SURFACE WATER CONDITION IN THE ANTARCTIC WHALING PACIFIC AREA IN 1956-57

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INTRODUCTION

In this paper the surface water conditions in the Antarctic whaling grounds are discussed by use of the oceanographical data obtained by our investigations 1956-57, on the board of whaling factory ship "Nisshin-maru" and the whale marking research boat "Fumi-maru No. 17" belong to the Taiyo Fisheries Co., Ltd.

Our observation area is mainly covered by the region within the foremore whaling sanctuary area, from 70°W to 150°W. The oceanographical materials treated in this paper are the terms of surface temperature and salinity of sea water. The observations concerning these materials were made at interval of 4 hours on the board of "Nisshin-maru" and on the board of "Fumi-maru No. 17" at interval of one hour, during the whale marking research before the opening baleen whaling.

WHALING GROUNDS IN THE FOREMORE SANCTUARY AREA

Considering from twice catch operations carried out by the Japanese Whaling Expeditions, the whaling grounds within the foremore sanctuary area can be roughly separated into three parts.

Namely, these whaling grounds are located along the meridians of 90°, 120° and 150°W. The operations in the ground along the 90°W were mainly carried out in the beginning season (January) and afterwards shifted towards the west sea areas with the pass of the whaling season. Moreover, the latitudinal area of these whaling grounds corresponds to the domain from about 60°S to 71°S.

The positions of northern-most and southern-most parts of these grounds exist near the 140°W. And, generally speaking, as for the latitudinal width of the whaling grounds, it appears to become narrow from west towards east.

HORIZONTAL DISTRIBUTION OF SURFACE TEMPERATURE AND SALINITY

December. The −1.5°C-isotherm is situated in the east of the Peter I

Island, in the neighbourhood of 68°S, 83°W. And, in this region it is extended in a tongue shape towards the NE direction. In the vicinity of the tongue area, the temperature changes abruptly.

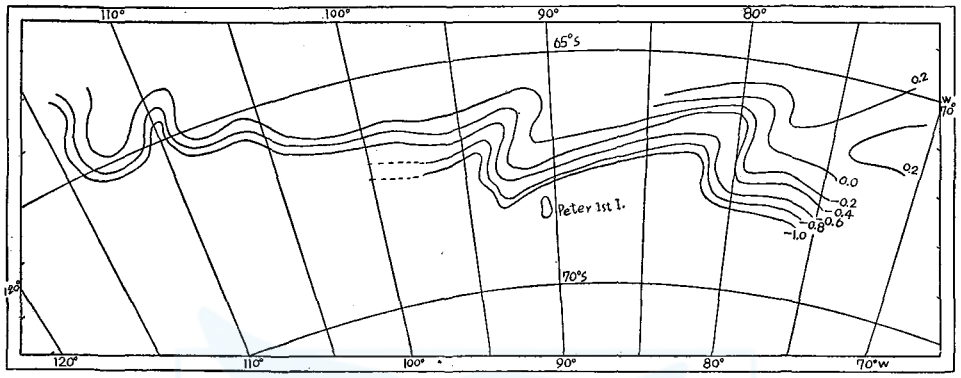

Fig. 1. The horizontal distribution of temperature at surface. December 1956.

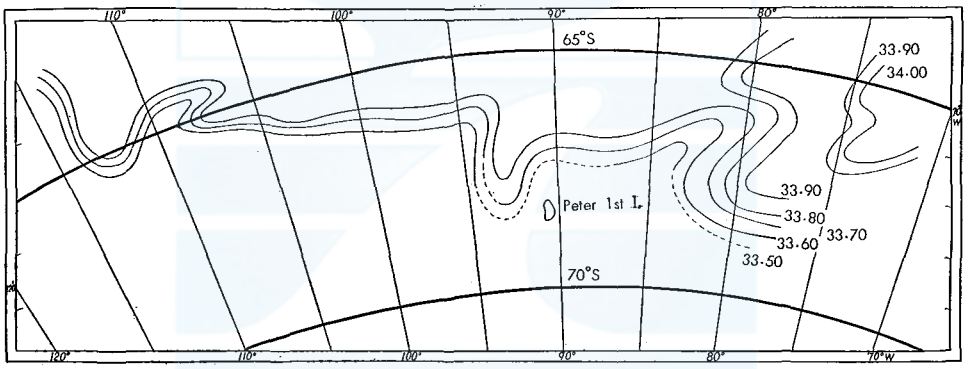

Fig. 2. The horizontal distribution of salinity at surface. December 1956.

The 33.50‰-isohaline is distributed in the same pattern as the temperature isoline, and in this region the low temperature and salinity water mass, which is formed by the melting ice and moves northward, is apparently found. The salinity seems to reduce gradually with the pass of month, as already described by Sugiura (1949). The sea water in this region is well known as the Antarctic surface water (Midttun and Natvig, 1957).

At the position of 66°–30′S, 73°–00′W, the tongue shape distribution of the high temperature and salinity water mass (more than 0.5°C and 34.00‰) is projected towards the west. Near 74°W, the meandering discontinuous lines of temperature and salinity are found. At the position of 64°S, 83°W, the water mass having the high temperature and salinity more than 1.0°C and 33.90‰ is situated towards the south-west.

