surface fire by combining with future climate scenarios
- identify the signature of smouldering fire events in the Earth's past.

This project combines fire dynamics and Earth systems research, and builds on a collaboration between three experts in their different fields. Funding for a sister PhD, to work exclusively on sub-surface fire modelling, is under review with SFI. Bord na Móna and the International Peat Society will be approached as partners on the project.

This project provides important baseline data and analysis of sub-surface peat fires, delivering a global reputation in management of smouldering fires. This research addresses key concerns in the EU's Climate Change Programme II9 and the 2009 white paper<sup>10</sup> that highlights the need for measures to reduce Europe's vulnerability to climate change impacts. The data will inform global policy on mitigating against their impact on greenhouse gas emissions, biodiversity loss and the economic costs of control.

Potential end-users include: peat extraction companies, land-managers, fire engineers, earth system scientists, government policy makers.

*There is one PhD Studentship associated with this Project and will be based at UCD*

*Project BIO 4*

## Modelling past and future fire regimes in the Irish uplands

*Principal Investigator:* Professor Fraser Mitchell (TCD) – [fraser.mitchell@tcd.ie](mailto:fraser.mitchell@tcd.ie)

*Collaborators:* **Dr Robbie Goodhue** (TCD); **Dr Jonathan Turner** (UCD)

The latest predictions for the future climate of Ireland indicate that a seasonal shift in rainfall will lead to warmer drier summers. Reform in agricultural fiscal incentives will lead to reductions in upland stocking densities, resulting in increased biomass (fuel loads) with higher inflammability in Irish uplands over forthcoming decades. Policy makers from key stake holders in the Irish uplands (e.g. agriculture, forestry, National Parks, wind farms and NGOs) will have increasing needs to address potential changes in vegetation communities and surface run off, and measures to control fires. This project will provide the foundations for effective management.

Pollen, charcoal and mineral fraction of lake sediments can be used to reconstruct past vegetation communities, fire regimes and catchment erosion. Integration of these data with radiocarbon chronologies will provide the basis for building a risk assessment model of the drivers and impacts of fire in Irish uplands.

A small enclosed lake within Killarney National Park will be cored. Detailed records of land use and past fires for the last 200 years in this lake catchment are available to the PI. Recent sediments will be compared with recorded data for calibration purposes. The PI also has lake cores in storage from six other upland sites, with existing pollen data and geochronologies; to provide an overall dataset of seven sites with national coverage.

Pollen analysis will follow standard methods. Charcoal analysis will be undertaken on the macroscopic (>100µm) fraction in contiguous subsamples using a digital image analysis system at TCD. Geochemical data will be acquired using the Itrax scanner in UCD on whole-core sections and mineralogy through the x-ray diffractometer in TCD.

A biomisation technique will be adopted to convert pollen data into vegetation landscape units. Rates-of-change analysis of the associated pollen, geochemistry and mineralogy data will be used to investigate the ecological impact and response times of the fire events.

Deliverables include: Reconstruction of long term fire regimes in the Irish uplands; Reconstruction of associated vegetation dynamics; Assessment of the changes in erosion/runoff from lake catchments associated with the palaeo-fire regime; A risk assessment model of drivers and impacts of past fires on the Irish uplands; Exploration of the validity of using parameters from the Itrax data as a proxy for charcoal concentration; PhD thesis and associated publications.

*There is one PhD Studentship associated with this Project and will be based at TCD*

*Project BIO 5*

## Impacts of climate change on marine ecosystems: simulated disturbance regimes based on regional climate models

*Principal Investigator:* **Dr Tasman Crowe** (UCD) – [tasman.crowe@ucd.ie](mailto:tasman.crowe@ucd.ie)

*Collaborators:* **Professor Lisandro Benedetti-Cecchi** (University of Pisa); **Professor Peter Lynch** (UCD)

