Sei Whales in the Adjacent Waters of Japan

III. Relation between Movement and Water Temperature of the Sea

By

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In our former reports (1952, 1954) we reached to a conclusion that there are two kinds of species in the so-called sei whales in the waters adjacent to Japan, one being *Balaenoptera borealis* and others *B. brydei*. The latter, *brydei*, has been taken mostly in the waters around Bonin Island, but it moves northward from there up to the ground off Sanriku, where the warm current from the south meet the cold current from the north. It is assumed, however, also in the former report (1954) that it does not go far north beyond the polar front. In this report, the movements of both species are studied in relation to the water temperature of the sea, based on the data collected in 1953.

In 1953, 584 sei whales were caught in the coastal waters of Japan, in which the baleen plates for 343 whales were forwarded to us from the various landstations for the identification of both species. In table 1, the catch of both species in every ten days of the season are shown, separately in two regions of Sanriku and Hokkaido, classified according to the location of the landstations, in which the whales were processed. Among examined 343 whales, 296 were *borealis* and 47 were *brydei*. Only one *brydei* was taken from the landstation in Hokkaido, and the rest in Sanriku, in the period from the 3rd decade of June to the 1st decade of October, mostly in July and August.

In Figs. 1–18 the positions of the catches of both species are shown with isotherms of surface water temperature of the sea, which were supplied by the Oceanographic Section of the Tokai Regional Fisheries Research Laboratory, Tokyo. One may get general idea on the relation between movements and water temperature from these charts, though the actual water temperature at the position of the catch may differ slightly from the temperature shown in these charts.

It is clearly shown in these charts that *brydei* moves in this region of the sea with the warm current and retreats from this ground with the prevalence of the cold current. In May, the water temperature is still low and the isotherm of 20°C is lying further south from this ground. No *brydei* is taken in May, and it is only in the 3rd decade of June that the first *brydei* was caught in this ground, in the waters

Table 1. Catch of *Balaenoptera borealis* and *B. brydei* in Japan, 1953.

Regions	Species	Sex	May			June			July			August			September			October			Total catch
			1st decade	2nd 〃	3rd 〃	1st 〃	2nd 〃	3rd 〃	1st 〃	2nd 〃	3rd 〃	1st 〃	2nd 〃	3rd 〃	1st 〃	2nd 〃	3rd 〃	1st 〃	2nd 〃	3rd 〃	
Sanriku	*B. borealis*	♂	1	5	7	1	1	2	1	4	5	1	1	2	9	8	6	6	4	3	67
		♀	2	4	2	1	1	1	1	1	2	2	5	1	8	8	5	7	2	1	54
	B. brydei	♂	—	—	—	—	—	—	4	4	1	2	6	—	—	1	1	2	—	—	21
		♀	—	—	—	—	—	1	5	5	2	1	7	1	1	2	—	—	—	—	25
	Not examined	♂	4	7	2	1	—	—	1	—	—	1	3	—	3	1	1	—	1	2	27
		♀	4	3	2	4	1	—	1	—	1	—	—	1	—	—	—	4	2	1	24
	Total		11	19	13	7	3	4	13	14	11	7	22	5	21	20	13	19	9	7	218
Hokkaido	*B. borealis*	♂	—	—	—	—	2	2	7	7	—	3	7	10	14	28	12	4	4	1	101
		♀	—	—	—	—	1	1	8	6	1	—	5	3	8	20	14	5	2	—	74
	B. brydei	♂	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		♀	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
	Not examined	♂	—	—	3	—	2	1	6	4	—	—	3	6	8	10	6	26	16	8	99
		♀	—	—	2	—	1	2	5	2	—	—	2	1	6	5	13	28	11	13	91
	Total		—	—	5	—	6	6	26	19	1	3	18	20	36	63	45	63	33	22	366
Grand total			11	19	18	7	9	10	39	33	12	10	40	25	57	83	58	82	42	29	584

of about 21°C. We have two records of *brydei* in May. They were taken on 31 May 1952 and 4 May 1954 in the waters off Oshima, south-most part of Japan proper. The water temperature there is over 20°C even in May. As in July and August the water temperature in the ground off Sanriku is high enough to afford a room to the immigration of *brydei*, most of them are taken in this period. Some *brydei* are caught also in September and October, however, they were taken in the waters of about 20°C. From the 2nd decade of October the cold current regains its force and no single *brydei* was taken in this ground, suggesting that they had already retreated from this ground and went further south.

