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[Transl. by J.J. Burns].  
[and the State Department interpreters]

Fay

# Aerial Surveys of Pacific Walrus in the Soviet Sector during Fall, 1975\*

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## I. Introduction

From September 17 through October 16, 1975 following a five-year break, work has again been done to determine the abundance of Pacific walrus (Odobenus rosmarus divergens, 1811), based on counts from aircraft.

The hauling grounds of walrus were photographed and walrus groups on the ice were subjected to methods of visual counts from aircraft, and subsequent extrapolation.

During the period of surveys there were nine coastal hauling grounds, seven of which were in the Bering Sea and two in the Chukchi Sea. Two new hauling grounds were found, one on the island of Nuneangan and the other one on the island of John the Baptist (Ioanna Bogoslova) both in the Bering Sea. The ice hauling grounds of the walrus were situated in the western part of the Chukchi Sea from Point Billings to Koluchin Island in near proximity of shore.

The count of walrus in the Soviet sector of the Arctic was 128 to 130 thousand head. Of that number the shore rookeries yielded 96.9 thousand head as photographed from the air. The remaining numbers were observed on the ice and while swimming. In comparison to the count of 1970 (101 thousand walrus) we have observed the growth of the population and extension of summer distribution in a southward direction.

The history of harvest of Pacific walrus is very similar to that of the northern fur seal, the bowhead and gray whales. Only the most severe measures of the interested governments had to be undertaken to save the species from complete extinction.

The take of Pacific walrus started in the middle of the 17th century. Each year 5 to 6 thousand walrus were taken. However, in the middle of the 19th century, as established by F. Fay (13), the size of the (walrus) stock had to still constitute around 200 thousand head and by the end of the 19th century 150 thousand head. The annual harvest was 15 to 20 thousand animals. However, the continued harvest attained in the beginning of the 20th century was 8-12 thousand head, not including losses additional to this. By the mid 1950's the walrus population had decreased to 38-40 thousand head (7, 13). By the end of the 1950's, both the United States and the Soviet Union forbade national harvesting in general, permitting harvesting only to serve the needs of the local population of Alaska and Chukotka.

\*Translated by J. J. Burns, Alaska Department of Fish and Game, Fairbanks  
(among others)

The aerial count which was conducted in September 1958 by N. G. Nikulin was the first attempt by Soviet scientists to establish the absolute number of the walrus population. The second count was made in 1960 when aerial photo equipment was used to take pictures of the shore hauling grounds (9).

The total number in the population at that time was estimated at 50 thousand animals. On the basis of this figure recommendations for the conservation and regeneration of the stock were put forward (by the Soviet Government). Beginning in 1963, the ship harvesting of the walrus stopped and the size of the harvest was limited to serve the local needs of people inhabiting Chukotka. The annual take was set at 1000 animals. At this time also, American specialists began aerial surveys of the walrus (11) and they determined the population to be 70 thousand head or greater. At about that time F. Fay began studying the reestablishment of walrus in the southern portion of their range, as it showed an indication of an increase in their number (11). In 1965 J. Burns (12) estimated the population of the walrus to be 90 thousand animals. In 1968, on the basis of aerial surveys in walrus wintering areas, K. Kenyon (unpublished data) gave the figure 73 to 113 thousand.

Numerous facts obtained during the period 1966-1970, by Soviet investigators, have also indicated a southward shift of the southern border of distribution. In 1966 individual walruses were found in the Bay of Russia and Listvenichnia in Kamchatka. The appearance of smaller groups of walruses in Karaginski Bay was noted and the formation of a hauling ground on Verksoturova Island (10) was also observed. Individual walrus were observed near the Commander Islands (8) and on ice of the Okhotsk Sea (5). Several hauling grounds in the Bering Strait region (Island of Arakamchechen and near the abandoned village of Naukan) which up to this time were considered to be defunct and were not visited by walrus for many years, now started functioning regularly. The number of animals visiting these islands has grown each year.

Another count conducted in 1970 (3) supported the data provided by American scientists. The shore hauling grounds of the Chukotsk Peninsula and the ice formations of the Chukchi Sea (in the shared sector of the Arctic) yielded the count of 101 thousand animals.

