Application Form for SHN-MASTS PhD Internship Proposals

A. INFORMATION ABOUT THE PROPOSED INTERNSHIP

1. **Inter-habitat linkages between Priority Marine Features in Scotland's marine environment**

2. **Which area(s) of interest to SNH does the internship proposal address?**

	Main area(s)	Secondary interest(s)
Marine planning and policy	☐	☐
Coastal and Marine Climate Change	☐	☐
Coastal and Marine Management Advice	☐	☒
Marine Protected Areas and Priority Marine Features	☒	☐
Marine research, survey and data management	☐	☐
Sea fisheries management	☐	☐

3. **Which MASTS Theme(s) does the proposed Internship have relevance to?**

	Main area(s)	Secondary interest(s)
Dynamics and Properties of Marine Systems	☐	☐
Productive Seas	☐	☐
Marine Biodiversity, Function and Services	☒	☐

4. **Background and rationale of the internship project (max 200 words).**

There have been numerous published studies on the inter-habitat relationships between tropical marine ecosystems, i.e. coral reefs - seagrass beds - mangroves - beaches in relation to the connectivity of species e.g. fish, and physical processes such as sediment transfer and stability. There is a lack of similar studies in the UK and Scotland.

This information is important for effective MPA and marine conservation management (Carr *et al.* 2017). For the selection and designation of MPAs in Scotland various supporting documents were produced including 'Detailed ecological guidance' (Lancaster *et al.* 2014). This document included a summary of what we knew about the 'functional links' of habitats which included information on the critical services it provides, the species it supports and other ecological functions. For example for flame shell beds it highlights how horse mussel beds may be found in close proximity, how the byssal threads of flame shells can stabilise maerl beds, and how tide-swept algal communities can develop on the stabilised sediment. However beyond this we have little understanding of such associations and linkages and their significance. Neither do we understand whether there are shared communities between linked/neighbouring habitats and how this changes when the linkages are not there.

5. **Outline of project proposal, including proposed tasks for candidate and relevant methods likely to be used (max 300 words).**

The project would aim to undertake the following tasks:

1. Literature review - to review existing literature and contact experts and internal SNH staff where appropriate to document our current knowledge on the linkages between Priority Marine Feature habitats and their associated communities. This would build on the work undertaken in the detailed ecological guidance. This could be focussed on specific PMF habitats (scope to be discussed further with the student) but could include horse mussel beds, flameshell beds, maerl beds, tide-swept coarse sands with burrowing bivalves and maerl or coarse shell gravel with burrowing sea cucumbers.

2. GIS analysis and interpretation – interrogate SNH's data to look at spatial relationships between selected PMFs e.g. areas where they are overlapping in the horizontal plane but also the vertical plane e.g. relationships between tide-swept coarse sands with burrowing bivalves, maerl or coarse shell gravel with burrowing sea cucumbers; relationships between maerl and underlying sediments. If possible look at historical data (where PMFs used to be where available). Determine where spatial relationships exist and if there are patterns in the spatial relationships. Using literature review/expert knowledge explore why these spatial relationships may exist.

3. Explore community structure similarities - select example(s) from the GIS analysis where habitats are spatially adjacent (vertically/horizontally), and using existing infaunal data from cores and grabs, or epifaunal species data collected during dive survey work , look at similarities/differences in the community structure and species present using statistical analysis in programs such as R (e.g clustering / similarity analyses etc). This is exploratory work making initial investigations as to whether there are identifiable links between communities (in terms of shared species or assemblages), and may yield mainly recommendations for further work. Relevant statistical knowledge by the student would be required for this task.

6. **What impacts will this internship have, what deliverables or outcomes are likely, why is this work important to SNH? (max 200 words)**

We would expect that the internship would deliver the following:

- A report outlining the findings of the literature review.
- GIS map products of overlapping/in proximity PMFs (to be chosen) from the GIS analysis within and outside MPAs.
- Interpretation/analysis of the map products.
- Analysis and interpretation from analysis of existing field data.
- Recommendations for further work.
- Potential to produce an SNH Commissioned Report for external publication.

The work is important to further our understanding of the MPA network (and indeed the Scottish marine environment) as a coherent whole, as opposed to an assemblage of disconnected habitats. This understanding is essential to enable us to manage the network with a view to ecosystem services and larger processes which rely on whole ecosystems, such as carbon capture and storage or coastal stabilisation, and also to be able to understand and manage for system resilience and productivity based on functional linkages – to understand knock-on effects of pressures on one habitat to another, and to understand where protection of one habitat might positively affect others (thus enabling us to target conservation work best).

7. **Does this proposal link to industry and/or policy and/or regulation? (max 200 words)**

This proposal would help to inform the development of Conservation Objectives and Advice to Support Management documents that are being produced for MPAs. Subsequently it would help to improve the advice SNH give in Habitats Regulations Appraisals and EIAs. It would assist in understanding the linkages between habitats that are important for MPA management and could

be of benefit in the development of regional MPA management plans in Argyll and the Outer Hebrides under the MarPAMM project.

8. What is the proposed schedule or timetable for work during internship? (max 200 words)

We would propose that this project could be carried out January - March 2020, to fit around availability of supervisors at SNH.

For a 3-month internship we would propose the following timetable to be discussed further with any prospective student and their supervisors:

- 2-3 weeks – literature review for existing information on inter-habitat linkages in temperate environment/habitats that have been selected. GIS interrogation for locations where overlapping/neighbouring habitats of choice occur or have occurred in the past.
- Month 2-3 –analysis of existing core/sample data looking at shared species and communities between habitats that are neighbouring/overlap
- Month 3 – write up project report.

9. Does this internship have any dependencies? (i.e. ship time, fieldwork, specialist facilities or resources, software, high cost items, location dependency, etc) (max 100 words)

There would be dependencies on access to scientific literature, although we would anticipate the student being able to access what they need through their own library system or through SNH library services.

Access to GIS software (utilising Marine GIS workstation from Perth office, or provision of data so student can do this at university). Access to statistical software for looking at community/species overlaps.

The location can vary throughout the project, dependent on the particular work tasks. We would offer hosting at our Perth (Battleby) office. Some of the literature research may be more accessible from the student's university.

B. INFORMATION ABOUT THE SNH SUPERVISING STAFF MEMBERS

10. Name
Sarah Cunningham & Lisa Kamphausen

11. Email address
sarah.cunningham@nature.scot or lisa.kamphausen@nature.scot

12. Any previous experience of supervising students (undergraduate/ postgraduate)

Sarah - MSc supervision during PhD, PhD intern during time at SNH (plus MSc student due summer 2019)

Lisa – assisting Masters/honours project supervision during PhD, providing input to the work of several PhD students as the main contact at SNH

C. FUNDING

13. The National Minimum Doctoral Stipend for 2019/20 is £15,009. SNH-MASTS have submitted bids to provide the equivalence of up to 3 months funding i.e. £3,752.25, payable to the intern. Confirmation of this bidding success will be known in the latter part of March. If the internship will incur additional costs, please detail these below and indicate the source of SNH or any additional funding.

14. Please include any other relevant information about the internship not covered elsewhere.

Further information on PMFs - https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas

Further information on MPAs in Scotland - https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/marine-protected-areas-mpas

Please submit proposals in an Expression of Interest form to the following contact by 12pm, Thursday 28ᵗʰ March 2019.

Emma Defew   **masts@st-andrews.ac.uk**   **01334 467200**
                    Programme Co-ordinator & Deputy Dean of the MASTS Grad School, MASTS

Thank you.