Andrews (1916) describes that his own study of the genus *Balaenoptera* has led him to conclude that the temperature of the water is of comparatively little importance in determing their movements, but we think that the temperature of the water is a very important factor which affects the movement of the whale, at least for *Balaenoptera brydei*. Uda (1954) states that there is a close connection between the prosperous whaling ground and the oceanographic conditions of the sea, chiefly from the viewpoint of the structure of water masses. To our regret, *brydei* is not specified from *borealis* in his paper. We may add more knowledge to this field of science if the staffs of whaling land-stations could cooperate to us also in future, as they did in 1953.

Contrary to *brydei*, most of *borealis* are taken in the cold waters below 20°C, though some are taken also in the more warmer waters than 20°C. Nozawa, Takayama and Nemoto (1954) report that 98 sei whales which were taken by the whaling factory ship "Baikal Maru" in the northwestern part of the North Pacific in 1953 were all *borealis*. The water temperature at the position of these catches were about 11°C. Although it is likely to happen that *borealis* may be taken in the more colder waters than this, however, it seems to us that *borealis* in the North Pacific do not migrate to the seas of so high latitude, as that in the Antarctic.

In our former report (1954), it is assumed that *borealis* comes near to Bonin Island in the period from December to the middle of April, and after it moved up to the north *brydei* approaches to that island from the middle or end of April. The water temperature in these waters in the former period is up to about 20°C and in May about 24°C or more, though it varies according to the oceanographic conditions in that year.

Kawakami and others (1953) sighted 74 sei whales in these waters on the whale marking trip, carried on from the end of June to the beginning of July 1952, in the waters of 28–29°C. These sei whales

are thought to be *brydei*.

It will be generally concluded from the above, that *Balaenoptera brydei* is living in the warm waters of about 20°C or more, and *B. borealis* in the colder waters below this temperature, though the two species intermingle each other in the waters around 20°C in some cases.

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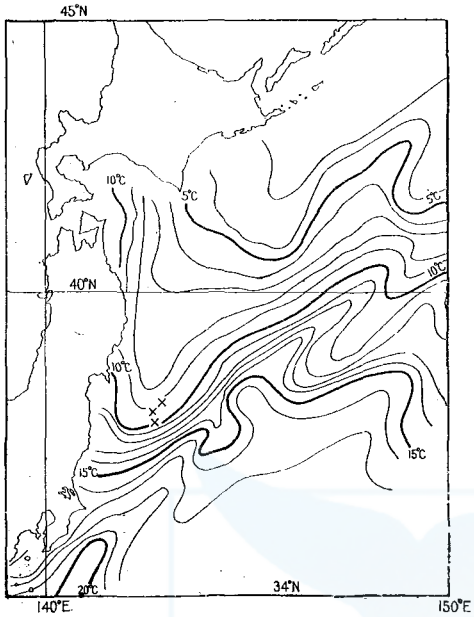

Fig. 1. 1st Decade, May, 1953
× *B. borealis*

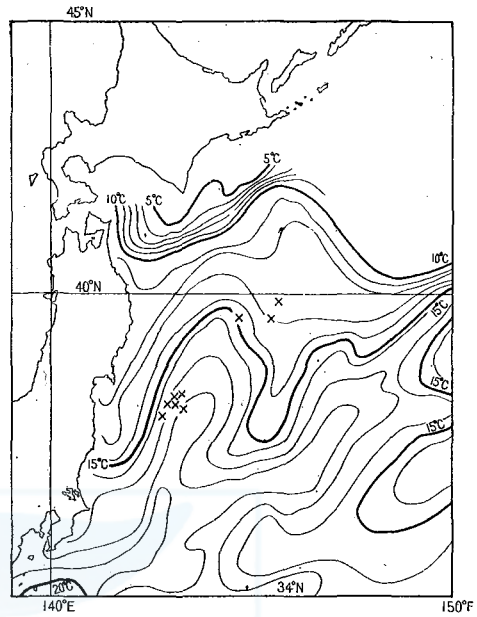

Fig. 2. 2nd Decade, May, 1953
× *B. borealis*.

