Travel report: Melandra Castle Fund

Report by Ramesh Wilson

Throughout January 2024, my fieldwork, generously supported by the Melandra Castle Fund, has taken me across the Antarctic peninsula, and the sub-Antarctic islands. The goal of my fieldwork has been to scout suitable sites to extend the scope of my PhD (Project HotMess), which investigates the impacts of warming and sewage pollution on rocky shore communities.

Global warming and sewage pollution represent global, and local level stressors respectively. Rarely does marine research consider the combined impacts of stressors on community composition, and even less so at different spatial scales. As a result, my PhD has aimed to develop a simple, replicable study system, that can be installed globally. The experiment uses black and white plastic squares placed along global coastlines, and at different proximities to a pollution source. The black plates heat up under the sun, producing a simple, passive warming treatment in combination with different pollution densities - allowing us to see what communities develop in different stressor scenarios.

Experimental set-up: Brighton, UK.

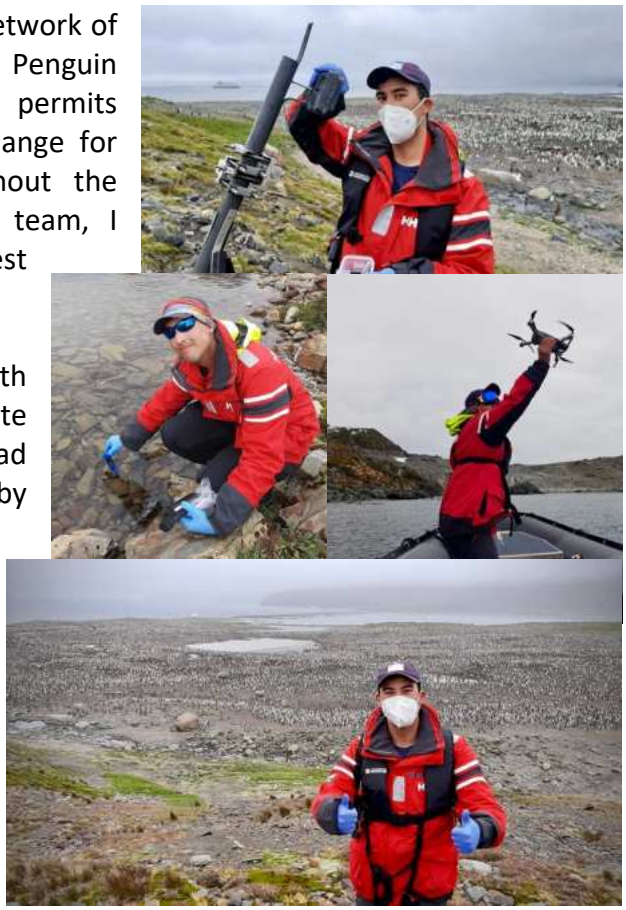
Current spread of experimental replicates.

**Blue pins indicate socioeconomic Global North, and yellow pins indicate Global South.*

Prior to my fieldwork, I had managed to recruit over 20 collaborators globally to repeat the experiment - in every continent except Antarctica. I conducted lots of research to provisionally determine key sites that would be appropriate to install my experiment across the Southern Ocean. However, the lack of transparency in reporting pollution data across these regions, as well as a lack of rocky shore research in general, necessitated that I personally scout sites for myself.

I was invited by the project, Penguin Watch, to accompany their research efforts in Antarctica for the entire month of January. Penguin Watch, a research project originated in the University of Oxford by Dr. Tom Hart (now Oxford Brookes University), has placed time-lapse cameras across Antarctica and the sub-Antarctic, to monitor the phenology of +90 penguin colonies, in response to climate change pressures. Maintenance of these cameras and

retrieval of data has been facilitated by a network of expedition cruise operators, of which the Penguin Watch team join as guest scientists. This permits access to Antarctic sites annually, in exchange for providing lectures and seminars throughout the excursion. Alongside the Penguin Watch team, I joined the Hurtigruten MS Fram as a guest scientist.



Penguin Watch works collaboratively with other scientists across the globe, to facilitate their projects in Antarctica. As such, we had several additional projects to support by collecting data and samples. This included:

- Benthic microalgae readings of freshwater lakes
- Freshwater zooplankton samples
- Freshwater pollution readings
- Penguin guano samples
- Drone images of penguin colonies and freshwater lake thermal gradients
- Pollen trap set-up
- Avian influenza (H5N1) reporting and documentation of suspected/confirmed cases

Various project work, including camera servicing, benthic microalgae sampling, drone flight retrieval, and colony density estimation.

The Melandra Castle Fund allowed me to travel to Punta Arenas, Chile, in order to board the ship. From here, the expedition went across four regions: 1) The Falklands; 2) South Georgia; 3) South Orkney; 4) Antarctic peninsula - in total, we were able to land on 18 sites across these regions to conduct our project work. Each region was incredibly different from the last: either by climate, wildlife, or heritage value. What was incredibly noticeable however, was the further South we went, the more pristine it felt. Never before had I encountered such an untouched environment, filled with wildlife. As a result, it was earlier on in the trip, where I discovered ideal candidate sites to install my experiment, due to the presence of sewage effluents along some rocky shores. Notably, two key sites emerged:

- Carcass Island (Falklands)
- Grytviken (South Georgia)

Sewage effluent: Carcass Island, Falklands.

Both sites had a clear presence of coastal sewage. This is largely due to higher tourism levels as well as more consistent annual maintenance of these regions, necessitating a staff population. The presence of higher levels of nitrates and phosphates was

verified using in situ probes, as well as biotic indicators - namely, high levels of benthic microalgae, indicative of local pollution. These sites provide an invaluable opportunity to install my experiment in the next year.

Unfortunately, the Southern Ocean is facing a pandemic of avian influenza, spreading rapidly and in large part is suspected to have been facilitated by tourism. As a result, biosecurity measures were incredibly strict and mandated, to mitigate the impact of tour operators and scientific endeavours on the environment. This may (appropriately) limit access to these regions in years to come. However I am confident that within the year, I shall be able to install one site in at least Carcass Island (access and permits pending), with infrastructure in place to install in South Georgia also, should access allow it.

I am incredibly grateful for being awarded the Melandra Castle Travel Prize. It has given me an invaluable opportunity to expand the scope of my PhD, as well as gain more practical fieldwork and lecture experience. Furthermore, I have been able to contribute to a variety of research projects across the southernmost region of the world. I hope my work can bring increased awareness of the necessity to protect rocky shore coastlines, particularly in the face of a both global and local change.

Ramesh Wilson
DPhil student; Department of Biology (NERC Doctoral Training Partnership)
Pembroke College

West Point Island, Falklands.

St. Andrew's Bay, South Georgia.

Largest King penguin colony in South Georgia.

Grytviken, South Georgia.

Historical whaling boat, 'Petrel'.

Yalour Islands, Antarctica.

Southernmost landing site of the expedition.