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Modeling Antarctic krill (Euphausia superba) development in the Lazarev Sea

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Physiological data on Antarctic krill (Euphausia superba) from three LAKRIS cruises in the Lazarev Sea were synthesized to develop a biochemical model of krill that takes food quality into account rather than just food availability over the course of the year. It defines krill in terms of their protein, neutral lipid, polar lipid, carbohydrate and chitin content and tracks krill weight separately from length. The model includes parameterizations of filtration, ingestion, and metabolic processes, which determine krill growth. The model was developed to investigate environmental and biological factors controlling growth and development of Antarctic krill, focusing on their ability to survive times with low food concentration such as during austral winter. Model results show that lipid metabolism plays a major role in surviving low food conditions but as another survival strategy the use of alternative food sources (omnivory) is shown to be important. Implications of these survival strategies for krill populations in the Lazarev Sea, possible connection with other areas and with it causes for variability in krill biomass are discussed by way of combining the biochemical model with output from a finite element model of Southern Ocean hydrography and biochemistry (FESOM).