New data have been obtained during the five year period following the last count. That data, in particular information of the new hauling ground in Peters Bay (personal observations by Captain A. V. Kiselev), supported the picture of walrus migrating farther south. In 1971 in Lavrov Bay (61°16' north) a female walrus with a calf were taken (5). In the fall of 1974 large groups of walruses were observed in Anastasii Bay (information provided by inspector of the Okhotsk Fisheries, N. Sokolov). All these facts suggest that the stock of Pacific walrus is increasing and is about to occupy its former range, which extends south along the coast of eastern Kamchatka to Cape Kronotski and, on the American coast, to the Alaska Peninsula (13).

To check the data obtained from the former survey and to monitor the abundance of the population, it was decided according to the agreements



reached with American scientists to simultaneously conduct a count of walrus in the Soviet and American territories in the fall of 1975. Each side would conduct a count in its own territories and the boundary between them would be the "International Date Line."

## II. Biological Considerations for Making Counts and the Methods Used In Carrying Out the Work

I(2). During the fall-winter period Pacific walrus inhabit ice in the northern part of the Bering Sea, occupying a broad aquatic territory from Nunivak Island in the south to the Chukchi Peninsula in the north. In the summer-fall period the basic mass (majority) of walrus move north to the Chukchi Sea when ice conditions permit. Only a small part of the herd stays in the Gulf of Anadyr forming one or two shore rookeries by Rudder Bay and on Meechkin Spit. According to observations made during the 1960's (2) this portion of the herd does not exceed 6 to 8 thousand head. During the June-August period, owing to the abundance of drifting or moving ice, the majority of the population disperses over the large water territory from Chaunskoi Inlet in the west, to Point Barrow in the east, and north to 72°.

At the time of greatest destruction of ice, which usually occurs in September, walrus concentrate in the region of Wrangell Island and also at one coastal hauling ground by Cape Inchoun. During years when the summers are warm and the edge of the pack ice is far north (to 73° or 74°) walrus abandon the ice and form coastal hauling grounds on Wrangell Island, Herald Island and a number of other places on the northern coast of the Chukchi Peninsula. The maximal hauling out of walrus on these rookeries takes place during the second half of September. These circumstances are particularly convenient for counting because by photographing the hauling grounds it is possible to obtain an absolute count of the larger portion of the population. In the case that summer ice remains close to shore, walrus do not abandon it. During the first 10 days of October, when the intense formation of ice begins in the region of Long Strait the walrus' ice rookeries are concentrated in a relatively small area near the ice edge, facilitating conduct of aerial surveys. At that same time migration of the walrus begins to the southeast, in the direction of Bering Strait. If no ice is present on their migration route, near shore, the walrus haul out on the shore, forming temporary hauling grounds. Knowing these peculiarities of this animal's distribution during the autumn period, we wanted to conduct two to three aerial surveys of the ice hauling grounds and to photograph the shore hauling grounds several times.

Taking into account what we have just said, the dates for conducting counts were in the period from September 15 to October 20.

2(2). Work was conducted from an airplane of the IL-14 type, from September 16 to October 16, 1975. The plane was equipped with two "blisters" with visors, which allowed the exact delineation of width of the survey track.

Subject to conditions of visibility and altitude of the flight, the observation angle was 45° or 63°; that is, the width of the strip in the

first instance was equal to the altitude of the plane and in the second instance it was equal to two times the flight altitude. The plane speed, on the average, was 250 kilometers per hour.

The plane was equipped with two cameras: AFA TE-500 with a film format of 18 x 18; and AFA-42-20 with a film format of 30 x 30 cm. Focal length of the objective lens in the first camera was 500 mm. For the second camera it was 200 mm. Scale of the pictures depends on the relationship of focal distance of the objective lens to flight altitude. Pictures were usually taken from a height of 1000 m. In this case (from a height of 1000 m) the scale of pictures for the first camera was 1/2000, i.e. 1 cm on the photograph corresponded to 20 m of the place being photographed. For the second camera the ratio was 1/5000. On photos made with the first camera it is possible, using binocular magnifying lenses, to see the different parts of a walrus. The second camera was operated simultaneously with the first only when there were many walruses in the water near the rookeries and they could not be seen in the frames of the AFA-TE-500 camera.

3(2). Counts were accomplished in the following manner. First, the shoreline was inspected from Karaginski Bay (including Karaginski and Verkooturov islands) to Cape Schmidt with the aim of searching for occupied walrus hauling areas. Observation through the blisters and from the cockpit of the plane was constant throughout these search flights. The optimum altitude of these flights was 300-400 m. The shore was continually observed through binoculars.

