



Protozoans as a food source for Antarctic krill, *Euphausia superba*: Complementary insights from stomach content, fatty acids, and stable isotopes

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ABSTRACT: We studied the diet of Antarctic krill, *Euphausia superba*, at five stations across the southwest Atlantic sector in summer 2003 by analyzing stomach content, fatty acids, and stable isotopes on the same individuals. Our aim was to examine what each method could contribute to our understanding of krill nutrition and whether differences seen in growth rates were linked to their food. All three methods indicated clear regional differences in diet, but small ontogenetic and sex-related differences. Overall, diatoms were the most abundant item in the stomach, but at three of the stations, tintinnids, large dinoflagellates, and other armored flagellates dominated the identifiable biomass. Copepod remains were rare. Fatty acids profiles gave additional information about feeding on weakly silicified diatoms and athecate heterotrophic dinoflagellates, with the latter being the main food source at one of the stations. Two independent indices of carnivory, $\delta^{15}\text{N}$ and the fatty acid ratio 18:1(n-9)/18:1(n-7), were correlated among krill from the same swarm, suggesting consistent differences in diet between individuals. An internal index of trophic position, (i.e., $\delta^{15}\text{N}_{\text{glucosaminic acid}} - \delta^{15}\text{N}_{\text{phenylalanine}}$) underlined the importance of heterotrophic food for the nutrition of krill, even in summer. Highest growth rates of krill were found during a diatom bloom and coincided with a mixed diet, large digestive gland, and fast stomach passage. However, even in a nonbloom, flagellate-dominated system, krill were able to sustain medium growth rates when feeding on heterotrophic dinoflagellates. Each method supplied specific information on krill nutrition, and the true picture is only revealed when the various methods are used together.

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