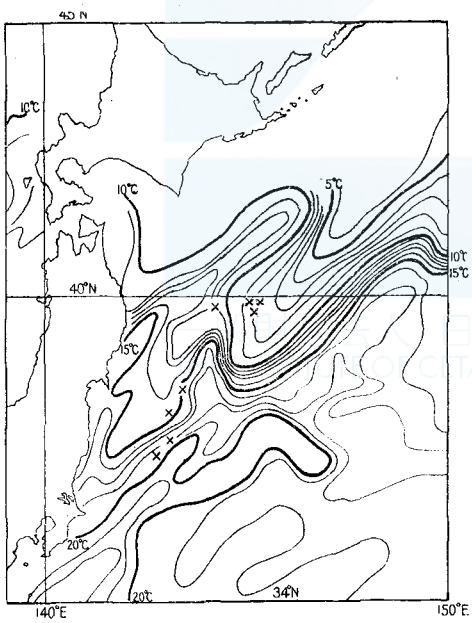

Fig. 3. 3rd Decade, May, 1953
× *B. borealis*

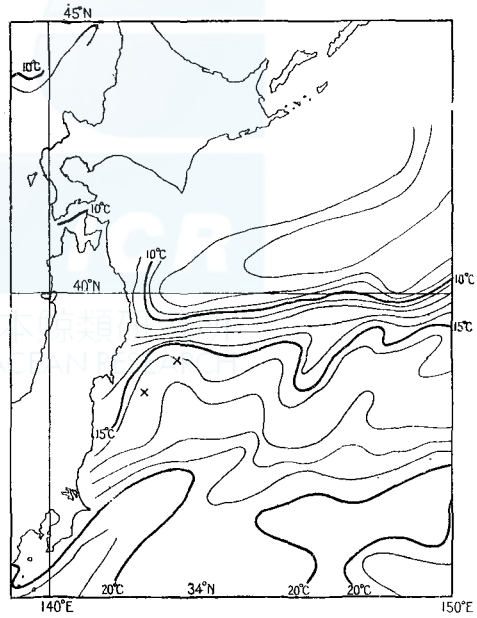

Fig. 4. 1st Decade, June, 1953
× *B. borealis*

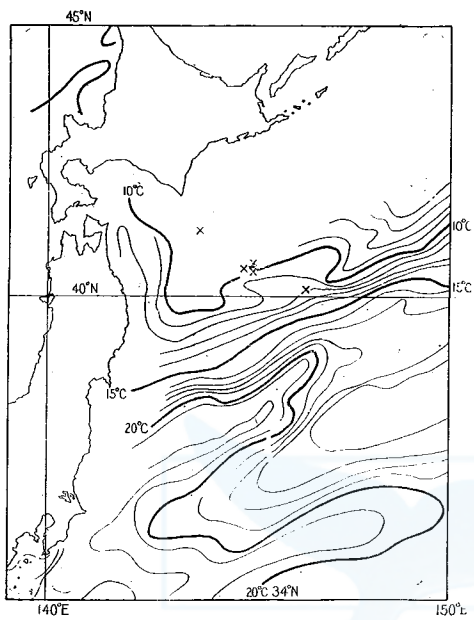

Fig. 5. 2nd Decade, June, 1953
× *B. borealis*

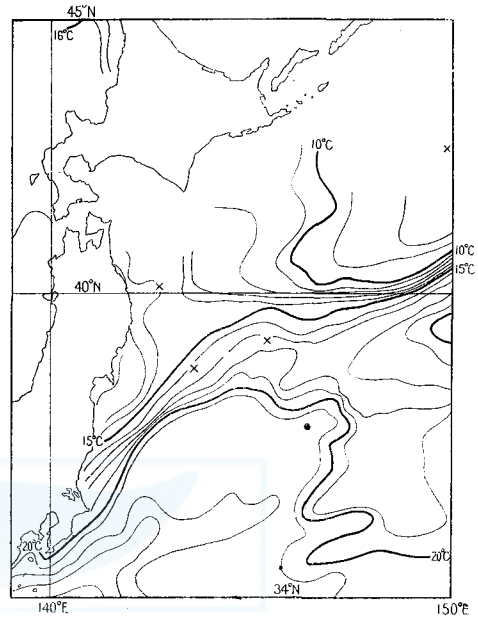

Fig. 6. 3rd Decade, June, 1953
× *B. borealis* ● *B. brydei*

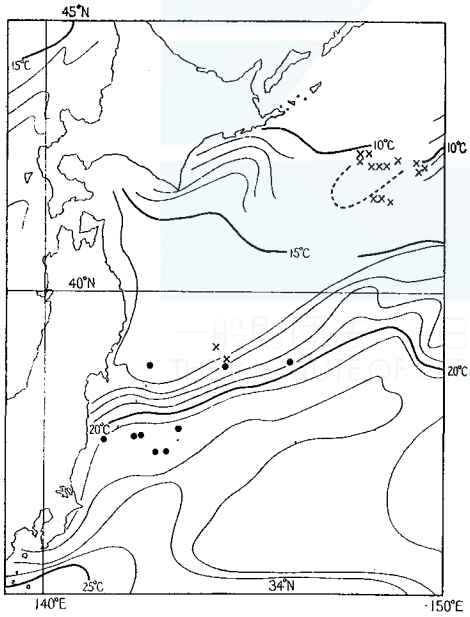

