

Study on Acoustic Characteristics of Pseudobrachial Sakura Krill

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Abstract

As a widespread species in the Southern Ocean, pseudobrachial Sakurapill has relatively high abundance and relatively uniform distribution. The acoustic data for this study were obtained from the scientific fish finder (SIMRAD EK60) aboard the Xuelong polar research vessel, which operates at 120kHz. Biological sampling was obtained from vertical trawl sampling of zooplankton from 200m to the surface, and acoustic data processing was performed in the specialized software of the Institute for Underwater Acoustic Survey and Analysis of Biological Resources (ECHOVIEW 6.1.72, MYRIAX, AUSTRILIA). The study of acoustic features is carried out by using the comparative method. It was found that at 120 kHz, most of the SVS of pseudobrachinus were distributed between -107.63 dB and -87.25 dB, and the peak value was between -93.88 dB and -92.50dB. The Ts were mostly distributed from -99.75 dB to -63.75dB, showing obvious bimodal structure.

Keywords

Thysanoessa Macrura; Acoustic Characteristics; Scientific Echosounder.

1. Introduction

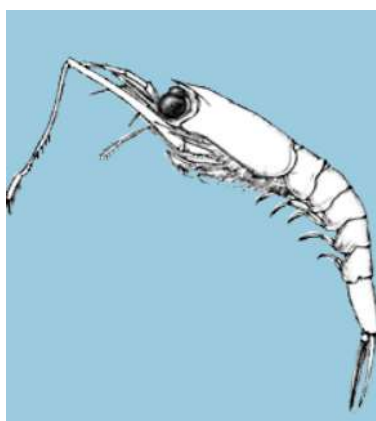


Figure 1. Thysanoessa macrura

Thysanoessa macrura belongs to the Phylum Arthropoda, Crustacean, order Krill, family Krill, and genus Krill. As a widespread species in the Southern Ocean, it has relatively high abundance and relatively uniform distribution. Macrokrill is generally distributed in the shallow waters of 130m, while pseudobrachial krill is distributed in the deeper waters of 90-250m, and its body length is generally not more than 30mm. According to the North Pacific net sampling and

synchronous environmental survey in the waters around South Shetland Islands in the summer of 2013/2014, the following results were obtained: Among the 22 stations in the trawl, 14 stations were found with the abundance ranging from 10.0 to 650.0 ind./1000m³, with an average abundance of (132.9 to 183.2) ind./1000m³. From the population structure distribution of the whole survey area, the proportion of adult females was higher, followed by the larvae of FVI and FV stages. Female adults were widely distributed in all stations, and the proportion of krill in late larval developmental stage was higher than that in early larval stage[1-3].

2. Materials and Methods

The field survey was conducted in the waters around South Shetland (60 -- 63°S, 44 -- 59°W) during China's 30th Antarctic Expedition from February 7 to 14, 2014. The acoustic data were obtained from the Scientific Fish Exploration Instrument (SIMRAD EK60) aboard the Xuelong Polar Research vessel, which operated at 120kHz. Biological samples were collected from vertical trawl of zooplankton collected from 200m to the surface. Naked eye observation showed that there was 10-20% floating ice in the waters around South Shetland during the survey period. The zooplankton collection net was the north Pacific net (net size 330μm, network port area 0.5m²), and the water filtration volume was obtained by multiplying the network port area by the trawl depth, which was 100m³. The samples were fixed with formalin at 5% concentration and brought back to the laboratory for identification and counting.

