Antarctic krill (*Euphausia superba*) hotspot: population characteristics, abundance and vertical structure explored from a krill fishing vessel

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Antarctic krill (*Euphausia superba*) aggregate in various ways depending on a range of biological and physical factors. In some areas, typically associated with bathymetric features such as shelf edges and canyons, they may aggregate densely to form hotspots. Despite the importance of such hotspots, their development over time in demographic composition and spatial distribution is not well understood. A fishing vessel during regular operation was used for collection of krill demographic and acoustic data on the shelf northwest of South Orkney Islands. Results show a decrease in the proportion of subadult males, partly reflected in an increase in mature adult males. Concurrently, there was a change in the proportion of males in the sampled population from 0.8 to 0.3, indicating immigration or emigration of krill through the hotspot. A clear trend was observed in the diurnal vertical distribution with deeper and more vertically compact swarms during the day. However, some days displayed very small differences between the day and night distribution and considerable variability in the daytime depth distribution. It was noted that although fishing was carried out during the entire period of the study, there was no obvious trend in the acoustic backscatter, suggesting that the overall krill density was not changing during this period. Using a fishing vessel as a research platform has advantages for understanding the dynamics of the fishery and in quantifying biological and physical processes during actual exploitation of these resources.

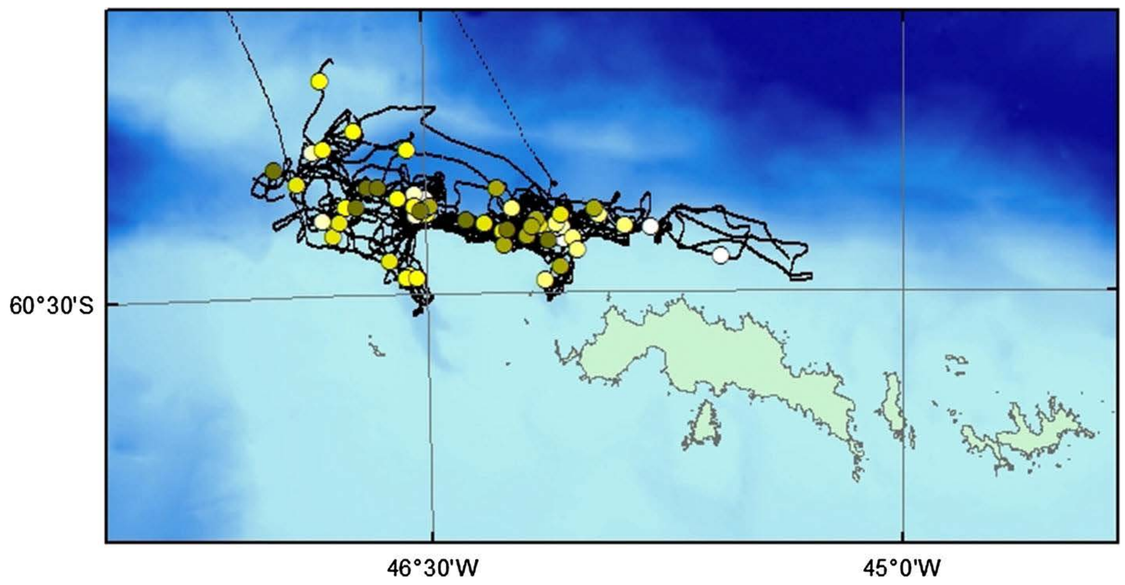

Figure 1 Overview of vessel cruise tracks and biological sampling locations 1–55 (with white circles at start of cruise and gradually darkening toward to end of cruise) during the period 28 January–2 March 2009