After finding a rookery the plane assumed the required altitude and at the moment it flew directly over the rookery, pictures were taken. In order that nothing was missed, pictures with a linear overlap of 30-35 percent were made. The altitude from which pictures were taken was usually 1000 m. However, if there was a problem due to clouds, pictures were taken from a height of 700 m. In this case the speed of the airplane was reduced to a minimum in order not to obtain photos which were out of focus. With this same aim (obtaining pictures in focus) a minimum exposure time (1/140 sec.) was used. Regulation of light was done with the diaphragm. Counting of the animals appearing on the pictures was done by drawing contour lines around the hauling ground, and measuring its area with a planimeter. Several places in each frame, where the density of walrus varied, were pierced with needles marking the central points. Each of these areas was 1 cm<sup>2</sup>. In these areas the number of walruses was counted with the aid of binocular magnifiers. After that, the average number of the animals per unit area was calculated and the results extrapolated to the entire area of the hauling ground. In areas with marked variation in density from the basic hauling ground all animals were counted individually under a binocular magnifying glass. The same procedure was used for counting walrus close to the rookery but in the water.

As a control for the area extrapolations of the hauling grounds we checked our data, obtained by this method, with the counts of individual walruses included in these same photographs. For instance, a picture of

the Meechinsk rookery, taken on September 18, yields a difference between the area extrapolations and individual counts of only 198 animals or 2.46 percent (Table 1). As we can see this is not a large error.

Animals underwater at the moment pictures were taken could not be enumerated. However, as this is the period of greatest occupation of the hauling areas, the number of animals in the water was insignificant. Those that were diving were even fewer. Errors from this source can be ignored.

The process of aerial surveys of the ice rookeries was initially achieved with reconnaissance flights. During such flights a map would have ice conditions indicated on it. Those areas occupied by walruses were designated.

During the following day the areas in which walruses were discovered would be covered by uniform transects. The distance between adjacent transects varied between 10-20 kilometers. In the flight records, on board the aircraft, the time of sighting individual walruses or herds on the ice was noted. As we processed the resulting material these data were put on maps and regions with varying concentrations of walruses would be singled out. The extrapolation would only be done for those areas with similar densities of walruses. Simultaneously, from another airplane, a count of gray whales was also being conducted under the direction of a collaborator from the Magadan Branch of TINRO, V. V. Zimooshko. We used the data obtained by him concerning the distribution of the walruses in the open sea.

### III. Distribution and Number of Walrus in September and October 1975

1(3). The reconnaissance flights that were carried out on September 17 and 19 and on October 25 allowed us to survey the coast from the Oссора Peninsula in eastern Kamchatka, to Koluchin Island in the Chukchi Sea and also the ice extending from the eastern ice edge to Point Billings in the west and Wrangell Island in the north. In September (1975) there were seven coastal hauling grounds in the Bering Sea. They were as follows:

1. on John the Baptist Island (o. Ioanna Bogoslova);
2. on the western extremity of Meechkin Spit (locally called Meechkinskoye);
3. on Red'kin Spit next to Rudder Bay (Rudderskoye);
4. on the coast of Nuneangan Island in Bering Strait (Nuneanganskoye);
5. the eastern end of Arakamchechen Island (Arakamchechenskoye);
6. the southern end of Ratmanova Island ((Big Diomed) Ratmanovskoye);
7. the former site of the village Naukan (Naukanskoye)

One hauling ground in the Chukchi Sea, the southeast part of Point Inchoun (Inchounskoye) was occupied by walruses. The Rudderskoye hauling ground stopped functioning in October. Walruses no longer appeared there but in the Chukchi Sea a large hauling ground at Cape Serdse-Kamen' was formed.

2(3). The greatest number of ice rookeries during September were concentrated mostly on the narrow strip of ice extending from Koluchin Island to the Bar of Two Pilots (Kosi Dvuk Pilotov) and extending 15 to 20 km eastward from Point Billings. The smaller hauling areas on the ice and in general the swimming walrus were noted all along the way from Point Billings to the eastern edge (of ice) (Fig. 1).