Predicted changes in global climate will impose multiple stressors on productive marine ecosystems. For example, increases in the frequency of extreme precipitation events will bring pulses of freshwater, sediment, nutrients and organic matter from the catchment to the coast. Similarly, changes in the frequency and intensity of storms will alter physical disturbance regimes. Multiple disturbance types can combine to influence ecosystems in complex ways. Variation in the nature, frequency and intensity of disturbances can dramatically alter their impacts on the structure of ecosystems and the rates at which they process energy and materials (their functioning), potentially affecting their contribution to human society (e.g. in terms of changed rates of production of fisheries and aquaculture, reduced capacity to stabilise sediments, reduced capacity to process waste). Global climatic models are not sufficiently detailed to derive meaningful predictions of the nature of changes in particular regions. In order to develop meaningful priorities and strategies for adaptation and mitigation to climate change, it is essential that we refine our understanding of how disturbance regimes are likely to change and what the ecological consequences of such changes will be.

In this project we will:

- Draw on meteorological research to derive realistic scenarios for changes in climatic disturbance regimes in Irish coastal ecosystems
- Simulate disturbance regimes involving multiple stressors at appropriate levels of frequency, intensity and variance to test impacts on marine benthic communities
- Assess consequences for ecosystem functioning and the provision of ecosystem services

Realistic disturbance regimes would be imposed on coastal ecosystems based on predictions derived by the UCD Meteorology and Climate Centre. Its modellers are simulating future climate change in Ireland by dynamically downscaling the outputs of global climate models. A unique facility for precise simulation of disturbance regimes in the field has just been developed at Malahide Marina in cooperation with its managers and Fingal County Council. Controlled discharges of fresh water with or without selected contaminants can be delivered into large numbers of experimental plots over extended periods. During the experiments, changes in assemblages of marine organisms would be characterised and measurements made of ecosystem productivity and respiration.

The PhD student would be trained at the interface between scientific disciplines and between science and society. The results would inform development and prioritisation of strategies for adaptation to and mitigation of climate change and contribute to effective compliance with the Floods Directive, the Marine Strategy Framework Directive and the Water Framework Directive.

*There is one PhD Studentship associated with this Project and will be based at UCD*

*Project BIO 6*

## Assessing and limiting the environmental impact of wind energy installations in Ireland

*Principal Investigator: Dr Emma Teeling (UCD) – [emma.teeling@ucd.ie](mailto:emma.teeling@ucd.ie)*

*Collaborators: Professor Ian Montgomery (QUB)*

In response to dwindling energy supplies and the associated global warming that results from the burning of carbon based fuel, there is a growing demand for sustainable energy generated without carbon emissions. Wind energy is a new 'green' energy that meets this demand. As outlined in the Irish government's 2007 Energy White Paper, Ireland had aimed to supply 33% of its electricity demand from renewable sources by 2020, of which wind energy is a large component. However, although wind energy seems to be the ultimate 'green' energy source there has been an unprecedented and unanticipated environmental catastrophe resulting from the installation of wind turbines. Within the US and Europe there have been large numbers of bat fatalities at wind farms, which in some cases are driving local extinction of certain species. Within Ireland there are nine species of resident bat species, all of which are protected under the Irish Wildlife Acts [1976 and 2000] and listed in Annex IV of the E.U. Habitats Directive [92/43/EEC] as in need of strict protection and monitoring. Within Europe at least four of Ireland's bat species have shown considerable mortality at wind farms suggesting that within Ireland these species may be undergoing similar fatalities. To date nothing is known about the effect of wind farms on Irish bat populations, nor how Irish ecosystems may be affected by the loss or decline of these species.

To assess the effect of wind turbines on Irish bat populations we propose to firstly: (1) identify and map existing wind farms in Ireland and using acoustic monitoring and ecological techniques, determine the presence of bats and level of bat activity at these wind farms throughout the year; (2) develop an ecological model of bat distribution in Ireland to find sites removed from bat populations best suited for wind turbines; (3) develop novel acoustic and ecological methods to monitor bat activity at different heights that can be utilized globally; (4) screen wind farms, that show positive bat activity, for bat fatalities and assess the population of origin of these individuals using population genetic methodologies.

