

IX. DISTRIBUTION OF THE *GLOBIGERINA PACHYDERMA* (EHRENBERG) IN THE KURIL AND JAPAN BASINS, AND THE FLUCTUATION OF COILING DIRECTION OF *G. PACHYDERMA* IN THE CORE P109

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Introduction

Since ERICSON (1959) pointed out that the coiling direction of *Globigerina pachyderma* (EHRENBERG) was temperature dependent, the change in proportion of right and left coiling of this species has been used as a paleoclimatic indicator in the study of high-latitude cores.

The planktonic foraminiferal fauna from the samples obtained during the present cruise, GH 77-3, were studied. The distribution of *G. pachyderma* on the bottoms of the northern Japan Sea and of the southern Okhotsk Sea, and the fluctuation of coiling direction of *G. pachyderma* in the core P109 are reported in this paper.

Materials and Method of Study

Twenty-five bottom samples were examined to determine the distribution of recent *G. pachyderma*. The core P109 was used for the analysis of the climatic change in the southern Okhotsk Sea. Sampling localities are shown in Fig. IX-1. The core is about six meters long, and the samples analyzed were taken from two meters of the core. The top one meter of the core was examined at intervals of five centimeters, and the next meter was examined at ten centimeter intervals; that means, thirty samples were treated in all.

Samples were treated with the usual micropaleontological procedure in the laboratory. Residuals above the 200 mesh screen were examined. About 100 individuals of *G. pachyderma* from each sample were analyzed.

Results

The planktonic foraminiferal fauna of the Okhotsk Sea and of the Sea of Japan is very monotonous, as described by SAIDOVA (1957) and LIPPS & WARME (1966). Only two species, *Globigerina pachyderma* (EHRENBERG) and *Globigerina bulloides* d'Orbigny are dominant in the samples. *Globigerinita glutinata* (EGGER) and *Globigerina quinqueloba* Natland are found rarely.

The distribution and the percentage abundance of left coiling *G. pachyderma* in the surface sediments are shown in Fig. IX-1. Solid line in the figure indicates the isopleth of the percentage of the left coiling *G. pachyderma*. The coiling ratio of *G. pachyderma* changes remarkably from 20 to 100 percent in this relatively narrow area. In the Okhotsk Sea, it ranges from 95 to 100 percent and decreases southwestward toward the Soya Strait. In the Japan Sea, it ranges from 20 to 90 percent, and increases away

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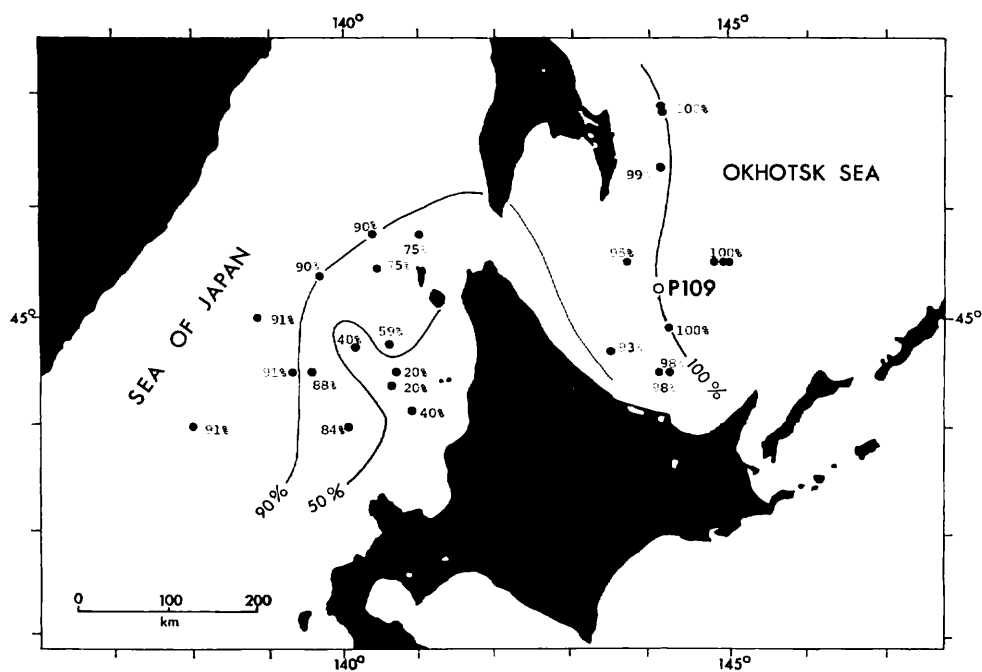


Fig. IX-1 Distribution and the percentage of left coiling *Globigerina pachyderma* (EHRENBERG) on the sea floor of the southern Okhotsk Sea and of the northern Sea of Japan. Solid line indicates the isopleth of the percentage of the left coiling *G. pachyderma*. Closed circle shows the sampling locality of surface sediments examined and open circle indicates the location of the core P109. Numerals beside the closed circle indicate the percentage of the left coiling *G. pachyderma* at each location.