The ice conditions being formed in the region of Long Strait in September of that year (1975) were quite complex. Suffice it to say that the ice edge at the beginning of the last decade of September was 140-160 km farther to the east than it was at the same time in 1970 (3), and the ice density (coverage) was much higher. The basic ice hauling areas for walrus in 1970 were to the west and southwest of Wrangell Island, that is 300-350 km to the northwest of where they were in 1975. The new ice formations with densities reaching 5 to 9 tenths extended northward 15 to 20 km from the shoreline. The walrus occurred in this ice zone. Farther north the ice cover was complete (10 balls) consisting of grey and grey white ice among which were found occasional deposits of multiyear ice. There were no walrus observed on this ice.

The following day, September 20, the entire region from Point Billings to Koluchin Island was covered with transects. It turned out that in the region of Point Billings there are small polynia. Significant numbers of walrus were found in the water and on the adjacent ice. Amidst the thin ice along the coastline the walrus were in small groups of 3 to 5 animals as well as singly, and they were moving southeast. Quite frequently the groups included females and calves.

When the walrus would reach a field of grey ice or nilas, they would swim under the ice and, in order to breathe, they would break through it with their heads. Along the edge, where the water was clear enough to observe walrus, they were primarily moving to the southeast, although some animals moved in the opposite direction. In the area extending from Point Billings to 178° west longitude the density of walrus was .76 animals per square kilometer and here there were 6.5 thousand animals counted. The lowest density turned out to be near the eastern ice edge between 69° and 70° north. That is .03 walrus per square kilometer. The greatest density was in the near shore strip of ice extending from the estuary of the Anguema River to Point Onman - 16.4 animals per square kilometer. Altogether 23 thousand animals were counted in this region. It is difficult to judge how complete this count was because the majority of the walrus encountered were in the water. While the count was taken it was inevitable that not all walrus were seen because the plane flies low. Some walrus, because of fear of the noise of the motors, would dive as the plane came within 500-800 meters of them. After 4 or 5 seconds it was impossible to identify them in the water. Moreover it is entirely possible that some walrus were west of Point Billings but it was not possible to survey this region. There was no ice along the Chukchi coast between Koluchinskoi Inlet and Cape Inchoun and walrus were not observed on the side of Bering Strait.



3(3). The photocensus conducted on September 18 and 21 showed that on those dates the number of walrus on the shore hauling grounds reached 82 thousand head (Table 1). In 1970, at the same time, there were about 20 thousand walrus on them. Apparently because of the unusual ice conditions which occurred in the region of Long Strait in September of 1975, the majority of the population that (usually) inhabits Wrangell Island waters in the summer moved to the Bering Sea somewhat earlier than usual.

4(3). We expected that the freezing weather which started in mid-September would speed up the formation of ice in the Chukchi Sea and, because of this, the walrus would leave the ice earlier than usual and occupy the shore hauling grounds. However, the deep cyclone which passed over the Chukchi Peninsula at the end of September reversed the situation; the ice was broken up and its eastern edge moved 100-200 km westward, reaching the meridian of the Point Schmidt (Fig. 2).

On October 5 and 6 the ice hauling groups of walrus were situated 10-15 km north of Point Schmidt, although the general picture of distribution was practically unchanged from that of September (Fig. 1). Twenty-six thousand and six hundred walrus were counted on the ice. The greater part of these walrus, 19.7 thousand, were concentrated in two relatively small areas with a total area of 475 square km. Walrus density in the remaining part of the territory was low, between .3 to .76 per square km.

5(3). During the first 10 days of October, as in previous years (3,9), there was a migration of walrus to the southeast. Approximately half way between the Island of Koluchin, where the ice ended, and the Meechkinskii hauling ground, the walrus formed one large hauling ground, in October, near Cape Serdse-Kamen'.

6(3). Of the nine hauling grounds that functioned in the fall of 1975, two of them on John the Baptist Island (Ioanna Bogoslov) and Nuneangan Island, were recorded for the first time. There are no earlier references in literature about them. On the Island of John the Baptist the walrus were apparently part of a small herd which has remained in this region for several years during the summer. As has already been mentioned, in 1971 hunters saw the walrus hauling ground in Peter Bay (containing up to 1000 animals). The Island of John the Baptist is situated in the inlet to that bay. A bit to the north, in Anastasii Bay, on June 25, 1971, a group of 500 walrus was observed (8). In Olutorskii Bay on September 9, 1975, 50 walrus were seen from an airplane which was engaged in a survey of whales. A colleague from the Magadan Branch of TINRO, V. V. Zimooshko, who at the time was conducting this work, also indicated encountering walrus 12 to 15 km off the coast of Anastasii Bay on October 1 (12 animals), and 3 walrus by Point Vitgenshtein. He counted 5 animals in Olutorskii Bay. On October 2, in the Anadyrskii estuary, he counted 7 walrus and 60 miles to the east of Cape Navarin he counted 2 walrus. Because there are no hauling grounds in the region of coast between Cape Olutorskii and Cape Navarin we assumed that the groups of walrus encountered were performing a feeding migration



