



## MASTS - Making the Most of Masters – Project Proposal Form

<b>Name and address of Organisation:</b> Scottish Natural Heritage
<b>Name of the key contact in Organisation:</b> Carol Hume
<b>Contact e-mail and phone number:</b> <a href="mailto:carol.hume@snh.gov.uk">carol.hume@snh.gov.uk</a>
<b>Title of proposed project:</b> Valuing our marine environment (SNH ref.P46)
<b>Project outline and intended outcomes:</b> <p>This study is focussed on measuring what role the marine environment generally, and Marine Protected Areas specifically, play in the economies of local coastal communities. We would like to understand more about the dependencies between our marine environment and the local business community and highlight any changes (positive or negative) that have come about from the designation of marine protected areas. We would also like to look a little broader at the value gained from the marine environment more generally. This study may also involve the identification of measurable economic elements that could serve as a baseline to trend against in future studies.</p>
<b>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?):</b> <p>We envisage that the tasks will include an element of literature review to identify and evaluate appropriate study methodologies, development of economic profiles of the communities identified for the study, some form of survey of local businesses, and delivery of a findings report.</p> <p>Work to be carried out at the university. A relevant SNH staff advisor would help with the scope of the project, and ensure outcomes are relevant to our work as well as being beneficial to the university and student.</p> <p><i>Please note that SNH will commit to providing basic funds for travel and fieldwork expenses. This is dependent on agreeing appropriate and relevant students and supervisors, and agreeing the level of financial support for the particular project and circumstances.</i></p>

**Name and address of Organisation:**

Scottish Natural Heritage

**Name of the key contact in Organisation:**

Carol Hume

**Contact e-mail and phone number:**

[carol.hume@snh.gov.uk](mailto:carol.hume@snh.gov.uk)

**Title of proposed project:**

Supporting coastal communities with a Coastal Community Fund project (SNH ref. P47)

**Project outline and intended outcomes:**

If successful we will have a Coastal Community Fund (lottery funded) project running by summer 2017. Students could get involved in many different ways with the project foci on community-led surveys, promoting local marine areas, creating jobs in the areas.

The community groups will be looking for any assistance they can from student placements across many different areas but will definitely include elements of marine survey (sub-tidal and intertidal), development of data recording methods, marine species interpretation, film-making, schools education. We will be able to identify projects that have a scientific focus, or a social / education / interpretation focus.

**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?):**

Preparation work to be carried out at the university. A relevant SNH staff advisor would help with the scope of the project, and ensure outcomes are relevant to our work as well as being beneficial to the university and student. Students will also work with community groups and Non-Governmental Organisations involved in this project based around Skye and the west coast of Scotland.

*Please note that SNH will commit to providing basic funds for travel and fieldwork expenses. This is dependent on agreeing appropriate and relevant students and supervisors, and agreeing the level of financial support for the particular project and circumstances.*

**Name and address of Organisation:**

Scottish Natural Heritage

**Name of the key contact in Organisation:**

Carol Hume

**Contact e-mail and phone number:**

[carol.hume@snh.gov.uk](mailto:carol.hume@snh.gov.uk)

**Title of proposed project:**

Fair Isle Demonstration and Research MPA (SNH ref.P48)

**Project outline and intended outcomes:**

Fair Isle has recently been designated as a Demonstration and Research MPA – the first and only one in Scotland. Therefore this is a unique opportunity to be involved with the early stages of a novel designation. The first steps required will be in the form of a scoping study to identify all the sources of historical and ongoing data, survey and research work, how they interrelate and what gaps there are. This would involve detailed literature reviews, speaking with the community and stakeholders about the type of information they have and identifying first research priorities.

As this is a huge task, it could be split into particular subjects for example – ornithology, fisheries, predators, benthic etc and these topics looked at in greater depth. In addition, many of these datasets will be required to be cleaned or even in the case of community records accurately recorded (eg fish stomach content details). There may also be the opportunity to explore options to increase citizen science and community empowerment. Depending on the skills and experience of the student this may be a topic that could be further worked up.

As this designation has come about from the dedicated work of the community on Fair Isle it is expected that the student would work closely with the advisory group and the community on this task.

SNH (Karen Hall) will be happy to speak with any potential folks who may be curious.