Fig. 7. 1st Decade, July, 1953
× *B. borealis* ● *B. brydei*

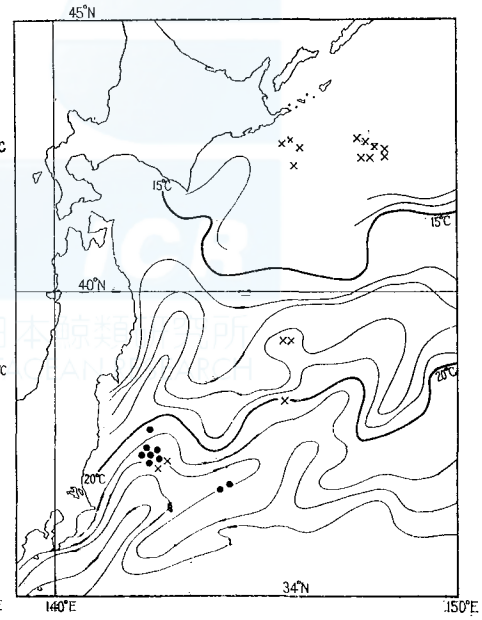

Fig. 8. 2nd Decade, July, 1953
× *B. borealis* ● *B. brydei*

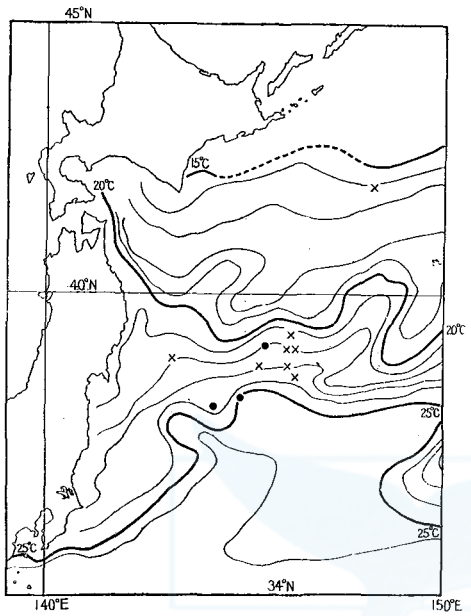

Fig. 9. 3rd Decade, July, 1953
× *B. borealis* ● *B. brydei*

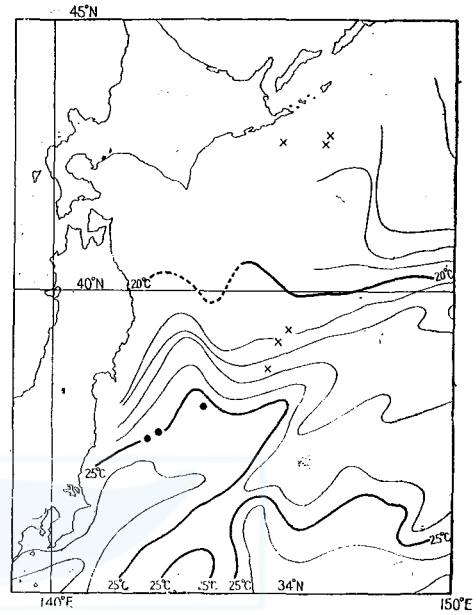

Fig. 10. 1st Decade, August, 1953
× *B. borealis* ● *B. brydei*

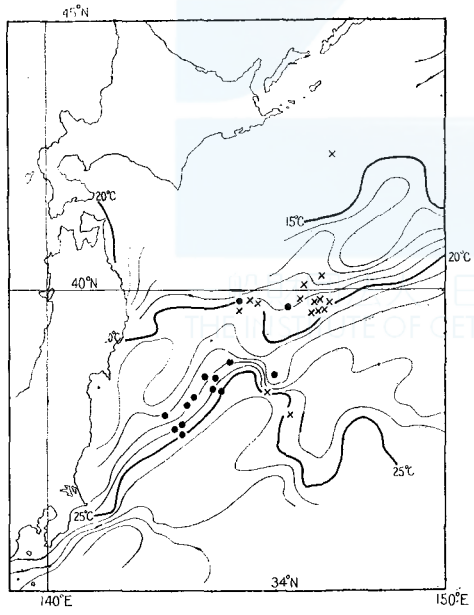