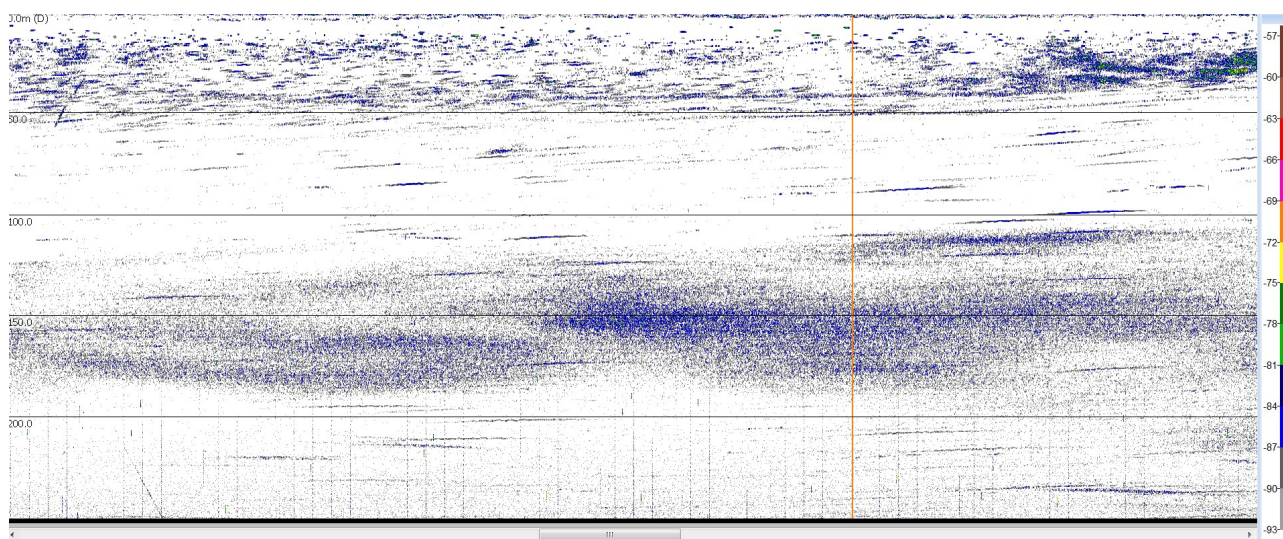


Figure 2. Acoustic image of *Thysanoessa macrura*

In terms of survey time and scope, the acoustic survey covered the whole time of the survey, focusing on the seas around the Antarctic Peninsula. The acoustic data obtained from the expedition were processed in the specialized software used by the Institute for Underwater Acoustic Survey and Analysis of Biological Resources (ECHOVIEW 6.1.72, MYRIAX, AUSTRILIA). The study of acoustic features is carried out using the comparative method.

As for pseudobranchial sakurapill, among all the survey stations selected in this study, there was no Antarctic large krill in the biological sampling samples, and only the stations of pseudobranchial Sakurapill were selected for analysis. The three stations D1-05 D2-04 D2-10 were selected for analysis.