**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?):**

As this project will require close work with the Fair Isle community it is important that interested students consider this aspect carefully. SNH and university staff will help to assess which students are suited for this project. Students will also work with the Fair Isle community, the D&R MPA Advisory Group and stakeholders involved in this project. It is expected that some of the placement will be on Fair Isle. Note this is a remote small community (limited transport options and no 24 hour power) and we would expect any potential candidates to think carefully about whether they could cope with the remoteness/restrictions of island living and how they would fit into the community. Therefore there will be additional considerations in the selection process to ensure that the match is right for both the student and the Fair Isle Community.

*Please note that SNH will commit to providing basic funds for travel and fieldwork expenses. In addition, for this project we may have additional funds available as part of the wider study. This is dependent on agreeing appropriate and relevant students and supervisors, and agreeing the level of financial support for the particular project and circumstances.*

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**Name of the key contact in Organisation:**

Carol Hume

**Contact e-mail and phone number:**

[carol.hume@snh.gov.uk](mailto:carol.hume@snh.gov.uk)

**Title of proposed project:**

Identifying whether visitor management is required to reduce disturbance to seals on Mousa SAC in Shetland (SNH ref.P23)

**Project outline and intended outcomes:**

This was taken on by a student in 2015 but it developed into a study around a different area. This project would probably suit a relatively experienced and committed student due to the fieldwork focus in Shetland.

*Some broad background:* Visitor disturbance on Mousa is an issue that has been investigated in short student projects already, but not recently, or in as much detail as it would be in an MSc project. The island is one of only two SACs for breeding harbour seals in Shetland, the E. coast population of which has been plummeting in recent years. Although visitors to Mousa (which is home to one of the best examples of an iron age broch and therefore a popular tourist destination) receive interpretation and warnings about not approaching the breeding seals (which you can get quite close to in some locations at some times of year), some visitors to the island do not respect this and have been seen to crawl even underneath barriers to get close to the seals and photograph them, which causes disturbance. However there may be other factors that are influencing seals use of Mousa, for example competition with grey seals or predation by killer whales.

*Project summary:* Undertake a literature review of existing projects on Mousa and other applicable sites first to see what the current state of knowledge about avoiding disturbance to breeding seals (or e.g. sealions in the States) is and how it is managed there, and then to see whether this could be applied and tested at Mousa. Comparison with other seal SACs (eg on mainland Scotland) could also be included as part of this study.

*Fieldwork:* The amount of fieldwork (which can be tough in Shetland, depending on the weather, even in the summer) involved depends on the student's preferences, and ability to spend several weeks in the summer in Shetland. If SNH cannot provide any funding for the project, we could provide some other contacts worth investigating (RSPB, Shetland Amenity Trust) for cheap/free accommodation (camping would certainly be possible, though isn't everyone's bag).

**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 probably suit a relatively experienced, self-reliant and committed student due to the fieldwork focus in Shetland.

Work to be carried out at the university. A relevant SNH staff supervisor would help with the scope of the project, and ensure outcomes are relevant to our work as well as being beneficial to the university and student.

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**Name of the key contact in Organisation:**

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[carol.hume@snh.gov.uk](mailto:carol.hume@snh.gov.uk)

**Title of proposed project:**

Interaction matrices in marine planning (SNH ref.P30)

**Project outline and intended outcomes:**

It is important to identify priority issues and opportunities that need addressing through plan policies. To do this, marine planners require an understanding of past, current, and potential future interactions (positive and negative) amongst development, activities, uses and other interests. The use of interaction matrices for this purpose is not new; in Scotland they have been carried out for a number of areas, including through the Clyde Forum for the Clyde SSMEI pilot, the Sound of Mull SSMEI pilot and the Tay Estuary Forum. However, to understand the reality of any interactions it is important to progress to mapping the developments, activities and interests; this should also inform the formation of appropriate spatial planning policies, such as steering marine activities & developments to less ecologically sensitive locations. Further review and research would support the application of such matrices in regional marine planning. In particular:

- Evaluation of different methodologies for interaction matrices, including appropriate use of sensitivity information and testing approaches for deriving spatial policies at appropriate scales;
- Exploring the value of matrix-led approaches at different scales (e.g. are they more beneficial at local (sealoch/estuary) scale than for whole regions?);
- Data / information needs / options for matrix development and their spatial application.