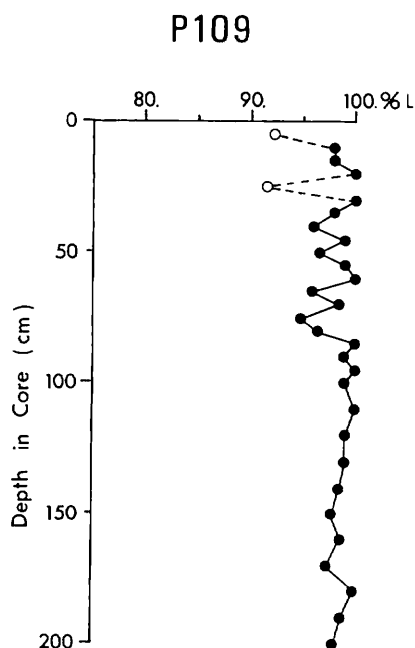


Fig. IX-2 Coiling of the *Globigerina pachyderma* (EHRENBERG) in the core P109. Closed circle indicates samples with more than 50 individuals and open circle those with less than 50.

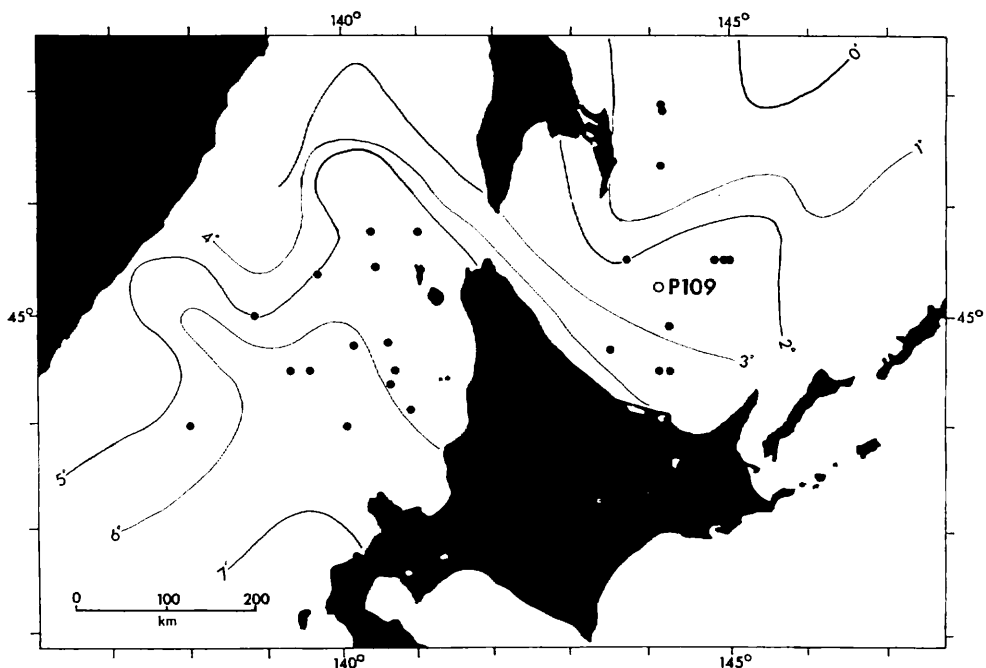


Fig. IX-3 Average surface temperature ($^{\circ}\text{C}$) of the southern Okhotsk Sea and of the northern Sea of Japan in April, 1972, drawn from 10-day marine report of the Japan Meteorological Agency (REDRAWN from MAIYA, SAITO and SATO, 1976).

from the western coast of Hokkaido. The change in coiling of the *G. pachyderma* from the core P109 is shown in Fig. IX-2.

Discussion

Comparing the distribution of the left coiling *G. pachyderma* with the surface water temperature in April of 1972 (Fig. IX-3), the general tendency of the left coiling tests distribution is concordant with the isotherm configuration. The 90 percent isopleth may be compared with the 4°C isotherm. This result agrees with ERICSON's observation (ERICSON, *op. cit.*). Distribution of the surface water temperature is fundamentally controlled by the distribution of surface current systems. The distribution of the coiling ratio of *G. pachyderma* is, then, controlled by the current systems.

The left coiling ratio of *G. pachyderma* varies from 95 to 100 percent in core P109. The coiling ratio frequently fluctuates in the upper part of the core, from the surface to 80 cm in depth; while the amplitude decreases in the lower part. Since repeated occurrences of low percentage indicate the warming of surface water, the upper 85 cm of the core is assumed to be Post-glacial in age. If this assumption is correct, the average rate of sedimentation of this core can be estimated to be of the order of 8 cm/1000 years.

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