



MASTS - Making the Most of Masters – Project Proposal Form

Name and address of Organisation: Marine Scotland Science Marine Laboratory 375 Victoria Road Aberdeen AB11 9DB
Name of the key contact in Organisation: Dr Hannah Millar
Contact e-mail and phone number: Hannah.millar@gov.scot, 07584 889 225
Title of proposed project: Mapping changes in the marine soundscape due to oil and gas decommissioning
Project outline and intended outcomes: <p>Underwater noise arises in the marine environment from a variety of natural and anthropogenic sources. International concern on the potential negative effects of anthropogenic underwater noise on sensitive marine fauna (e.g. marine mammals and fish) is increasing, and European countries are required to monitor anthropogenic underwater noise (Descriptor 11) for the Marine Strategy Framework Directive (MSFD)</p> <p>In the North Sea, one of the main sources of anthropogenic noise is from vessels and ships. A proportion of these vessels are associated with supplying and supporting the oil and gas industry. As production and exploration of the oil and gas industry in the North Sea declines, and more oil fields are decommissioned, there will be associated changes in underwater noise and marine soundscape.</p> <p>This project aims to use automatic identification system (AIS) vessel tracking data to estimate how the soundscape in the North Sea has changed in recent years due to changes in oil and gas vessel activity and decommissioning. The results will be interpreted in the context of potential impacts on sensitive marine fauna.</p> <p>Proposed methodology:</p> <ul style="list-style-type: none">• Plot and identify vessels associated with specific oil and gas fields using AIS data• Carry out noise modelling to estimate the noise level due to the shipping activities• Map soundscape for that scenario• Repeat after the oil field is decommissioned

The outcome of the project will be a working method to understand noise associated with oil and gas industry vessels. Soundscape maps of the North Sea will also be produced.

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

This project would suit a student who is competent with GIS (preferably ArcGIS) and experienced in working with large datasets. The student should have access to their own computer with either QGIS (open source) or ArcGIS (through their university)

The project will be entirely desk-based, and the assumption is that the project will be delivered remotely through home-working. The student will be introduced to a network of partners working across marine management, underwater noise and offshore energy.



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Name and address of Organisation: Marine Scotland Science
Name of the key contact in Organisation: Sally Rouse Daniel Stewart
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Title of proposed project: Quantifying the artificial reef potential of offshore energy structures
Project outline and intended outcomes: <p>Anthropogenic structures are deployed in marine environments to support industrial activities, with construction rates currently growing at up to 30% per year. Sessile epibiota rapidly colonise offshore structures, in turn attracting mobile invertebrates, fish and top predators. These 'artificial reef' communities deliver ecosystem services, including water filtration, carbon sequestration and fisheries (sport and commercial). Colonisation of structures has been studied at local scales, but the role of artificial reefs in regional processes and ecosystems, where structures may constitute a significant proportion of total hard substrata, is poorly understood. The increasing dominance of man-made structures in marine ecosystems, termed 'ocean sprawl', may have profound effects on ecosystem processes including the consumption and production of plankton and the spatial distribution of fish, mammals and birds. To understand the role of structures in regional ecosystem processes, data on the total amount of habitat provided by such structures are required.</p> <p>In this desk-based project, the student will collate data on the dimensions of offshore energy structures from a range of sources including industry, international databases and government records. Using the dimension data, the student will generate estimates of the total artificial reef habitat available in different production basins, and according to various offshore energy transition scenarios (decommissioning of oil and gas, installation of offshore wind). The results will be interpreted within the context of ecosystem functions and benthic secondary production.</p> <p>The outcomes of this project will provide a foundation for the sustainable management the marine environment and offshore energy activities.</p>

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

This project would suit a student who has experience of GIS software, and is confident in collating, manipulating and analysing data. The student will require their own laptop with access to GIS software either through their university or via open source GIS tool (e.g. QGIS). A basic understanding of offshore energy (oil and gas, renewables) and marine ecology would also be beneficial (but not essential)

The project will be entirely desk-based, and the assumption is that the project will be delivered remotely through home-working. The student will be introduced to a network of partners working across marine management and offshore energy.



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Name of the key contacts in Organisation:

Sally Rouse
Bill Turrell

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Title of proposed project:

Assessing the potential sensitivity of habitat and species to Carbon Capture and Storage developments.