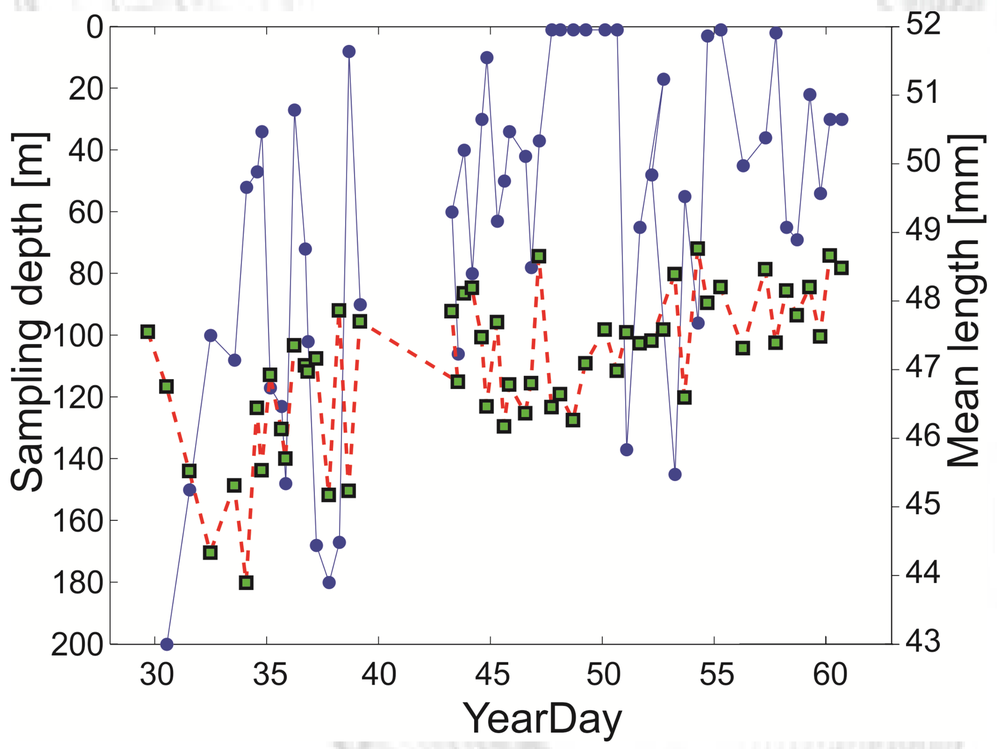

Figure 2 Estimated mean length (green squares) for the dominant size distribution of *Euphausia superba* C33 mm body length and depth of sampling (blue filled circles) versus year day during the study period. Sampling depth determined from the trawl sensor, considering a 10–12 min delay for the krill to travel from the cod-end to the trawl deck.

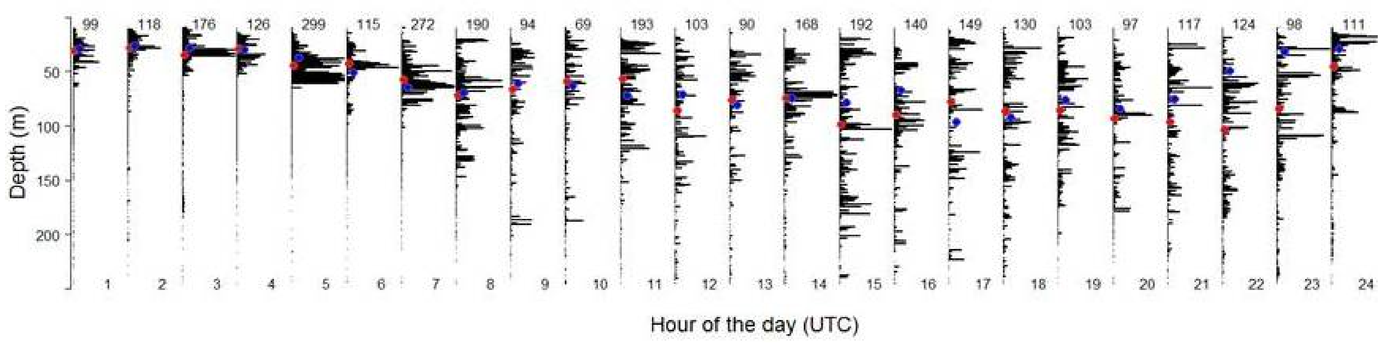

Figure 3 Depth distribution of krill recordings throughout the entire study period illustrating the diel cycle based on acoustic recordings. The diel cycle is categorized into 1-h periods, and each horizontal bar reflects the weighted vertical distribution center of acoustic recordings along a 50 ping sample period. The length of the bar is proportional to the value of the NASC (m2/nmi2). The red dots denote the mean depth distribution weighted according to the value of the NASC. The blue dots denote mean fishing depth, estimated from a CTD sensor fixed to the trawl opening. The number on the top of the panel denotes average NASC for the given 1-h period