And, in the region of south-west direction of the above water mass (about 68°S, 93°W), there exists a tongue shape region which extends towards the southern direction.

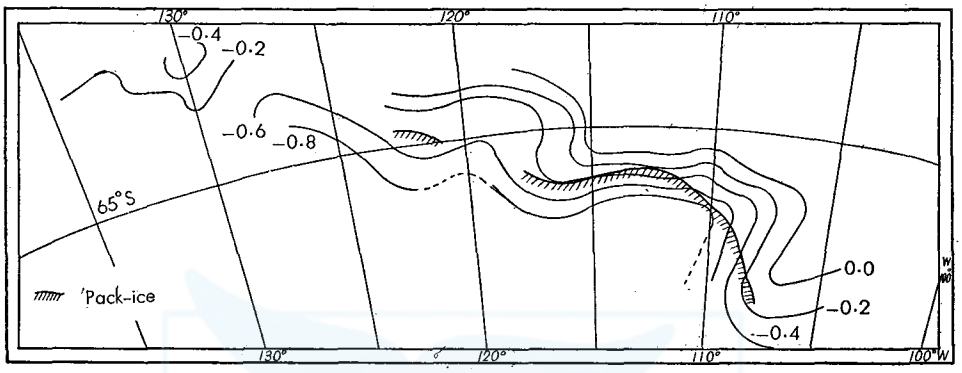

Fig. 3. The horizontal distribution of temperature at surface. January 1957.

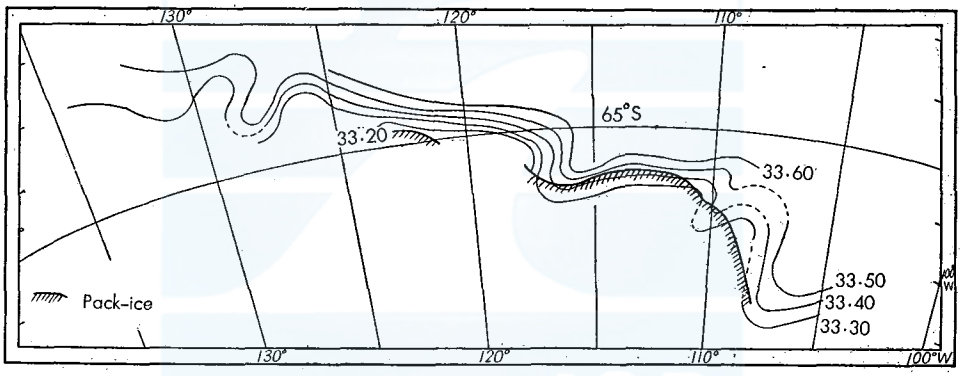

Fig. 4. The horizontal distribution of salinity at surface. January 1957.

In the vicinity of the about 65°S, 110°W, the low temperature and salinity water mass which are formed by −0.5°C and 33.50‰ run northerly in a tongue shape. In the western part of the above tongue shape region, the comparative high temperature and salinity water mass (more than −0.2°C and 33.70‰) is projected southerly. The isotherm and isohaline of this region are laterally meandered and it seems that their patterns form the cyclonic.

January. Observation area covered from about 105°W to 130°W. The surface temperature in this area varies from 0.5°C to −0.9°C. The distribution of pack-ice at January is extended towards the east from the vicinity of the position 66°, 117°W and it is directed southerly very sharp from the position of 66°S and 110°W. To the east area of the pack-ice, the tongue shape of the isolines of relative high tempera-

ture and salinity with values more than 0.0°C and 33.60‰ is penetrated towards the south-west. To the west side of the south-westerly tongue region, the low temperature and salinity water mass is projected towards the north-east. This fact would have been probably caused by the condition of distribution of pack-ice. In the sea region between the northern and southern currents evaluated by referring the isoline map are formed the intricate sea conditions, and the distribution of temperature in this area varies abruptly.

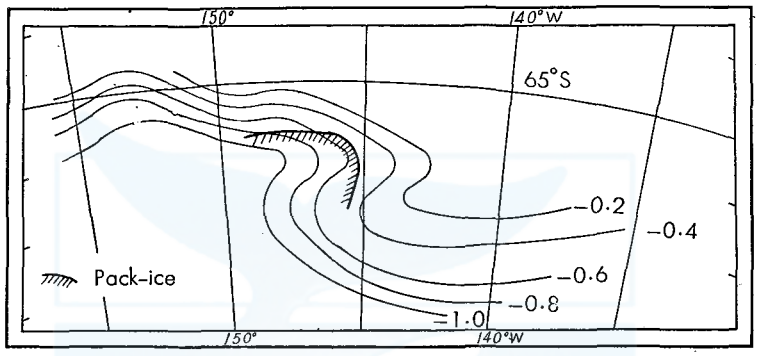

Fig. 5. The horizontal distribution of temperature at surface. February 1957.