Project outline and intended outcomes:

The development of large-scale carbon capture and storage (CCS) is essential if we are to meet international obligations on emission reductions and climate change mitigation. Scotland, and the wider UK, have vast potential for the geological storage of carbon under the seabed of the North Sea. Furthermore, the existing array of oil and gas infrastructure already installed in the North Sea, offers significant potential for reuse within CCS developments. To ensure that CCS is developed and managed in a manner that is consistent with the Scottish Government's vision of environmental sustainability, it is essential that the potential risks of CCS on marine habitats and species are understood. One of the principal risks of CCS is the release of CO₂ into the marine environment from storage wells and transportation pipelines.

In a recent report, the Department of Business, Energy and Industrial Strategy (BEIS) identified 51 existing pipelines and 123 wells that have high potential for reuse within CCS developments. This desk-based project will use the BEIS inventory to identify habitats and species that have the potential to be affected by CCS developments. The project will involve the following stages:

1. Undertaking a literature review to identify benthic species which are sensitive to low pH
2. Mapping potential habitat suitability for sensitive species across the North Sea basin
3. Undertaking a spatial analysis to determine the extent of overlap between sensitive species and habitats and potential CCS pipelines and wells.

The outcome of this project will provide a foundation for the sustainable development of CCS in Scottish waters and has the potential to guide policy and management approaches for CCS in Scottish and UK waters.

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

This project would suit a student who is competent with GIS and who has some background in marine ecology. The student should have access to their own computer with either QGIS (open source) or ArcGIS (through their university)

The project will be entirely desk-based, and the assumption is that the project will be delivered remotely through home-working. The student will be introduced to a network of partners working across marine management and offshore energy.



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Name and address of Organisation:

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Name of the key contact in Organisation:

Dr. Campbell Pert

Contact e-mail and phone number:

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Title of proposed project:

Parasites As Biological Tags of Monkfish – A Potential Fishery Management Tool

Project outline and intended outcomes:

In 2018 landings of monkfish (*Lophius piscatorius* L., 1758 and *L. budegassa* Spinola, 1807) in Scotland totalled 13,000 tonnes worth £39 million, making it the third most valuable demersal fish species after Atlantic cod and haddock. Consequently, due to its economic importance to the Scottish fishing industry, it is crucial that an efficient and reliable method of differentiating monkfish populations in Scottish waters is utilised to allow the implementation of optimal fisheries management strategies. To do this, we require robust data and scientific evidence around which management decisions can be made. Making use of new and innovative technology and techniques is a vital part of our process. This approach is set out as part of the development of our Future Fisheries Management Strategy.

As a deep-water, demersal fish, monkfish are incompatible with traditional physical tagging methods due to the degree of fishing effort required to capture significant numbers, and the resulting environmental damage this would cause, as well as the stress and high probability of fish mortality due to the handling/tagging process. These factors therefore make monkfish a viable candidate for parasitic biological tagging studies.

The first paper describing the use of a parasite as a biological tag for a marine fish species was published in 1939. Since then the methodology has been used with increasing frequency in population studies of commercially important marine fish, facilitated by advances in our knowledge of the biology and ecology of marine parasites.

During 2019 a pilot study was carried out examining monkfish from a range of locations, both inshore and offshore, to determine their parasitic fauna. A total of 40 monkfish were examined

from a range of locations including the North Sea, the Scottish West Coast, Rockall and Shetland. In total 19 different parasite species were found across the whole sample group with seven parasite species found to have the potential as effective biotags for *L. piscatorius*.

Utilising the 2019 data, we propose carrying out further, more targeted, research into parasite infection levels by location. To meet this aim we intend to gather larger sample sizes targeting selected parasites and more specific sampling areas to address the knowledge gap in parasitic infection levels within and between localities.

The student would be required to dissect monkfish collected at sea and deep-frozen. These fish will be stored in freezers at the Marine Laboratory, where the dissections could, Covid-19 restrictions allowing, be carried out. The main focus will be on myxosporean parasites of the gall bladder, but also on larval helminth parasites in the visceral cavity. Full descriptions of these parasites will be provided, along with the relevant literature and training. After the infection data have been collected, the student will be required to analyse the results to search for differences in infection rates between sampling areas.