3. Results

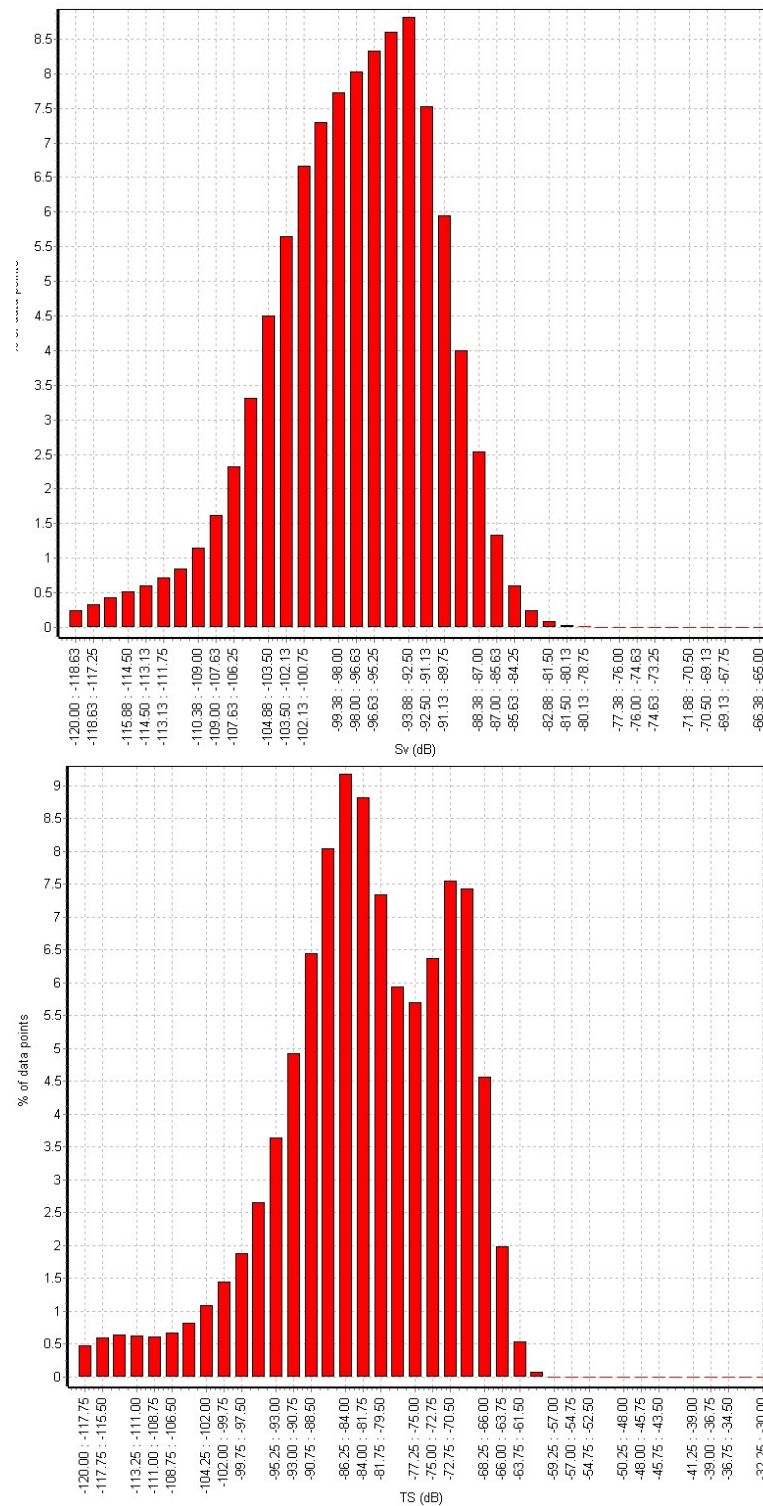


Figure 3. Distribution of Sv and Ts of pseudobranchial Sakurkrill

Under the operating frequency of 120 kHz, the Sv of pseudobranchial pseudobranchial was mostly distributed between -107.63 dB and -87.25 dB, and the peak value was between -93.88 dB and -92.50 dB. Most of Ts are distributed from -99.75 to -63.75 dB, showing obvious bimodal structure. The first distribution peak is around -72.75 to -68.25 dB, and the second distribution peak is around -86.25 to -84.00 dB. Because only one transducer was installed in the scientific echosounder at that time, the frequency difference method could not be compared.

Acknowledgments

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References

- [1] Wallis, Jake R., Maschette, Dale, Wotherspoon, Simon, Kawaguchi, So, Swadling, Kerrie M. *Thysanoessa macrura* in the southern Kerguelen region: Population dynamics and biomass. Deep-sea research, Part II. Topical studies in. 2020. 157. 223-228.
- [2] Wallis, R Jake, Kawaguchi, So, Swadling, M Kerrie. Sexual differentiation, gonad maturation, and reproduction of the Southern Ocean euphausiid *Thysanoessa macrura* (Sars, 1883) (Crustacea: Euphausiacea). *Journal of Crustacean Biology*. 2018. 23. 163-166.
- [3] Jaime, Farber-Lorda. Multivariate approach to the morphological and biochemical differentiation of Antarctic krill (*Euphausia superba* and *Thysanoessa macrura*). *Deep Sea Research Part A Oceanographic*. 1991. 631. 1563-1569.