

SPATIAL DISTRIBUTION OF ANTARCTIC KRILL (*Euphausia superba*) AND ICE KRILL (*E. crystallorophias*) IN THE WESTERN ROSS SEA DURING SUMMER 2018



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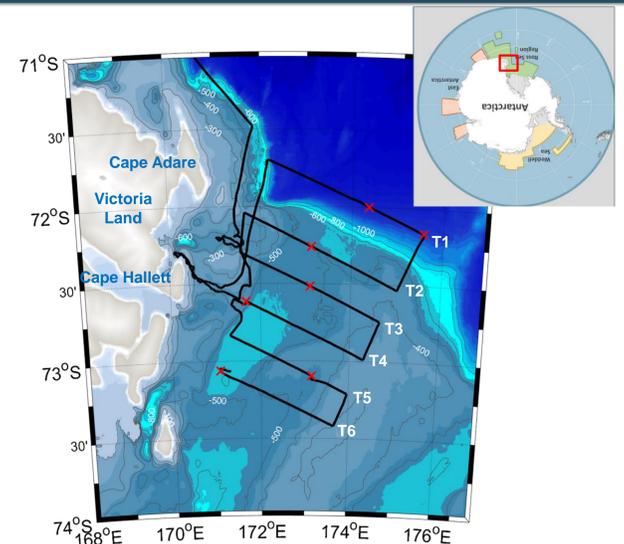
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Introduction

- Antarctic krill and ice krill are important components of the Southern Ocean ecosystem because numerous marine organisms (including whales, seals, fish, and squid) either directly and indirectly prey on them.
- The Ross Sea sector is one of the most rapidly changing region in the Southern Ocean. In recent, it has been selected as Marine Protected Area (MPA), which is the largest MPA regions in the Southern Ocean.
- Thus, sustained observations for abundance and distribution of krill are essential to understand marine ecosystems.
- The aim of this research is to classify Antarctic krill and ice krill by using acoustic method and to estimate their horizontal and vertical distribution.

Fig. 1. A map of the study region with net sampling stations during ANA08C. Black solid lines and red crosses represent acoustic survey lines and rectangular net sampling stations, respectively.



Materials and methods

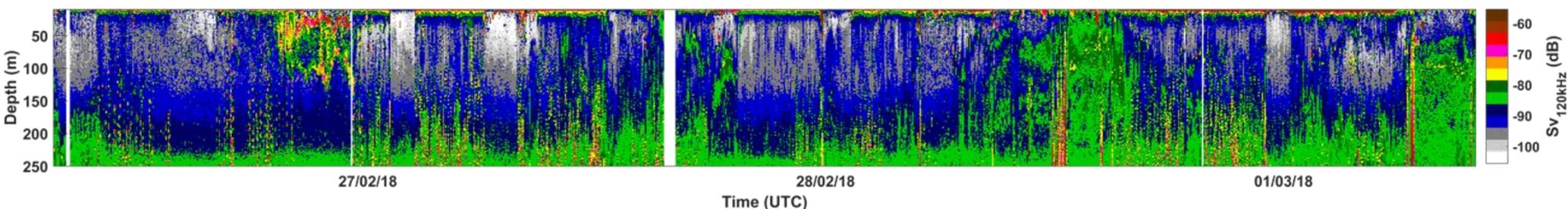


Fig. 2. Echogram of 120 kHz from the top 250 m of the water column during acoustic survey period.

Multi-frequency acoustic data (38 and 120 kHz) were obtained throughout ANA08C cruise to collect information on the horizontal and vertical distribution of zooplankton and krill around Cape Hallett. Figure 2 shows the 120 kHz echogram along the acoustic transects (T1-T6). The echogram clearly shows the existence of a horizontally continuous and vertically distinguished scattering layer. Non biological signals such as surface bubbles, bottom and false bottom echoes and ice noise from the ship's passage through the ice breaking were identified and excluded. A 120 – 38 kHz two-frequency ($S_{v\ 120-38\text{ kHz}}$) dB window identification technique was used to identify both krill species from the acoustic data. The nautical area scattering coefficient (NASC, $\text{m}^2\text{nmi}^{-2}$) and the weighted mean depths (WMDs) for both krill species were calculated to estimate horizontal and vertical distribution. In order to separate acoustic signals attributed to Antarctic krill and ice krill, the 2 - 12 dB and 12 - 18 dB $S_{v\ 120-38\text{ kHz}}$ windows were applied, respectively.

