MASTS-SFC Saltire Emerging Researcher Scheme (MASTS-SERS)

Final Report

MASTS in association with the Scottish Funding Council supported the Saltire Emerging Researcher Scheme, which represented an important and exciting opportunity for Post Graduate Researchers (PGR) and Early Career Researchers (ECR) to engage in substantive collaboration with colleagues from Europe (EA, EEA and EFTA countries).

The scheme aimed to promote mobility between Scotland and European research partners with the aim of strengthening existing, and seeding future, research relationships. Participants are expected to demonstrate the impact of their exchange through the publication of novel research work, the formation of new collaborations and project/ funding submissions, and the dissemination of their results.

As your exchange has now come to a close, we ask that you reflect on the exchanges and provide a report by filling in the form below. The reports will need to demonstrate the potential benefits of the grant for both the recipient and their collaborators. Please return this within four weeks of completing your exchanges to **masts@st-andrews.ac.uk**. When you do so, you are agreeing that your answers may be used to promote the activities of MASTS, including being used on the website and social media channels.

Please note that MASTS may also contact you, the participants, and/or your supervisors to gather additional post-exchange impact information. This information must be provided on request.

Contact information

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Exchange overview

Title	Developing techniques to study *Neoparamoeba* species isolated from sea urchins
Start date	27/06/2022
End date	27/07/2022
Project location(s)	University de la Laguna, Tenerife

Abstract (max 300 words)

Provide a brief summary of the exchange using language accessible to a non-specialist. Describe what the exchange objectives were, the activities that were carried out, and the subsequent outcomes. This may be published on the MASTS website.

Amoebic gill disease (AGD) is an emerging marine parasitic infection of predominantly aquacultured fish caused by Neoparamoeba perurans. Since its first characterisation in 1985 the disease is now a world-wide issue for the salmon aquaculture industry. The epidemiology of Neoparamoeba perurans, as well as other Neoparamoeba spp., is widely undetermined and requires investigation to prevail possible virulence factors and host-pathogen relationships. In addition, Neoparamoeba have various bacterial endosymbionts that could potentially impact virulence and disease severity in infected hosts.

Sea urchins are also infected with Neoparamoeba spp. Interestingly, infected sea urchins have been found in warmer seas, in contrast to salmon aquaculture. This suggests that Neoparamoeba are ubiquitous in marine environments and that the emergence of AGD may be linked to climate change. There are several species of Neoparamoeba that can potentially cause disease and the distribution and virulence of species is still unknown. In this project we sought to isolate and characterise Neoparamoeba from sea urchins, harvested from the Atlantic ocean surrounding the Canary Islands – with aims to compare isolates from warmer seas with those isolated from salmon farms in Scotland.

During my visit to the Universidad de la Laguna, I was provided sea urchins of different spp. to learn how isolate Neoparamoeba/amoeba from sea urchins. I also screened the urchins for the presence of Vibrio (which is another pathogen to sea urchins and a pathogen of relevance in my PhD). Vibrio isolation was successful however, amoeba isolation attempts were extensive and required various techniques to attain possible specimens. This was done by trialing different media/techniques, of which I only retrieved some potential amoebae which I am still in the process of isolating and characterising. These results prompted the question of natural levels of amoebae in sea urchins (sea urchins used in the study appeared healthy, as no disease outbreaks were present.

Impact (max 600 words)

Please demonstrate the impact of your exchange from your perspective, and that of your exchange partner. Describe what the wider benefits of the exchange were to you as participant, your own and host institutions, and the wider community.

From this exchange, I have gained thorough skills in amoeba isolation. The host research lab had various members working on amoeba isolation from environmental samples, where they trained me on these techniques. After isolation techniques were conducted, I checked samples using microscopy evaluation, where I spent the majority of the exchange observing sample plates to investigate morphological characteristics of present organisms. This experience highlighted the complications in marine amoebae isolation. The marine environment contains various microorganism of numerous morphologies, where using microscopy alone can be challenging to find and isolate organisms of interest, especially when samples have no known pathologies and are healthy specimens. Nevertheless, I have learned a lot about the morphologies of various marine components e.g., diatoms as well as the components of coelomic fluid.

