PROJECT TITLE: Antarctic Zooplankton and fish – fast food or fine dining?

DTP Research Theme – Living World

Lead Institution: British Antarctic Survey

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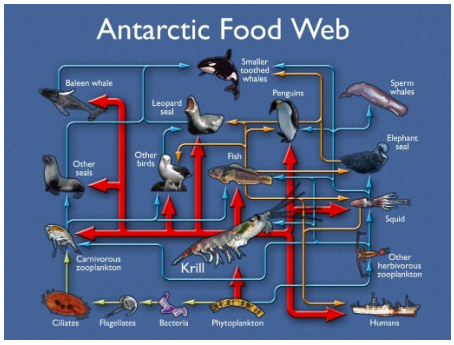
Project keywords: Energy flux, zooplankton, food webs, Southern Ocean, bioenergetic models

Antarctic Zooplankton ©Ecosystems BAS



Model of an Antarctic food web © Nadine Johnston

Project Background

Understanding the flux and flow of energy through a food web is vital when estimating the capacity of marine ecosystems to support important living resources. One such resource is Antarctic krill, which is considered to be one of the last under-exploited fishing stocks, globally. However, the Southern Ocean is undergoing rapid environmental change and to accurately predict the effects of climate change or increased fishing pressure on these ecosystems, we need a quantitative and comprehensive understanding of how energy flows through these food webs (Van de Putte, 2006, Schaafsma et al. 2018).

To achieve this, quantifying the energy content of species is crucial. At an individual level, energy reserves of an organism affect life history strategies such as over-wintering behaviours and reproduction. At an ecosystem level, energy density can structure food webs and ecosystem functioning.

This PhD project will measure energy content and proximate composition (e.g., lipids) of species from Sub-Antarctic and Antarctic waters from the extensive archived collection of frozen zooplankton and fish species held at BAS. Inter and intra-annual variation will be investigated alongside environmental factors that may drive variability. Literature information on physiology, diet, and population size will be used to develop bioenergetic models of predators and their prey (e.g., Pirotta et al. 2022). These models will improve our estimates of prey consumption rates for specific higher predator species, and hence our ability to predict changes in the capacity of Antarctic ecosystems to support key marine resources.

Project Aims and Methods

This project will use biochemical methods to quantify the energy flux through the Southern Ocean food web and improve understanding of the capacity of marine ecosystems to support living resources. You will carry out laboratory work measuring energy and lipid contents and learn to identify Southern Ocean zooplankton and fish. Your primary dataset will be the analysis of archived material, but there is potential for gaining experience working at sea and collecting your own material. There is also the flexibility to bring in your own ideas to the project and adapt the research direction, so long it remains aligned with available data and the supervisory team's expertise.

Candidate requirements

A background in marine sciences, biochemistry, biological oceanography or ecological modelling. Candidates should demonstrate high academic achievement, good numerical and practical skills and academic research experience.

Project partners

The GW4+ programme provides comprehensive personal and professional development training alongside extensive opportunities for students to expand their multi-disciplinary outlook through interactions with a wide network of academic, research and industrial/policy partners.

The student will be registered at the University of Exeter and hosted at *the British Antarctic Survey*. BAS will provide expert supervisory input, data, possible fieldwork opportunities, and participation in departmental and institute-wide seminars and training courses.

Training

Specific training will include:

Zooplankton and fish identification; Bomb calorimetry; Proximate composition analysis; General scientific computing and data analysis; Handling and analysis of oceanographic and biological datasets;Ecological and spatial statistics, including bioenergetic models; Preparation of scientific outputs;Possible sea-going experience

Background reading and references

Pirotta, E., 2022. A review of bioenergetic modelling for marine mammal populations. doi:10.1093/conphys/coac036.G. **Schaafsma, F.L. et al., 2018**. Review: the energetic value of zooplankton and nekton species of the Southern Ocean. doi.org/10.1007/s00227-018-3386-z . **Van de Putte, A. et al., 2006**. Energy content of Antarctic mesopelagic fishes: implications for the marine food web. doi.org/10.1007/s00300-006-0148-z.

Useful links

In the first instance, contact the Lead Supervisor to discuss the project.
To submit an application, please send your CV, personal statement, degree transcripts, degree certificates and contact details of two academic referees directly to the Lead Supervisor of the project before **Tuesday 9 January 2024 at 2359 GMT.**

Should you have any enquires, please contact Ali Teague at the BAS Student Office
Please visit our website to find out more about BAS and the BAS PhD Student Programme

The application deadline is Tuesday 9 January 2024 at 2359 GMT. Interviews will take place from 26 February to 8 March 2024. For more information about the NERC GW4+ Doctoral Training Partnership please visit https://www.nercgw4plus.ac.uk.