

Impacts of rapid regional climate change on the population dynamics of Antarctic krill

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The strength of recruitment of larval *Euphausia superba* to the adult population varies greatly from year to year. On longer timescales their main population centre, the SW Atlantic sector, is warming rapidly with regional declines in sea ice. Our study uses an updated version of KRILLBASE, a circumpolar compilation of krill abundance and length frequency data, to analyse time trends in this sector from 1976-2014. We found a latitudinal trend from decreases to increases in stocks, indicating a polewards shift in the distribution of krill. Fluctuations are synchronous across the whole sector, however, and mean summer abundance of krill shows a strong negative relationship to their mean length, signifying a population periodically boosted by strong recruitments from the larval phase. Absolute recruitment has declined more abruptly than total abundance, yet mean krill length has increased, suggesting a fundamental change in the recruitment/mortality dynamic over the last four decades. The Southern Annular Mode appears to be a major climatic driver of this episodic recruitment, acting only partly through the seasonal cycle of sea ice. We examine the power spectra of climatic drivers, the lifespan of krill and a simple model of krill population dynamics to investigate the effect of future CMIP5 model SAM projections on krill abundance. We discuss the implications of these major, climate-driven changes in krill dynamics for nutrient flows in the food web.

Key words

Antarctic krill, Southern Ocean, Southern Annular Mode, recruitment, mortality