**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?):**

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**Name of the key contact in Organisation:**

Carol Hume

**Contact e-mail and phone number:**

[carol.hume@snh.gov.uk](mailto:carol.hume@snh.gov.uk)

**Title of proposed project:**

Review of worldwide mitigation measures used to reduce marine animal entanglement in fishing rope: Understanding the suitability of these measures for use in Scottish waters. (SNH ref. P49)

**Project outline and intended outcomes:**

Desk top study reviewing the types of mitigation measures that are currently being used in other parts of the world to reduce the risk of marine animals becoming entangled in fishing gear/rope. Using this information assess the suitability of the mitigation measures for use in Scottish waters. Consideration must be made to the size of the animals, feeding habits, life traits, and legal landscape to the animals most at risk e.g. minke whales, humpbacked whales, leatherback turtles and basking sharks.

The outcome will be a written report.

**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?):**

We envisage that the tasks will mainly be a literature review to identify mitigation measures currently being used in other parts of the world and evaluate these measures for use in Scottish waters.

More details will follow as this will need to be developed with appropriate collaborators e.g. looking into possibility of a day on an inshore fishing vessel to learn how they operate in Scottish waters and use this knowledge to assess the suitability of any possible mitigation methods.

Work to be carried out at the university. A relevant SNH staff advisor would help with the scope of the project, and ensure outcomes are relevant to our work as well as being beneficial to the university and student.

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**Name and address of Organisation:**

Scottish Environment Protection Agency  
Angus Smith Building  
Maxim 6, 6 Parklands Avenue  
Eurocentral  
Holytown  
North Lanarkshire ML1 4WQ

Tel: 01698 839000 / Fax: 01698 738155

**Name of the key contact in Organisation:** Dr Malcolm Baptie

**Contact e-mail and phone number:** [Malcolm.Baptie@sepa.org.uk](mailto:Malcolm.Baptie@sepa.org.uk) / 01698 839468

**Title of proposed project:**

Clarification of the extent of the non-native diatom *Mediopyxis helysia* in east of Scotland and Northern Isles, and whether phytoplankton and microzooplankton community composition has been changed by the introduction of this species.

**Project outline and intended outcomes:****Introduction:**

The large diatom *Mediopyxis helysia* was first discovered in the Northwest Atlantic in 1996 and the North Sea in 2002 and was formally described as a new species in 2006 (Kühn *et al*, 2006). It was discovered in Icelandic waters in 2007 (Thorarinsdottir *et al*, 2014) and the first Scottish case was found in 2005 (McCollin, 2008). It has since been recorded at a number of locations on the east coast of Scotland (SEPA, unpublished data). In experiments it has been shown to be resistant to grazing by microzooplankton (Loebl *et al*, 2013) and alters phytoplankton community composition when it is present (Meier *et al*, 2015). It blooms in cold, turbid and brackish conditions, and can grow in a wide range of nutrient regimes (Kraberg *et al*. 2012; Wollschläger *et al*, 2015; Meier *et al*, 2015). These characteristics suggest potential for development of *M. helysia* into an invasive nuisance species.

Most scientific study is in the southern North Sea, which has particular characteristics (shallow depth, limited thermal stratification, strong freshwater influence) that are dissimilar to conditions on the east coast of Scotland. Authors in this field have not yet addressed if *M. helysia* has the same effects on the phytoplankton and microzooplankton community in the northern North Sea, or if these effects are subject to region specific constraints. The Scottish Environment Protection Agency (SEPA) possesses an archive of fine mesh net samples taken as a component of its Water Framework Directive (WFD) monitoring programme. Using these samples the MMM candidate will clarify the extent of *M. helysia* in east of Scotland and Northern Isles, and whether phytoplankton and microzooplankton community composition has been changed by the introduction of this species.

### Project Specifics:

SEPA has sampled across Scotland as part of its WFD responsibilities since the mid-2000s and in addition has a number of samples that pre-date this legislative driver of marine monitoring. These cover much of the east coast of Scotland from Berwickshire to the north coast as well as Orkney and Shetland. The time period straddles the date at which *M. helysia* was discovered and described in the North Sea.

