

A BIOCHEMICALLY BASED MODELLING STUDY OF ANTARCTIC KRILL (*EUPHAUSIA SUPERBA*) GROWTH AND DEVELOPMENT IN THE LAZAREV SEA

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A biochemical model of Antarctic krill (*Euphausia superba*) was developed to investigate the physiological mechanisms which enable krill to survive winter when food is scarce. In this modeling approach data sets on the biochemical composition of krill and its food sources are combined into a model that takes food quality into account rather than just food availability during different seasons. Krill is defined in terms of protein, neutral lipid, polar lipid, carbohydrate and chitin content and the model tracks krill weight separately from length. The model includes parameterizations of filtration, ingestion, and metabolic processes, which determine krill growth rate. Changes in the initial ratios of protein, neutral lipid, polar lipid, carbohydrate and chitin occur in response to the biochemical composition of available food as krill grows. Model results show that phytoplankton alone is not sufficient to meet the energetic needs of krill of all stages over most of the year. Lipid metabolism plays a major role in surviving times of low food supply but extensive lipid utilization alone does not provide enough energy for any krill stage to survive winter. The strategy of depleting body protein for energy is found to provide limited energy and can only play a minor role. Therefore other overwintering mechanisms such as reduced metabolism in times of starvation and alternative food sources (omnivory) gain importance. Results are discussed focusing on implications for krill populations in the Lazarev Sea where krill are subject to different environmental conditions than in the Scotia Sea.