

---

## Study on the Population Structure of *Euphausia superba* in the Northern Weddell Sea

Shuai Chen, Hongliang Huang<sup>a</sup>, Lingzhi Li, Xin Rao, Jialiang Yang

Key Laboratory of Oceanic and Polar Fisheries, Ministry of Agriculture; East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Shanghai, China;

<sup>a</sup>Corresponding author e-mail: yangpu79@hotmail.com

---

### Abstract

In order to understand the ecology of Antarctica and avoid affecting the ecological development of Antarctic biological resources, the author studied on the population structure of K. krill in the northern Weddell Sea. Research is conducted through biological sampling and analysis methods. The sampling network is a double-sac structure, with a mesh-type frame size of 4 m×2 m and a mesh size of 15 mm. The result shows: the population composition of the krill was mainly 1-2 and 2-3 years old. There was a spawning ground for the Southern Giant Krill in January 2016 in the northeastern sea of Koh Chang and the northern part of King George Island. This can provide a reference for the protection of biological resources in the sea areas near the Antarctic Peninsula in the future.

### Keywords

*Euphausia superba*; Weddell Sea; Population structure.

---

## 1. Introduction

In order to understand the ecology of Antarctica and avoid the development of Antarctic biological resources affecting the ecology, scientific surveys of the biological resources of the Southern Ocean have been conducted to examine and assess the quantity and resource distribution of Antarctic krill and other biological resources, and to understand the distribution of Antarctic krill in the Southern Ocean. With the composition of populations<sup>[1-3]</sup>, the relationship between the distribution of biological resources in the Southern Ocean and environmental factors was explored to provide basic data for the assessment of biological resources in the Southern Ocean.

## 2. Materials and Methods

In order to effectively study the biological significance of the acoustic image, this study used biological sampling of the key sea area using the “double balloon trawls for the evaluation of framed Antarctic krill resources” at the same time as the acoustic survey. The sampling network is a double-sac structure, with a mesh-type frame size of 4 m×2 m and a mesh size of 15 mm. During the investigation, according to the time schedule, biological sampling operations are selected after the station operation is completed. The towing speed is generally controlled at about 3-4 kn. The sampling depth is generally adjusted according to the influence of the scientific sonar and the sampling time is generally controlled at 20 min. the above. In the process of trawling, we used the results of the investigation of the tension of the winch on the ship, and we also studied the force of the sampling network.

During the inspection period, 8 special trawl samples (8 stations × 1) were obtained. The station position is shown in Figure 1 About 15 kg of Antarctic krill samples, 200 g of jellyfish samples, 300 g

of larvae, cope pods, and footholds were obtained. In field surveys, the near-shore and continental slopes of the krill densely distributed area are generally selected before or after leaving the station. The speed of the ship is maintained at 3-4 knots. The length of the cable is adjusted according to the image of the scientific sonar. The trawl is 0-20 minutes later. , Low speed (speed about 0.2 m/s) put away.

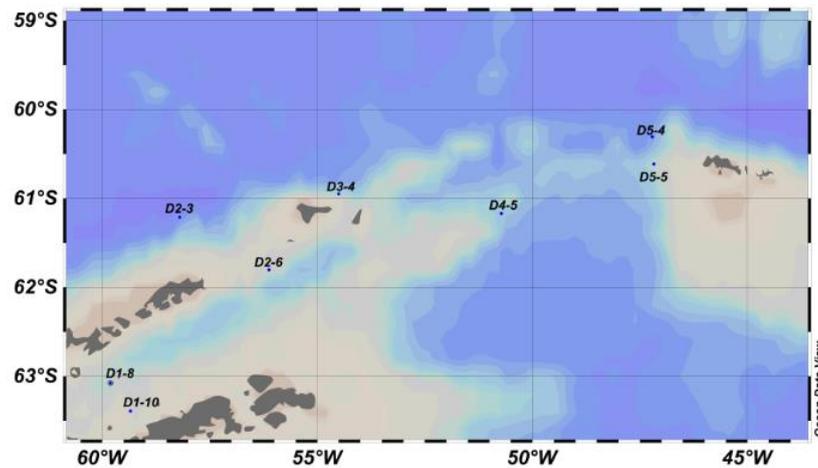


Figure 1. Antarctic krill frame double-sac sampling network operation site

### 3. Results and discussion

In general, the biological data of the surveyed sea area shows that the frequency distribution of the body length of *Euphausia superba* Dana shows a double peak Gaussian distribution. Specifically for each station, especially for the analysis of stations with more samples, the population size of the D3-4 S. krill group is larger, and that of the D5-4 group is smaller. The average body length and average body weight are The difference is 5.748mm, 0.108g. From the analysis results, the average population of the Antarctic krill population in the western South Orkney Islands is relatively small. In the eastern part of the island of Koh Chang, the surface of the sea is very large, which can be a key focus for commercial fishing.