Fig. 11. 2nd Decade, August, 1953
× *B. borealis* ● *B. brydei*

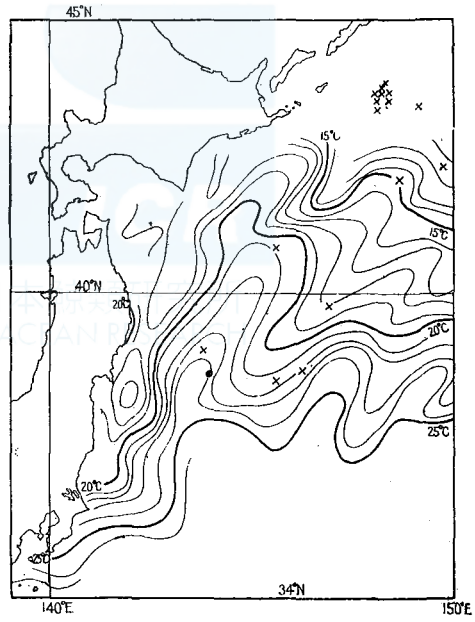

Fig. 12. 3rd Decade, August, 1953
× *B. borealis* ● *B. brydei*

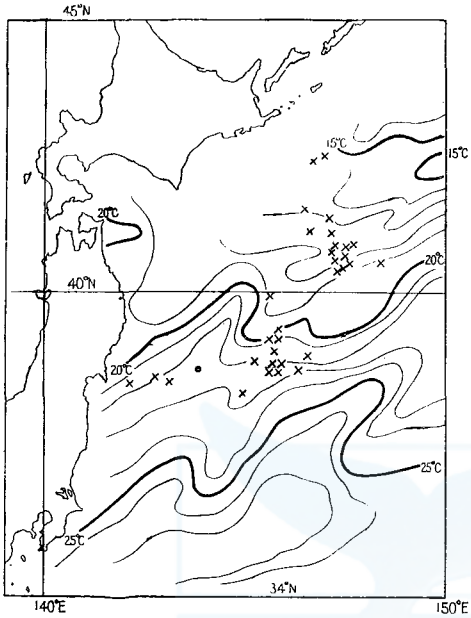

Fig. 13. 1st Decade, September, 1953
× *B. borealis* ● *B. brydei*

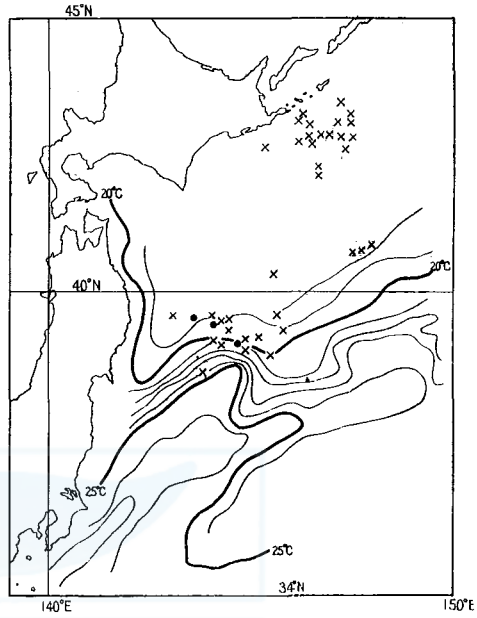

Fig. 14. 2nd Decade, September, 1953
× *B. borealis* ● *B. brydei*

