MEASO18
Marine Ecosystem Assessment for the Southern Ocean

Juergen Groeneveld

TU Dresden, Germany

Understanding and extrapolating the population dynamics of the key grazer species Salpa thompsoni in the Southern Ocean using an individual-based model

Groeneveld, J. [1,2], Henschke, N. [3], Pakhomov, E.A. [3,4], Meyer, B. [5,6,7]

[1] Institute of Forest Growth and Computer Sciences, TU Dresden, Tharandt, Germany; [2] Department of Ecological Modelling, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany; [3] Department of Earth and Ocean and Atmospheric Sciences, University of British Columbia, Vancouver, Canada; [4] Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, Canada; [5] Department of Biosiences, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Section Polar Biological Oceanography, Bremerhaven, Germany; [6] Institute for Chemistry and Biology of the Marine Environment, Carl von Ossietzky University Oldenburg, Oldenburg, Germany; [7] Helmholtz Institute for Functional Marine Biodiversity at the University of Oldenburg, Oldenburg, Germany

Antarctic krill, Euphausia superba, and salps, Salpa thompsoni, are among the most important grazers in the Southern Ocean. While these species occupy different ecological and spatial niches and generally do not overlap in their distribution, this is likely to change with rising sea water temperatures. Shifts in dominance of S. thompsoni and Antarctic krill may significantly change the Antarctic ecosystem structure and dynamics. Therefore, under the PEKRIS project (The Perfomance of Krill vs. Salps to withstand in a warming Southern Ocean) funded by the German Ministry of Science we study the performance of krill vs. salps in the Southern Ocean. Here we present an individual-based salp model that will help us to summarize existing knowledge and to extrapolate available information to project the salp population dynamics under different environmental scenarios. The flexible nature of individual-based simulation models allows us to incorporate quantitative and qualitative data as well as expert knowledge. Of special interest in this study is to explore how many salp reproduction cycles can occur during one season and how the ratio between sexual and asexual reproduction affects the population growth rate and the adaptation potential of S. thompsoni. Growth in body size is modelled on daily time steps based on food availability using a simplified version of the Dynamic Energy Budget theory. The complicated life cycle of S. thompsoni is modelled in a simplified way, i.e. not considering the change in sex, but explicitly differentiating sexual and asexual reproduction. Our modelling approach is complementary to the current equation-based salp life cycle model developed at the University of British Columbia that will be also presented at the conference. In the individual-based approach we will especially address the individual variability, which will be critical in understanding and assessing the adaptation potential of salp populations under climate change.

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