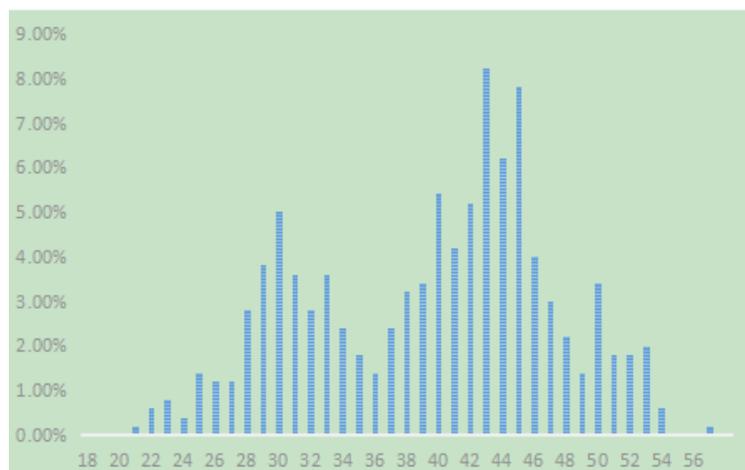


Fig.2 32CHINARE focuses on the distribution of Antarctic krill in the sea area

From the results of the Southern Ocean Krill eye diameter measurement, the data presented a double-peak structure, namely 0.97-1.46mm and 1.56-2.56mm, corresponding to the length of the southern giant krill 22-36 mm and 36-48 mm. In this survey, the population composition of the southern extreme krill was mainly 1-2 and 2-3 years old.

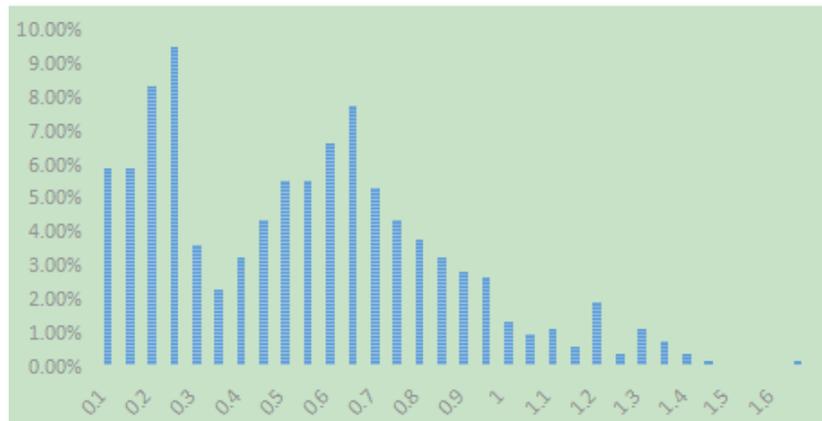


Fig. 3 32CHINARE focuses on surveying the weight distribution map of Antarctic krill in the sea area.

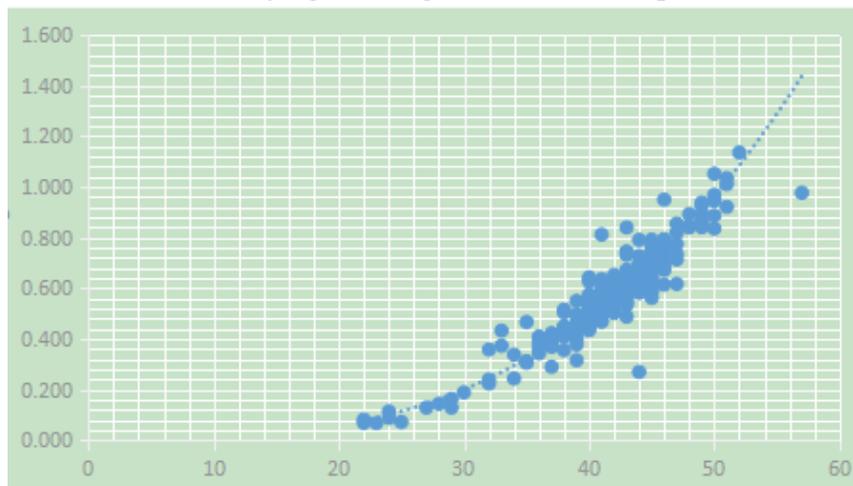


Fig. 4 32CHINARE focuses on the length and body weight fit of *Euphausia superba* in the southern sea area

According to the body length and weight data of the sample, the length-weight matching is as follows:

$$W=6 \times 10^{-6} L^{3.0668} \quad (R^2=0.9122) \quad (1)$$

Where W is body weight (g) and L is body length (mm).