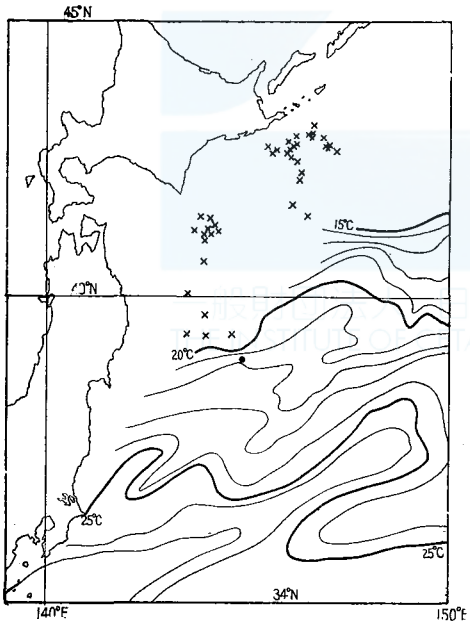

Fig. 15. 3rd Decade, September, 1953
× *B. borealis* ● *B. brydei*

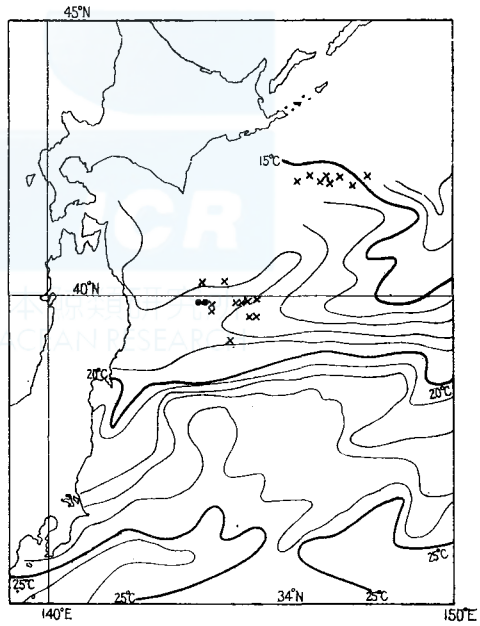

Fig. 16. 1st Decade, October, 1953
× *B. borealis* ● *B. brydei*

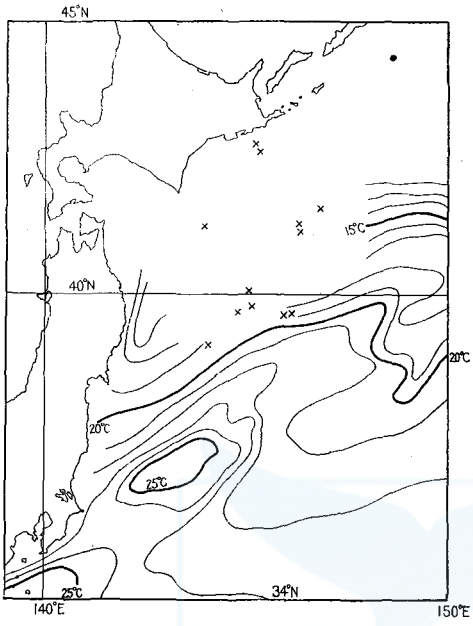

Fig. 17. 2nd Decade, October, 1953
× *B. borealis*

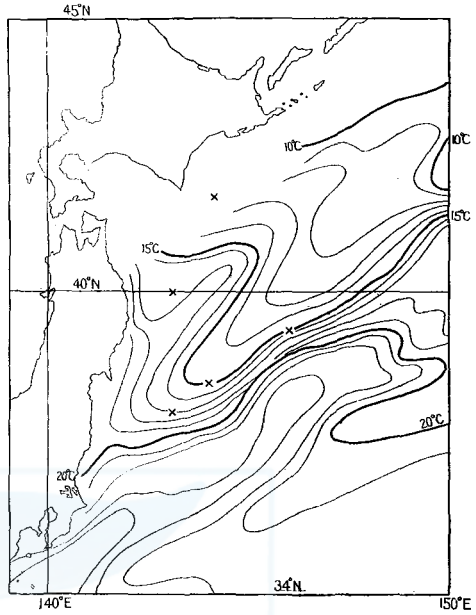

Fig. 18. 3rd Decade, October, 1953
× *B. borealis*