These samples are taken as an extra to the main quantitative water samples used in WFD classification and are only rarely examined by SEPA staff. They are preserved in weak (2%) formaldehyde solution so much finer taxonomic resolution is possible than with the quantitative samples which are preserved in Lugol's solution. This will make it feasible to create detailed species inventories from these samples. Because *M. helysia* is quite a large diatom, semiquantitative estimates of abundance will be possible.

Analysing the impact of *M. helysia* will involve multivariate statistical analysis of communities in space and time to detect dissimilarity coincident with the presence of *M. helysia*. The species least likely to be present when *M. helysia* is present will be catalogued. The implications INNS associated community composition change will be discussed, with reference to Marine Strategy Framework Directive descriptors.

The student would receive training in microscopic analysis of samples, and statistical analysis of data. Analysing samples would take place at the main SEPA laboratory at Holytown, giving experience of applied ecology within an arms-length public sector agency. Data generated will be subject to the same quality control system as all SEPA data. Depending on the progress in microscopic analysis of samples there may also be a possibility to investigate if the species can be detected in eDNA samples and how this compares to traditional sampling techniques.

### Methodology:

Samples will be selected from the extensive SEPA archive of phytoplankton net hauls to give appropriate geographic and temporal coverage to answer the research questions stated below (under outputs). Analysis will be based upon presence/absence detection of species in the main, with some examination of semiquantitative abundance cf Legendre & Legendre (2012) where that is justifiable (e.g. if organisms are typically larger than the maximum linear dimension of the mesh size of the sampling equipment). The most likely type of analysis of community composition will be non-metric multidimensional scaling using Sørensen's similarity coefficient, though the student will be free to explore their own analyses.

Should molecular analysis be undertaken this will involve filtration of seawater taken at a long term monitoring location in the Firth of Forth, extraction of RNA and PCR amplification using primers designed from published 18s RNA information for *M. helysia*. SEPA can conduct amplification in house, though a partner university with this capability is also encouraged.

### Timeline:

Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16
Taxonomic training	■	■	■	■												
Analysis of samples				■	■	■	■	■	■	■	■					
Statistical analysis											■	■	■			
Writing dissertation													■	■	■	■
Literature Review	■	■	■	■	■	■										
(Stretch) eDNA sampling		■				■				■				■		

### Outputs:

- Answers to the following questions:
  - Is phytoplankton community composition affected by the presence of *Mediopyxis helysia*?
  - Does *Mediopyxis helysia* negatively affect microzooplankton abundance and community composition?
  - Is there geographic variation in the establishment of *Mediopyxis helysia* on the east coast

of Scotland?

- i. How does this compare to other locations globally where this species has been discovered?
  - d. What factors are important in the development of *Mediopyxis helysia* blooms in Scotland?
2. Species inventories & high quality photographs for selected east coast locations to be held by SEPA.
  3. (Stretch) detection of *M. helysia* in eDNA samples compared to traditional sampling.

**Conclusion:**

SEPA expects this project to contribute to debate on what constitutes an invasive species in the phytoplankton, and how this should inform assessment of the state of the marine environment.

**References:**

Kraberg, AC., Carstens, K., Peters, S., Tilly, K., Wiltshire, KH. 2012. The diatom *Mediopyxis helysia* Kühn, Hargreaves & Halliger 2006 at Helgoland Roads: A success story? *Helgoland Marine Research* 66: 463-468.

Kühn, SF., Klein, G., Halliger, H., Hargreaves, PE., Medlin, LK. A new diatom, *Mediopyxis helysia* gen. nov. and sp. nov. (Mediophyceae) from the North Sea and the Gulf of Maine as determined from morphological and phylogenetic characteristics. 2006. *Nova Hedwigia* 130: 307-324

Legendre, P. & Legendre, L. (2012). *Numerical Ecology*. Elsevier, Paris. 1006pp.

Loebl, M., van Beusekom, JEE., Philippart, CJM., 2013. No microzooplankton grazing during a *Mediopyxis helysia* dominated diatom bloom. *Journal of Sea Research* 82: 80-85.

