

MASTS Marine Stressors Forum Small Grant Scheme

MSSG18 Funding Report: Quantifying Metal Bioaccumulation in *Nephrops norvegicus*

Larvae Exposed to Cadmium and Pile-driving Noise

Craig Stenton craig.stenton@napier.ac.uk

Edinburgh Napier University, Heriot-Watt University, MASTS

Project overview

Understanding the impacts of multiple drivers on marine life can be challenging, with drivers capable of interacting with one another on both abiotic and biotic levels. Such interactions can modify their impacts with potential ramifications for environmental risk assessment and management strategies yet are seldom considered at present.

Fundamental to understanding stressor interactions is a comprehensive understanding of the individual stressors, and the means and underlying mechanisms by which they interact. The awarded funds were requested to enable analytical quantification of waterborne cadmium in samples collected over two PhD experiments, "*Effects of pile driving noise and cadmium co-exposure on the early-life-stage development of the Norway Lobster, *Nephrops norvegicus**" and "*Understanding the mechanistic interaction between noise and heavy metal co-exposure in *Nephrops norvegicus* larvae*". Together these experiments formed a robust study addressing stressor impacts and mechanisms on multiple levels of biology of a commercially and ecologically valuable native species.

Summary of analysis funded by the grant

The entirety of the funds awarded from the MASTS Marine Stressors Forum contributed towards the total costs for the analysis of the experimental samples. Expected concentrations within samples were anticipated to be extremely low facilitating the need for top-tier analytical techniques – namely solid-phase extraction ICP-MS. Challenges in locating cost-effective services, and wider logistical concerns resultant of Covid-19 led to analysis being conducted by GEOMAR Helmholtz Centre for Ocean Research Kiel.

Results, outputs, and benefits to the MASTS community

The quantification of actual exposure metrics for cadmium have enabled more accurate modelling of potential toxic impacts, revealing deleterious impacts upon *N. norvegicus* larvae at lower concentrations than previously assumed.

The data obtained by this grant will be presented in my PhD thesis, as well as included into the minor revision of a manuscript currently under review, entitled "*Effects of Pile-driving Playbacks and Cadmium Co-Exposure on the Early-Life-Stage Development of the Norway Lobster, Nephrops norvegicus*". The manuscript will be published in a special issue entitled 'Multiple Stressors in Marine Ecosystems', hosted by the journal Marine Pollution Bulletin (pending final acceptance).

The research outputs contribute towards the MASTS "Marine Biodiversity, Function and Services" research theme by addressing the resilience of a commercially valuable species to two ubiquitous stressors.

They also contribute directly to the remit of the MASTS Marine Stressors Forum to "*...provide an integrated platform to promote the enhanced understanding of environmental stress, both natural and anthropogenic, on marine organisms.*"