Compared with 30 Antarctic expeditions (January 2014), the results of this biological sampling show that the body length and body weight of the Southern Giant Krill in sampling in January 2016 were significantly lower than those in January 2014, and the other in 2016. The body length and body weight of the Southern Giant Krill in the January sampling were also more uniform than in January 2014.

In terms of sex and sexual maturity, 60% of the samples were male, 38% were female, and the others were adolescent. This is quite different from the sampling of the sea near the Antarctic Peninsula in China's 30th Antarctic scientific expedition. The results of the 30 surveys showed that the vast majority are females, with a small percentage of male individuals. In terms of sexual maturity, 49% of individual maturity is grade 3, and 39% of individual maturity is grade 4. In addition, 38.3% of female individuals at the D3-4 site had oviposition. The corresponding proportion of female individuals at the D2-4 site is 9.1%, which indicates that there was a spawning ground for the Southern Giant Krill in January 2016 in the northeastern sea of Koh Chang and the northern part of King George Island. This can provide a reference for the protection of biological resources in the sea areas near the Antarctic Peninsula in the future.

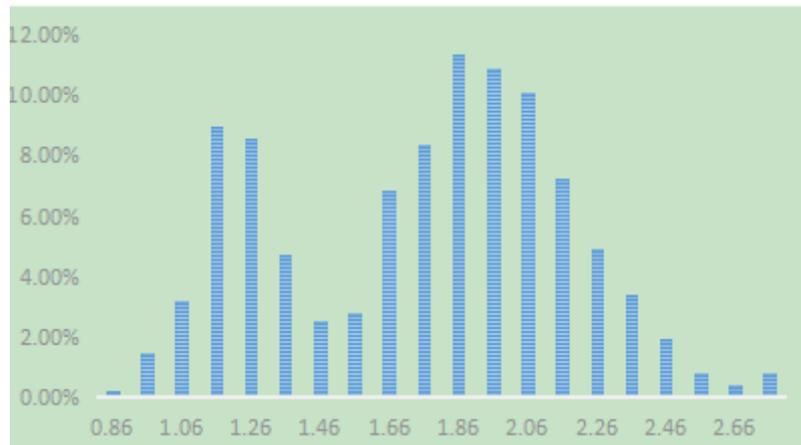


Fig.5 Distribution of Antarctic krill eye diameters in 32 CHINARE

From the distribution of eyeball diameters at each site, the *Euphausia superba* eye diameter at D2-4 site is mainly 1.0-1.3 mm. In general, the population structure is dominated by 1-2 years of krill, which also confirms the Long distribution analysis of the conclusions. In the DA-5, D5-5, D3-4, and D1-10 sites, the *Euphausia superba* eye diameter is mainly 1.5-2.2 mm. In general, the population structure is dominated by 2-3 years old krill, and it is also roughly Meet the conclusions of body length distribution analysis.

### Acknowledgements

This work was financially supported by Chinese Polar Environment Comprehensive Investigation and Assessment Program (Grant NO. CHINARE2016-01-05-07) funded by the State Oceanic Administration of China, Project NO. 2016T02 Supported by Special Scientific Research Funds for Central Non-profit Institutes (East China Sea Fisheries Research Institute), Supported by Fund (NO.LOF 2017-01) of Key Laboratory of Open-Sea Fishery Development, Ministry of Agriculture, P. R. China.

### References

- [1] Wiebe PH, Ashjian CJ, Lawson GL, Pinones A, Horizontal and vertical distribution of euphausiid species on the Western Antarctic Peninsula U.S. GLOBEC Southern Ocean study site. Deep Sea Res Part II. 58(2011)1630–1651.
- [2] Kate Richerson, Jarrod A. Santora, Marc Mangel, Climate variability and multi-scale assessment of the krill preyscape near the north Antarctic Peninsula, Polar Biology.40(2017)697-711.
- [3] Jones Christopher D, Ramm, David C, The commercial harvest of krill in the southwest Atlantic before and during the CCAMLR 2000 Survey, Deep Sea Research. Part II: Topical Studies in Oceanography. 21(2004)1421-1434.