MASTS - PECRE Final Report: Dr. Susanne Vogeler

PECRE30 - Neurotransmitter regulation of larval settlement and metamorphosis in commercial oyster species.

Host Institution:

Institute of Aquaculture
University of Stirling
Stirling, FK9 4LA
UK

Hosting Faculty:

Dr. Stefano Carboni
Genetic and Reproduction Group
Institute of Aquaculture
School of Natural Sciences
University of Stirling

Background:

This MASTS exchange aimed to investigate the regulation of metamorphosis in the Pacific oyster *Crassostrea gigas* by neurotransmitters and receptors, including their signalling pathways, to provide a fundamental understanding of how the metamorphic transition from larvae to spat is initiated and executed. In particular, Dr. Vogeler studied the previously unexplored *N*-methyl-D-aspartate (NMDA) receptor pathway in bivalves in more detail using *in-situ* hybridisation technique.

The exchange with the host institute provided Dr. Vogeler with the required equipment and facilities for conducting her experiments, as well as excellent training in the *in-situ* hybridisation technique. In return, Dr. Vogeler was able to pass on her expertise on bivalve development and knowledge on invertebrate neurobiology to staff and students at the University of Stirling.

This exchange has contributed to MASTS research goals by providing experience and training to a new generation of marine scientists, while also creating new collaborations between a MASTS institution and an international institution, in this case the University of Gothenburg, Sweden.

Interaction with the MASTS community:

During her three months exchange, Dr. Vogeler was an active member of the MASTS community at the Institute of Aquaculture at the University of Stirling. During her visit, she interacted with faculty, staff, post-docs and, in particular with postgraduate students at Stirling. For instance, she supervised a Master student of Dr. Carboni in various molecular biological techniques. Dr. Vogeler also presented her work twice at departmental seminars. The exchange also provided an opportunity for Dr. Vogeler to introduce MASTS and the University of Stirling to her other international partners in Australia and the USA (where her group has collaborations).

Outputs completed and expected:

1. ***Localisation of NMDA receptors in Pacific oyster larvae ready for metamorphosis***

   The exchange allowed Dr. Vogeler to successfully localise NMDA receptors in competent Pacific oyster larvae that are ready for metamorphosis using *in-situ* hybridisation. Localisation of these receptors, which may interact with chemical cues and may be part of neural circuits involved in initiating metamorphosis, in different larvae organs aids to understand how the process of metamorphosis is regulated. The outcomes of this experiment provide a foundation and guideline for upcoming experiments.

2. ***Development of decalcification, wax embedding and in-situ hybridisation methods specific for oyster larvae.***

When Dr. Vogeler visited the University of Stirling, a protocol for *in-situ* hybridisation specific to bivalves or oyster larvae did not exist. Although the basic technique for *in-situ* hybridisation is very similar independent of sample type, differences between species and tissue type might exists in particular in sample preparation as well as incubation times for probes etc. Therefore, in collaboration with the senior technician Jacquie Ireland, who has extensive knowledge on *in-situ* hybridisation in sea lice, Dr. Vogeler developed protocols for decalcification of oyster larvae and wax embedding techniques for micro sectioning, which could be applied to other bivalve larvae and will be utilised in other research by the host institution in future.

3. ***Publications:***

The findings of this exchange will be submitted to a peer reviewed journal shortly, in which MASTS will be credited. The publication is currently in progressed and will combine data from this exchange with outcomes from experiments with other international collaborators.

4. ***Enhancing collaborations between universities***

The exchange visit lead to further collaborations between Dr. Carboni from the University of Stirling and Dr. Vogeler from the University of Gothenburg pursuing further investigations regarding bivalve metamorphosis and both parties have collectively applied for further research funding on this joined project. The upcoming proposal will likely include other research groups form Institute of Aquaculture at the University of Stirling such as Dr. Sean Monaghan from the Immunology and Vaccinology group, who will provide his expertise in immunofluorescence antibody tests.

5. ***Proposals***

AquaExcel 2020 in collaboration with Dr. Carboni at the University of Stirling, UK
Assemble Plus in collaboration with Dr. Nancy Nevejan at the University of Gent, Belgium

Future plans enabled by PECRE:

As discussed above the outcomes of this exchange will be used for further experiments, in term of results as well as method optimisation for related techniques. Furthermore, the exchange resulted in further collaboration with the host institution as well as utilising the findings for upcoming collaborations with the university of Gent and an Assemble Plus funding application.

Award Expenditure (GBP):

Total award: £4,900

Rental assistance: £1,800
Daily allowance: £2,700
Travel: £400

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