This project will be completed as part of the ongoing research of the Centre for Irish bat research (CIBR) which is a joint initiative between University College Dublin (Dr. Emma Teeling, Director), Queen's University Belfast (Prof. Ian Montgomery) and the National Parks and Wildlife Service (Dr. Ferdia Marnell) [<http://www.cibr.ie>].

This proposed project is directly inline with the objectives of the Earth and Natural Sciences PhD programme. During this project we will investigate the environmental change of an Irish ecosystem that results from the anthropogenic introduction of a 'green' technology, deemed essential due to dwindling energy supplies. The student will be exposed to the multi-disciplinary ecological, computational and molecular expertise found in CIBR to address an urgent environmental problem from an all Ireland perspective. The information gathered using this project will be used to advise planning regulation authorities and the government on the development and future location of wind turbines to minimize their environmental impact. The project is necessary so that Ireland can fulfill both its legal commitment to 'green' energy and the protection of its native species.

*There is one PhD Studentship associated with this Project and will be based at UCD*

*Project BIO 7*

## **Novel methods to quantify differences in community structure: development of stable isotope metrics in a Bayesian framework**

*Principal Investigator:* **Dr Andrew Jackson** (TCD) – [a.jackson@tcd.ie](mailto:a.jackson@tcd.ie)

*Collaborators:* **Dr Andrew Parnell** (UCD)

There is an overwhelming need for the ability to accurately and rapidly quantify the trophic niches of species within their ecological communities. Recently, stable isotope techniques have revolutionised the study of trophic ecology. However, although they also hold much promise for the description of trophic structure, we lack the mathematical tools that will allow us to make quantitative comparisons of these structures. The main aim of this project is to develop novel methods for describing the structure of ecological communities.

As part of a cluster involving two additional projects offered by Dr Quentin Crowley and Dr Carlos Rocha, model development will focus on Cold Water Coral (CWC) reef ecosystems. Cold water coral reefs along the Irish continental margin are part of the largest reef system on the planet, host complex deep ocean habitats and are one of the earliest predicted Earth Systems to respond to shifts in the global carbon cycle. Additionally, CWC reefs are major speciation centres supporting deep-sea fishing stocks<sup>9</sup>. However, CWC food-web structure and its functional role within the marine ecosystem is poorly understood<sup>10</sup>. For example, whilst the role of echinoids as ecosystem engineers in shallow coral ecosystems is well known, their role in deep-sea systems remains obscure.

The aims of this project are:

- To build novel Bayesian models to generate a series of community and individual-level metrics of trophic form and function based on stable isotope data.
- To validate our models using extensive datasets in conjunction with simulated data
- Apply the novel metrics to address important questions about CWC ecosystems respond to disturbance events.
- Release the models as part of the SIAR toolset in the R computing language.

The student will be trained in a skill-set that is in considerable demand, with many employers and agencies now looking to use Bayesian methods to get the most of their data. The basic modeling toolset that will come from this project will have application in a wide range of systems where understanding impacts is of key importance and has additional scope for application to palaeoreconstructions and adaptation and speciation.

The PIs will provide training in quantitative methods in ecology. Project partners Dr Stuart Bearhop and Dr Richard Inger (both University of Exeter) are ongoing collaborators and will provide access to datasets for model development and application including multi-trophic parasite mesocosm experiments, Brent geese feeding ecology and migration, and competition in bat communities.

