

**PROJECT TITLE: Exploring South Georgia's Mesozooplankton Dynamics through Imaging Technologies**

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**Project keywords: zooplankton, Southern Ocean, South Georgia, image analysis, ecosystem**

**Proposed start date: 1<sup>st</sup> July 2024**

**Project description:**

Zooplankton are a critical component of the marine ecosystem, transferring energy and nutrients from primary producers to higher trophic levels; influencing ocean carbon storage through their role in the biological carbon pump; and as indicators of environmental change. In the waters around South Georgia (Scotia Sea), the zooplankton community supports globally important populations of higher predators such as seals, penguins and whales, and sustains valuable commercial fisheries. However, the Southern Ocean (SO) is experiencing rapid warming, making establishing plankton baselines a priority for ongoing management and conservation of the ecosystem.

Traditionally, zooplankton samples are collected using nets and analysed using microscopy. However, this can be challenging, time-consuming and costly (both in terms of finances and carbon) to achieve at the resolution required for detailed monitoring. New approaches are therefore being developed that include imaging technologies and machine-learning techniques, which offer the possibility to obtain certain ecological parameters at reduced financial and carbon costs, as well as increasing temporal and spatial resolutions.

This project will utilise zooplankton samples collected during recent field campaigns at South Georgia. Samples will be analysed through the use of a laboratory based ZooScan imager. Images will be classified using EcoTaxa (an online machine assisted learning platform) and analysed for metrics such as abundance, diversity and size spectra to examine mesozooplankton trophic structure and variability around SG. Microscope taxonomy will also be utilised to verify the ZooScan image classifications.

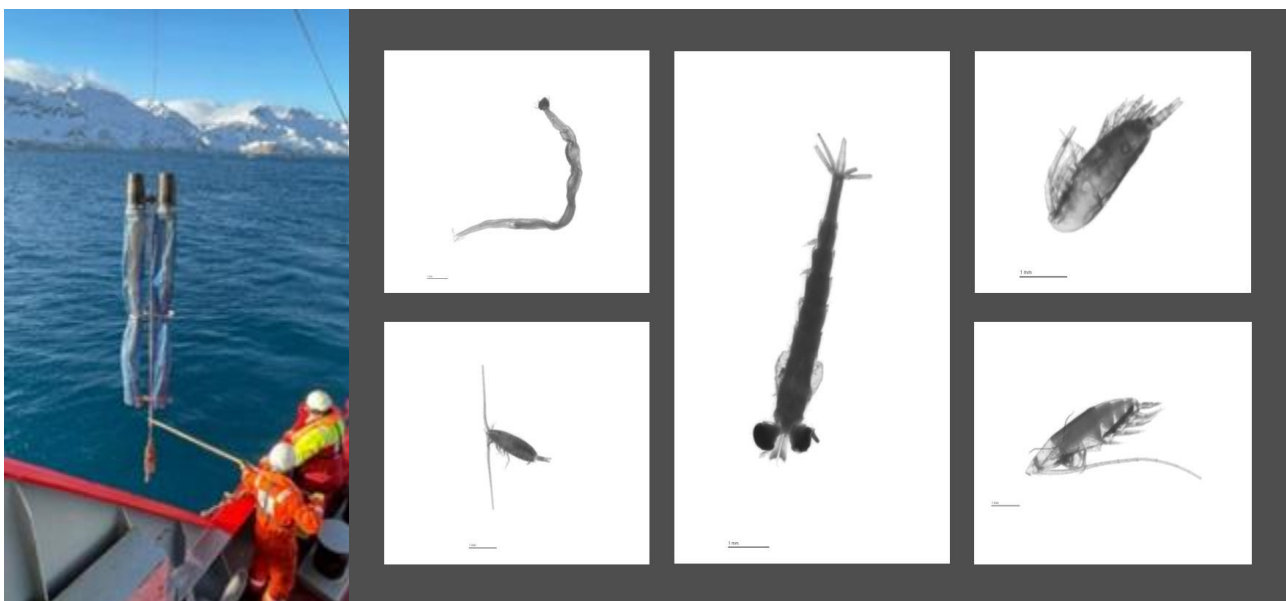


Figure 1. Left: Zooplankton sampling being carried out at South Georgia using a miniBongo net. Right: ZooScan images of previously analysed samples collected from South Georgia.

Candidate requirements:

Ideally studying for an environmental/ marine sciences degree (or equivalent) with good analytical and numerical skills. Some experience of lab work would be an advantage but is not essential. The candidate will be required to spend the majority of their time on site at BAS Cambridge.

Background reading:

Whitehouse et al (2008) Rapid warming of the ocean around South Georgia, Southern Ocean, during the 20th century: forcings, characteristics and implications for lower trophic levels

Atkinson et al (2001) South Georgia: a productive, cold water, pelagic ecosystem

Gorsky et al (2010) Digital zooplankton image analysis using the ZooScan integrated system

Tarling (2012) Seasonal trophic structure of the Scotia Sea pelagic ecosystem considered through biomass spectra and stable isotope analysis.

Ward et al (1995) The summer zooplankton community at South Georgia: biomass, vertical migration and grazing

Approximate Work Schedule in weeks (desk based/lab/report writing)

Weeks 1-4: Lab-based – sample analysis; Weeks 5-6: Desk-based - data analysis; Weeks 7-8: Desk-based - report writing and final presentation.