The exchange university also hosted a colleague who conducted experiments using various other amoeba spp. (*Naegleria fowleri* and various *Acanthamoeba* spp.) and so accompanying these experiments has broadened my knowledge on amoeba spp. important in clinical settings and pathogenic to humans. The host institution focused on drug challenges etc., so learning about this aspect of pathogenic amoebae was interesting and I developed understanding which may be useful further into my research of *Neoparamoeba.*

In terms of my research objectives, I am currently using the skills I learned during my exchange to isolate and investigate amoeba and other organisms from the gills of Salmon for my PhD. Just two weeks after arrival back to UWS, I transferred these skills to another PhD student studying *Neoparamoeba perurans* at Glasgow University (partnered institution of my project).

Working with Dr Lorenzo-Morales and colleagues has benefited me in diverse ways, not only have I developed scientific skills, but I have contributed to my own personal development massively as this was the first instance of studying at another institution. Their expertise were hugely influential to me during such an early phase of my research and having the opportunity to develop new connections has been very beneficial to me.

Outputs (max 300 words)

Has this exchange resulted in clear outputs, such as the generation of a proposal, research results, or publication? Please provide brief details here. Do any of these outputs have relevance to larger programmes such as the UN SDGs, Blue Economy Action Plan etc?[1]

To date, there have been no clear outputs made. I am still waiting on PCR results from the host institution to determine any free-living amoeba present in the sea urchin coelomic fluid which was sampled (as I did not have enough time to conduct this work). These results will then give me a clear indication of whether my chosen isolation methods were not fit for purpose, or if the presence of amoebae spp. in sea urchin coelomic fluid is not as ubiquitous as once thought. To my current knowledge, there are currently no papers which have investigated the natural amoeba load of sea urchin coelomic fluid, and whether they inhibit the fluid without causing pathology i.e., are only found during parasitic invasion of host. Depending on the PCR results, my work in Tenerife may contribute to a paper publication. Microscopy results generated will contribute to a chapter of my thesis – a long with vibrio spp. results (as I am investigating the relationship between vibrio spp. and Neoparamoeba). The work conducted will also contribute to my PG cert qualification, which will advance my employability on completion of my PhD.

The Future (max 300 words)

[1] All successful applicants will be expected to represent, promote and formally acknowledge the sponsors (MASTS, SFC & Scottish Government) during the course of their project and in any subsequent related outputs. All research outputs and any material used publicly must carry the funders' logos. The following acknowledgement should be used in all publications resulting from this funding. ["This work received funding from the Scottish Funding Council Saltire Emerging Researcher Scheme and the MASTS pooling initiative (The Marine Alliance for Science and Technology for Scotland) and their support is gratefully acknowledged. MASTS is funded by the Scottish Funding Council (grant reference HR09011) and contributing institutions"]

How do you plan to ensure a sustainable collaboration in the longer-term and maximise opportunities and impact in the future? How will you carry forward the benefits now the exchange has been completed? Please outline five concrete plans for future collaboration as a result of your exchange.

As mentioned previously, the host organisation and the AMEG research group at UWS are now a collaborative link – with students of Dr Lorenzo-Morales working with AMEG and Glasgow University earlier this year, as well as my mentioned colleague also undertaking aspects of his Postdoc along side my experience. Through means of networking, I will ensure a sustainable collaboration with the University de la Laguna.

Any further comments (max 500 words)

Please use this space to provide any additional comments. These may include, but are not limited to; what you would do differently if you could take the exchange again; what contingency measures you had to use (if any); details of any unexpected benefits or problems; any significant variations in costs;

If I were to undertake these experiments again, I would save coelomic fluid on first extraction to use in further experiments. Also, I would apply for longer time spent as I myself would have liked to conduct my own PCR experiments, rather than require this analysis from the host institution. However, now that I know the isolation of amoeba (especially from the marine environment) is a lengthy procedure, as well as any required troubleshooting, I will in future take this into consideration when planning these experiments.

Final expense report

Item Number	Description	Cost per Unit	Number of Units	Total Amount (£)
1	**Flights**			**608.30**
2	**Accommodation**			**2, 311.50**
3	**Sustenance**			**2, 089.45**
Add more rows if needed				
Total				**5, 009.25**
In-kind contributions				
In-cash contributions				
Grand Total (Total requested				**5, 009.25**

from scheme + In-kind + Cash)				