Making the Most of Masters

PROJECT PROPOSAL FORM

Making the Most of Masters aims to improve collaboration between employers and universities by providing opportunities for postgraduate students to undertake work based projects as an alternative to a traditional university dissertation. Projects should address a real need within the host organisation and be beneficial to both host and student.

The Marine Alliance for Science and Technology for Scotland (MASTS), pools the majority of Scotland's marine research capacity. MASTS members provide Masters courses in a range of marine related disciplines and many of their students are keen to undertake applied projects outside of academia.

Notes on Topic Selection
A relevant academic will work with your organisation to refine your proposed topic and ensure it meets both your needs and the academic requirements of the student. Projects should typically be achievable within a 12–16 week timeframe (including writing the final report).

Your proposed project could be:

- A specific project title or topic for the student to deliver;
- A general idea of a business need which requires further development;
- A core research theme to be developed by the student into a bespoke project;
- An intended outcome for the organisation.

The level of detail you provide will determine the extent to which further discussion may be required with the relevant programme director to ensure suitability.

desk-based/data studies that will easily facilitate remote working and remote supervision are welcome, as well as in person and/or experimental based projects where appropriate.

What's Next?
Please send your completed form to the MASTS Programme Coordinator & Deputy Dean of Grad School, Dr Emma Defew (masts@st-andrews.ac.uk) before the deadline.

Following submission of the form, it will be channeled to the leaders of the various Masters programmes that operate within the MASTS community and a representative from the most relevant programme or department will get in touch to discuss the project scope, delivery and the selection of an appropriate student. If more than one student expresses an interest in your project, you will need to ensure discussions take place to enable the most suitable student to be matched with your project. The projects themselves usually won't start until May or June.

MASTS - Making the Most of Masters – Project Proposal Form

Name and address of Organisation: Scottish Environment Protection Agency
Name of the key contact in Organisation: Dr Marion Harrald
Contact e-mail and phone number: marion.harrald@sepa.org.uk, 07787 001531
Title of proposed project: Controlled environment experiments to understand the effects of fish farm effluent on Priority Marine Features
Project outline and intended outcomes: Expansion of finfish aquaculture is leading to a shift from low current sites, where there is typically high loading of effluents on the seabed, to higher current sites, where that effluent is more dispersed. However, areas of strong current are often frequented by habitats valued for conservation, with species that are more sensitive to fish farm pressures than those found in more quiescent sites. The food and faeces which falls through the open net pens, typically in the form of uneaten food and faeces, may result in release of fine particulate matter with a high organic content and deoxygenated sediment and water. Species such as the northern sea fan, the Celtic feather star, horse mussel beds and flame shell beds are recognised in Scotland as Priority Marine Features. They are often coincident with locations being considered for fish farms, yet little is understood about their sensitivity to pressures specific to fish farms. The thresholds used in the models to predict whether a protected species will be affected by a proposed farm, are currently based on expert judgment. This study would provide us with direct evidence of tolerance of these species to organic matter. Suspension feeders, in particular, can have a low tolerance to these pressures, as particles can block their feeding apparatus. While some species can tolerate a degree of sedimentation, likely because they have evolved to live in turbid or sandy environments, they are strongly affected by organic matter. In a controlled environment study, maerl – coralline red algae - was found to tolerate low levels of sediment, but only a sprinkling of sewage sludge resulted in a cessation of photosynthesis, likely due to the toxic effects of hydrogen sulphide (Wilson et al. 2004). By controlling the environment in tank conditions, it is possible to isolate effects of a certain treatment from the numerous other environmental factors which are found in the wild. However, similar empirical studies on other benthic species in Scotland are lacking. In this study, we suggest conducting controlled environment experiments on one or more protected species in aquarium conditions and subjecting them to treatments including varying quantities of sludge collected from under a fish farm as well. Observations of the health of those species while subject to these treatments should be recorded. The levels of tolerance would be used to define benchmarks that are used to model effects of prospective developments on the species and habitats found in the vicinity of a farm. This would ensure that decision makers have the information required

to understand consequences of a fish farm development on protected features found in the vicinity of the farm.

Outcomes

Understand the tolerance level of key Priority Marine Features to organic matter resulting from fish farm effluent.

Important species that could be considered are:

- Northern sea fan *Callistephanus pallida*
- Celtic feather star *Leptometra celtica*
- Horse mussels *Modiolus modiolus*

Citations

Pearson, T.H. and Rosenberg, R. (1978) Macrobenthic Succession in Relation to Organic Enrichment and Pollution of the Marine Environment. *Oceanography and Marine Biology* - An Annual Review, 16, 229-311

Wilson, S., Blake, C., Berges, J.A., & Maggs, C.A. (2004). Environmental tolerances of free-living coralline algae (maerl): implications for European marine conservation. *Biological Conservation*, 120(2), 279–289. https://doi.org/10.1016/j.biocon.2004.03.001

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 could one or a series of projects on different species.

It would first involve bringing species into aquaria and ensuring that they are thriving in tank conditions. We would need to discuss permissions with NatureScot about collection of specimens.