McCollin, T. 2008. *Mediopyxis* in Scottish Waters. Poster presentation.  
[http://www.scotland.gov.uk/Uploads/Documents/posters\\_Mediopyxis\\_McCollen\\_05\\_08.pdf](http://www.scotland.gov.uk/Uploads/Documents/posters_Mediopyxis_McCollen_05_08.pdf)

Meier, S., Muijsers, F., Beck, M., Badewein, TH., Hillebrand, H. 2014. Dominance of the non-indigenous diatom *Mediopyxis helysia* in Wadden Sea phytoplankton can be linked to broad tolerance to different Si and N supplies. *Journal of Sea Research* 95: 36-44

Thorarinsdottir, GG., Gunnarson, K., Gislason, OS. 2014. Invasive Species: Case Studies from Iceland. In: Fernandez, L., Kaiser, BA., Vestergaard, N. (Eds) *Marine Invasive Species in the Arctic*. Norden. Copenhagen. 201pp.

Wollschläger, J., Wiltshire, KH., Petersen, W., Metfies, K. 2015. Analysis of phytoplankton distribution and community structure in the German Bight with respect to the different size classes. *Journal of Sea Research* 99: 83-96

**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?):**

**Budget:**

- There are no significant expenses associated with taxonomic training and time spent at SEPA analysing samples.
- There would be some expense associated with purchasing extraction kits, primers, filters and RNA preservation media. Approximately £500.



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<b>Name and address of Organisation:</b> <b>Spey Foundation</b>
<b>Name of the key contact in Organisation:</b> <b>Brian Shaw</b>
<b>Contact e-mail and phone number:</b> <b>b.shaw@speyfisheryboard.com</b>
<b>Title of proposed project:</b> <b>The cumulative impacts of thermal discharges from the whisky industry into the River Spey</b>
<b>Project outline and intended outcomes:</b> <p>Speyside is one of the major distilling regions in Scotland with about half of all whisky distilleries. Water is one of the three main ingredients used in the production of whisky but by far the largest use of water is for cooling. In recent years the whisky industry has gone through a significant phase of expansion with increased production including reopened or new build distilleries resulting in increased abstraction, and discharge, of cooling water directly to and from the Spey.</p> <p>The cumulative impact of these thermal discharges on the temperature profile of the River Spey, which is an SAC for four species including Atlantic salmon and freshwater pearl mussels, is not understood.</p> <p>This proposed MSc, will through a combination of desk and fieldwork, assess the potential impact of thermal impacts on the temperature profile of the River Spey, measure the local thermal footprint of a distillery(ies) and consider the ecological, or other consequences, of the findings with particular regard to climate change predictions.</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?):**

The ecological perspective is of most interest to the Spey Foundation but applications from a range of disciplines would be welcome.

The fieldwork could be hosted at the Spey Foundation offices at Knockando, Moray, which is close to all the major distilleries discharging into the River Spey. Desk work could also be based there although there is no requirement for this to happen.

The River Spey is part of the Scotland River Temperature Monitoring Network <http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature> with a range of temperature loggers located throughout the catchment. It is anticipated that access to the network data will be made available through Marine Scotland.

It is also anticipated that access to discharge sites will also be made available through local liaison with the industry. A key role for the applicant will be to develop a relationship with industry representatives; for access and for dissemination of the findings.

Assistance will be provided to the applicant during fieldwork or for any other aspect of the project.



## MASTS - Making the Most of Masters – Project Proposal Form

<b>Name and address of Organisation:</b>  The Deveron, Bogie and Isla Rivers Charitable Trust
<b>Name of the key contact in Organisation:</b>  Richard Miller
<b>Contact e-mail and phone number:</b>  <a href="mailto:richiemiller@deveron.org">richiemiller@deveron.org</a> and 01466 711 388
<b>Title of proposed project:</b>  Evaluation of Adult Salmonid Fish Counting Options and Recommendations for the River Deveron catchment.
<b>Project outline and intended outcomes:</b>  This project would undertake a review of a recent report produced for government called 'Technical, Logistical, and Economic Considerations for the Development and Implementation of a Scottish Salmon Counter Network: Scottish Marine and Freshwater Science Vol 7 No 2' ( <a href="http://www.gov.scot/Publications/2016/03/5757/1">http://www.gov.scot/Publications/2016/03/5757/1</a> ) and other relevant sources. Thereafter options and recommendations for appropriate and robust fish counting options for the Deveron catchment would be explored and reported on.
<b>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?):</b>  The work would mainly be desk based but the student would have to visit the Deveron catchment periodically. No confidentiality issues.