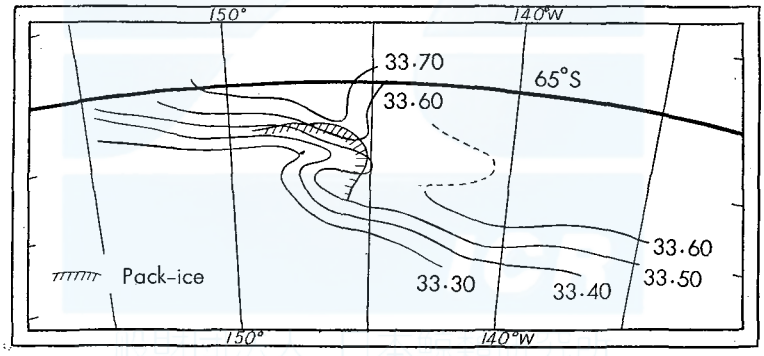

Fig. 6. The horizontal distribution of salinity at surface. February 1957.

The condition of pack-ice at the western part of the 117°W is not clear, but it will be evaluated that the pack-ice is distributed towards southern direction from about 117°W.

At the vicinity of 117°W, the high temperature and salinity water mass is found, and at the west part of it, near the 128°W, the considerable emphatic tongue shape running toward the south-west direction is recognized.

February. Observation area made in this month is covered from 160°W to 120°W. And, the minimum temperature in this region was −1.4°C

in the edge of pack-ice and also there exists the tongue-shaped low temperature zone extending towards the east direction along the pack-ice zone. Moreover, the low isohaline of 33.30‰ runs in the same pattern as the low isotherm along the pack-ice line. In the vicinity of the pack-ice zone the low temperature and salinity water mass is found, and the hydrographical conditions of water mass vary extremely. This fact is clearly influenced by the melting of ice, as described by Sverdrup et al (1946), and it is assumed that before the occurrence of its melting, the distribution of ice was extended towards the east.

On the other hand, the high temperature and salinity water mass is extended towards the west part, and in this part there exists the meandering convergence. Generally, the temperature and salinity in December, January, and February are distributed to the tendency to have high value in the east and low in the west. The isoplethes of temperature and salinity are analogous each other.

SEA CONDITION IN THE VICINITY OF THE PACK-ICE

It is clear from the facts already stated that the water temperature and salinity are low in the vicinity of the pack-ice. But we cannot

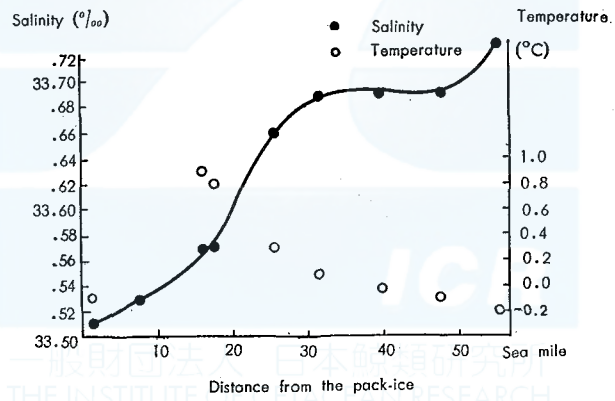

Fig. 7. Temperature and salinity in the vicinity of pack-ice.

assert the generality of this character. Because, the above result did not be deducted from an average treatment of the data obtained by many observations. But, it is recognized that the salinity becomes abruptly lower within the domain of distance 30 sea miles from the pack-ice zone. Besides, Tsuchida (1952) has pointed out that the distribution of salinity changes suddenly within the domain of distance 100 sea miles from the pack-ice.

Referring from Fig. 7, it seems that water temperature is ascent with approaching to the pack-ice and is descent at the nearest vicinity of

the pack-ice. But, we will consider that this phenomenon is unreasonable under our physical analysis. Because, in our treatment concerning the distribution of water temperature, we did not take into account the effect of the time dependent deviation of water temperature caused by the variation of the various kinds of meteorological factors with the phase shift of the time of observation in the respective positions.

RELATION BETWEEN THE SURFACE WATER CONDITION AND THE WHALING GROUNDS

In January, the main whaling grounds are situated near the regions of 65°S–115°W and 67°S–107°W, and in the neighbourhood of these two regions the southerly warm currents are found.

In February, the area of whaling grounds are narrower than that in January, and the center of ground area in this month are located near the position of 67°S–145°W, in where the relative high temperature and salinity water mass are projected towards the west. The most of whale caught in this area are fin whales, and the blue whales which are very few in the same ground are caught in the relatively lower temperature region, especially in the region near the pack-ice water.

It will be considered that the center of whaling grounds were situated in the tops of the tongue shape of isotherms and isohalines, as already reported by Shimomura (1950). Generally, it can be assumed that the southerly warm currents play a very important role for the formation of the Antarctic whaling grounds, especially baleen whale's ground.

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SUMMARY

1. Generally, the water temperature and salinity at the former sanctuary area have a tendency to be high in the east and low in the west.

2. The salinity around the pack-ice have varied in the vicinity of 30 sea miles apart from the pack-ice.
3. It can be assumed that the southerly warm currents play a very important role for the Antarctic baleen whale's ground.

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