*There is one PhD Studentship associated with this Project and will be based at TCD*

*Project BIO 8*

## Impact of past and future climate change on the spread of agriculture and the ecology of European grasslands

*Principal Investigator:* **Dr Jennifer McElwain** (UCD) – [jennifer.mcelwain@ucd.ie](mailto:jennifer.mcelwain@ucd.ie)

*Collaborators:* **Professor Mike Jones** (TCD); **Professor Christoph Muller** (University of Giessen)

Predicting the ecological impacts of future climate change is one of the greatest challenges in global change biology. This is due to the fact that plant species responses to climate change are highly individualistic and because elevated CO<sub>2</sub> experiments have shown that responses of individual plants grown in pots or in monocultures are not good predictors of the same species responses grown in competition within a diverse plant community. A key limitation of climate envelope models (which aim to project species' geographical range expansion/ contraction under future climate change scenarios) is the parameterization of ecological interactions between species. Recent experiments have also shown that elevated CO<sub>2</sub> intensifies intraplant/ interspecies competition for limiting resources, suggesting that the ecological 'winners' of future ecosystems will expand their ecological abundance and/or geographical range because they will be better adapted to future climatic in terms of obtaining and using these limiting resources (such as H<sub>2</sub>O, carbon, nitrogen etc). The primary objective of this collaborative proposal between UCD, TCD and the U. Giessen is to investigate the extent to which optimization of resource use efficiency particularly through stomatal functioning confers a competitive and thus ecological advantage in natural grasslands, the most geographically widespread and economically important vegetation type in Ireland. Pilot data from an UCD/Giessen MSc thesis have shown significant ecological changes in the relative abundances of native grassland taxa following 10 years of continuous fumigation with elevated CO<sub>2</sub> (year 2050 levels) but differing stomatal development responses to CO<sub>2</sub> (some taxa increase stomatal density others decreasing). We hypothesize based on our pilot data that the 'ecological winners' which are expanding their local abundances may have more finely tuned physiological control of stomatal opening and closure but a dampened stomatal developmental response to CO<sub>2</sub> and the ecological 'losers' have poorly optimized stomatal opening/closing function but a strong stomatal developmental response to CO<sub>2</sub>. This proposal therefore aims to utilize the high diversity undisturbed long-term FACE grassland site at Giessen in conjunction with UCD PEAC to test (1) whether there is a general trade off in plant stomatal response to elevated CO<sub>2</sub> and (2) whether particular stomatal functional traits are good predictors of ecological success under elevated CO<sub>2</sub> regimes of the near future. The broader impacts of this project will be to deliver an improved prediction of ecological responses of native European grassland species to future climate change.

*There is one PhD Studentship associated with this Project and will be based at UCD*

*Project BIO 9*

## **Patterns and drivers of seafood mislabelling in the European Markets**

*Principal Investigator: Dr Stefano Mariani (UCD) – [stefano.mariani@ucd.ie](mailto:stefano.mariani@ucd.ie)*

*Collaborators: Anna Davies (TCD); Professor David Taylor (TCD)*

One of the tools employed in the management of the seafood industry are 'labelling' regulations, which require that valid and accurate information is reported on each seafood retail product. Despite the strong and detailed set of laws on both labelling and traceability of fresh fishery and aquaculture products in the EU, recent investigations have provided evidence of alarmingly high levels of seafood mislabelling in Ireland. Yet, it is unclear where in the production chain mislabelling takes place, and whether the phenomenon is deliberately fraudulent or rather a by-product of poor policy and governance.

This doctoral project will expand the assessment of seafood mislabelling across the EU, by retailers in several EU countries (including Ireland, UK, France, Belgium, the Netherlands, Denmark, Sweden, Germany, Italy, Spain and Portugal). DNA barcoding will be used as the main identification tool and the incidence of mislabelling will be compared across countries. Then, an analysis of fisheries and aquaculture governance will be conducted, by examining the hard infrastructure of formal national and international executive powers, policies and enforcement practices, as well as the influence of private sector interests and civil society actions. Results will be interpreted in the light of the interplay among ecological, economic and societal drivers. Data will also be pivotal in predicting a range of possible environmental, economic and societal consequences deriving from different policy implementation scenarios and in identifying potential avenues that will assist in a transition to more sustainable fisheries.

*There is one PhD Studentship associated with this Project and will be based at UCD*