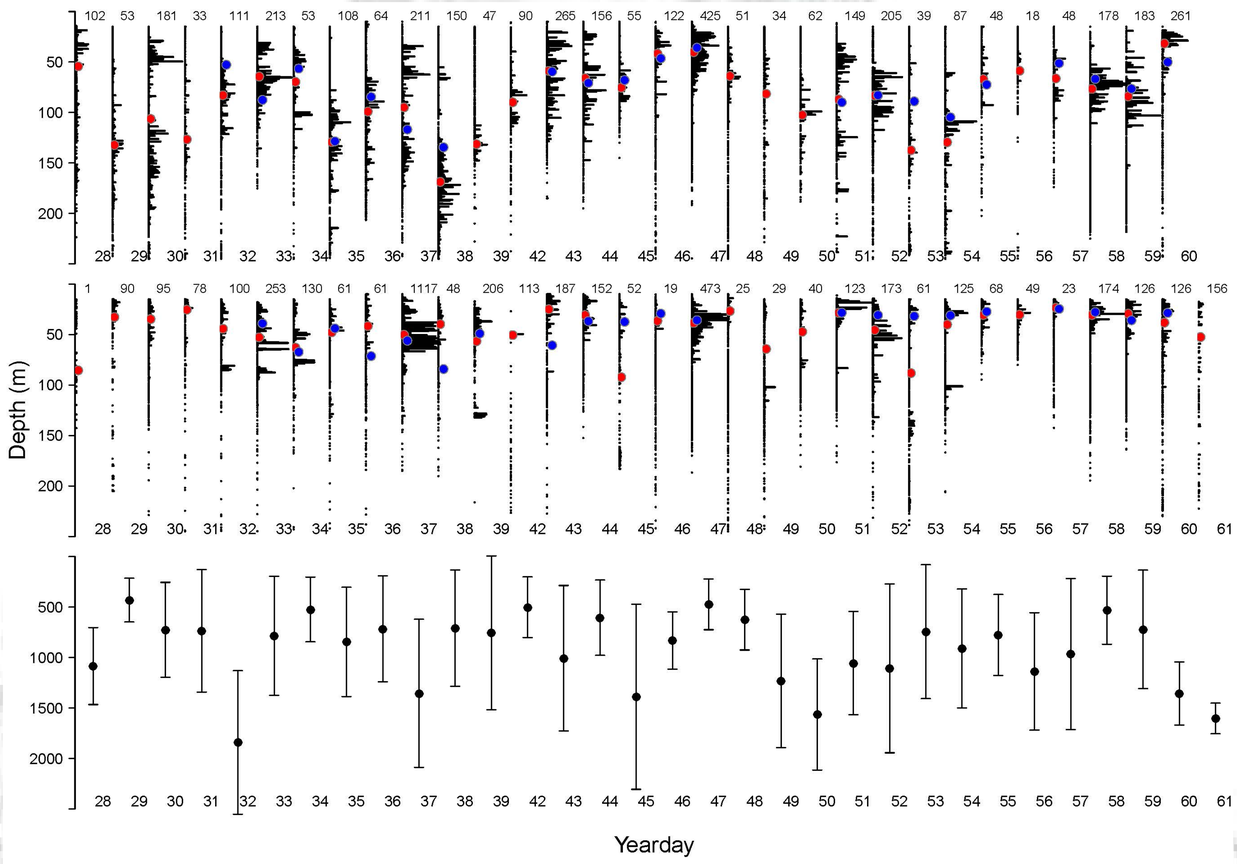

Figure 4 Depth distribution of krill recordings over the investigation period during daytime (upper panel) and nighttime (middle panel) and average daily bottom depth with standard deviation (lower panel). The investigation period is categorized into 1-day periods, and for the krill distribution plots, each horizontal bar represents the center of the vertical distribution for a 50 ping sample period, and the length of the bar is weighted according to the value of the NASC. The red dots denote the mean depth distribution, also weighted according to the value of the NASC. The blue dots denote mean fishing depth, estimated from a CTD sensor fixed to the trawl opening. Note that the data collection from the CTD started on yearday 32 and that data lack for some periods without fishing. The number on the top of the panel denotes average NASC for a given yearday. Note that the x-axis is not linear since there were days of no sampling

Fishing vessel Saga Sea. Photo: BA Krafft

Further information:
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