Results

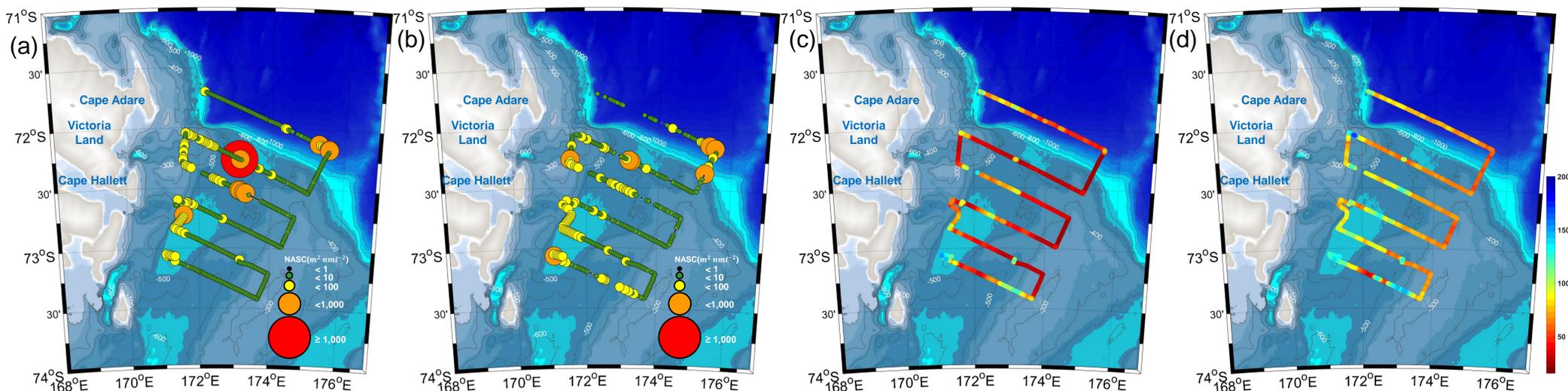


Fig. 3. Distribution of the Antarctic krill and ice krill in Western Ross sea. Relative abundance of (a) Antarctic krill and (b) ice krill as NASC values and Vertical distribution of (c) Antarctic krill and (d) ice krill as WMD values.

Relative abundance and distribution of two krill species show clearly the regional differences (Fig. 3 and Table 1). The highest NASC values of Antarctic krill and ice krill were observed in T2 and T6, respectively (Table 1). Both krill species, showed the lowest NASC values in T4. Overall, Antarctic krill and ice krill were mainly distributed in the vicinity of the Antarctica.

The mean WMD result of Antarctic krill was 49 m (SD = 29 m) and that of ice krill was 75 m (SD = 31 m). Both two krill species showed the maximum WMD results in T6. The vertical distribution of ice krill increases with increase in latitude. The results show that in each transect, Antarctic krill was mostly distributed shallower than ice krill (Table 1).

Transect	Mean NASC ($\text{m}^2\text{nmi}^{-2}$)		Mean WMD (m)	
	Antarctic krill	Ice krill	Antarctic krill	Ice krill
1	14.2(±42.3)	15.2(±27.0)	58.3(±22.5)	72.0(±20.6)
2	48.3(±297.7)	13.5(±58.0)	38.4(±27.5)	67.4(±34.5)
3	17.3(±47.5)	8.7(±11.3)	52.0(±27.8)	79.1(±20.9)
4	6.0(±4.8)	4.8(±4.4)	47.4(±25.9)	76.7(±29.7)
5	5.9(±4.2)	8.6(±10.2)	41.0(±23.1)	73.8(±28.5)
6	6.6(±4.1)	16.2(±22.1)	74.2(±36.4)	99.4(±42.4)

Table 1. The NASC and WMD of Antarctic krill and ice krill in six transect lines

Summary

- Analyses of acoustic observations revealed that Antarctic krill were distributed in the region of the continental slope at depths shallower than approximate 50 m. Ice krill were widely observed in the coastal waters on the continental shelf at depths deeper than 50 m.
- This research show that in the Western Ross Sea the two species of euphausiids inhabited different areas and vertical distribution during the summer period.

References

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