The data from this study would allow us to investigate more closely, parasites that could potentially be used as biological tags to help in stock differentiation and, from a fishery management point of view, allow biomass of any separate stocks to be more accurately estimated and therefore managed on a more realistic scale (ideally also discriminating between *L. piscatorius* and *L. budegassa*) to ensure the long term sustainability of the monkfish fishery.

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

Students would have to be able to attend the Marine Scotland Marine Laboratory in Aberdeen for training in fish dissection and parasite identification, as well as for access to labs and samples.



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Name and address of Organisation: Marine Scotland Science
Name of the key contact in Organisation: Alan Baudron
Contact e-mail and phone number: Alan.baudron@gov.scot 07876599731
Title of proposed project: Investigating growth trends and drivers of North Sea commercial fish species
Project outline and intended outcomes: <p>Warming is causing ectotherms' body size to shrink. This universal response is increasingly supported by empirical evidence worldwide, in both terrestrial and aquatic environments that are experiencing increasing temperatures. For commercial marine fish species, empirical studies have linked warming seas to a decrease in adult body size but also to an increase in juvenile body size. These changes can in turn impact fisheries yields, fish stock productivity, predator-prey relationships and ecosystem functioning. A difficulty in assessing the impact of temperature on commercial fish sizes is the co-occurrence of other drivers of change: density-dependent competition for food resources which is essential for growth, and size-selective fishing mortality which can truncate fish population size spectra and/or cause fisheries-induced evolution towards smaller sizes. The purpose of the project is to update the analysis published by Baudron et al. (2014) on the growth of North Sea commercial fish species. The North Sea is experiencing faster warming than adjacent areas, and is supports numerous commercially-important fish species exploited by several nations. It is therefore crucial to understand the impact of warming on fish sizes and fisheries productivity. This update will involve analysing new biological and physical data over a longer time series, which include recent changes in temperature and body sizes, to assess whether the impacts of warming on fish body sizes and fisheries yield identified by Baudron et al. (2014) are still observed. This update will also put an emphasis on the drivers of change, and density-dependence in particular, as many fish stocks in this area have recovered in recent years. The outcome of this project will inform ToR 2 of the ICES/PICES Working Group on Impacts of Warming on Growth Rates and Fisheries Yields (WGGRAFY).</p> <p>Baudron, A., Needle, C. L., Rijnsdorp, A. D. & Marshall, C. T. (2014). Warming temperatures and smaller body sizes: synchronous changes in growth of North Sea fishes. <i>Global Change Biology</i>, 20, 1023-1031.</p>

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

To apply for this project, the candidate must:

- be proficient in coding in R; and
- possess a strong knowledge of statistical modelling.

Previous experience in handling trawl survey data, and knowledge of the North Sea fisheries and commercial fish species are highly recommended, but not essential.

The data required for this project are publicly available. This project does not require sampling or travel and will be entirely desk-based. The student will be able to work remotely with supervision via email correspondence and/or online meetings as needed. Visits to Marine Scotland offices in Aberdeen can be arranged if required.



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Name of the key contact in Organisation:

Helen Holah

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Title of proposed project:

Monitoring of marine litter with fisheries CCTV data

Project outline and intended outcomes:

Remote electronic monitoring of fishing vessels using CCTV cameras is a new and growing field, providing data for monitoring compliance and enforcing fisheries regulations, recording protected species encounters and bycatch, and collecting data on the quantity and species composition of discards. This project will explore its utility in another area by investigating the quantities of litter observed on the processing belt of fishing vessels. It is prohibited to discard litter at sea under MARPOL regulations, and this project will use the new source of information to gain insight into the prevalence of this behaviour and any patterns in its occurrence. In this case, historical footage collected from vessels participating in the Scottish “fully documented fishery” scheme between 2012 and 2016 will be reviewed and any observed litter identified and counted. Results will be plotted spatially and compared with Marine Scotland’s database of marine litter records from research vessel surveys as a means to investigate the validity of the approach. These results could be used to inform future marine litter initiatives and identify recommendations for industry-partnered litter schemes to responsible waste management at sea.

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

This project would involve desktop video and image review using Archipelago EM Interpret data review software designed for at-sea fisheries monitoring. As there are data confidentiality issues with CCTV footage, the student would require a Scottish Government SCOTS laptop (including a MARLAB virtual machine) in order to access the video data – the laptop will be provided. The work could take place at any location provided there was an internet connection.

Familiarity with Excel or R, and ArcGIS or another spatial visualisation software, would be beneficial.