and all of them belonged to the herd which spends the summer in the Koryakskii region of the coast.

The hauling ground on Nuneangan Island was occupied for the first time in 1975 and perhaps, in some measure, took over the function of the Akkaniiskii hauling ground. This hauling ground was situated at Point Kriguigan and functioned during three seasons - 1972, 1973 and 1974. Up to 12 thousand walruses would haul out there. However, this fall, for some reason, this hauling ground was empty.

7(3). The majority of hauling grounds were photographed many times which, to some degree, permits us to evaluate their dynamics. It has frequently been noted that the maximum occupation of the hauling grounds usually occurs after a storm and during the evening. On stormy days the walruses occupy only those areas that are protected from the wind and waves, while the majority of animals go into the open sea or float near the hauling ground.

During calm weather the walruses begin abandoning their hauling grounds after 9 or 10 o'clock in the morning and the groups leave to feed. The distance of feeding migrations apparently varies greatly and may be due to the fact that the animals do not have sufficient time to return to the hauling ground during that same day. The walruses off the Islands of Arakamchehen and Nuneangan go to feed in Mechigmenskii Bay and also to the east and southeast off the hauling ground. We observed groups of walruses in October, 70-80 km eastward of Arakamchechen Island and one was encountered 120 km away (Fig. 2).

The fluctuations in counts of walruses occupying the hauling grounds is, to a great extent, connected with the fall migration. For instance, we can see that the Naukanskoye hauling ground is constantly occupied because of the animals coming there from the Chukchi Sea and the hauling grounds in the Chukchi Sea would correspondingly have smaller numbers of walrus.

By comparison with the 1970 count, a significantly larger number of the walruses were seen in 1975 on the Arakamchechenskii hauling ground. On the Naunkanskii and Inchounskii hauling grounds the number did not reach half of that which occurred in 1970 at the same time of year. This again is connected with the displacement of the migration dates.

8(3). V. P. Krilov determined the average area occupied by one walrus on the shore hauling grounds to be 3.3 square meters. In 1970 (3) the average area occupied by a single walrus on the hauling grounds varied from 2.7 to 3.8 square meters. This year (1975) on the same hauling grounds it appeared to be reduced by 50 percent (Table 1) with a variation of from 1.3 to 2.82 square meters.

Thus, this indicator was not constant and use of it as a reliable measure could yield large errors.

9(3). In calculating the total count of walruses we used the data obtained for the Chukchi Sea on October 5 and 6 and for the Bering Sea on September 18 and 21. It was during these days that we could photograph

the maximum occupation of the hauling grounds (Table 2). Moreover 3 to 5 thousand walrus had to be added, which were encountered on September 21 as they were approaching the Arakamchechen hauling ground. The minimum figure obtained was 128 to 130 thousand animals. These are minimum numbers because between September 21 and October 5, the migration of the walrus from the Chukchi Sea to the Bering Sea continued. However, to determine the number of the walrus that actually moved from one sea to the other is impossible because the September count of the Chukchi Sea ice cannot be considered complete and in October, because of bad weather, we were prevented from photographing the maximum occupation of hauling grounds in Bering Strait.

Thus, based on a comparison with the data from previous surveys we observed a good increase in the Pacific walrus population.

But, once again, as we have stated, the data which we have obtained characterizes the number of the walrus that are in the Soviet sector of the Arctic only.

Table 1. Numbers of walrus on coastal hauling grounds in September-October 1975.

Date and local time of counts	Weather	Number of walruses	Area occupied by one walrus(m <sup>2</sup> )	Remarks
1	2	3	4	5
<u>John the Baptist Island</u>				
4-X-75, 1313	Overcast, calm	220	4	Individual count*
<u>Meechkinskoye (Point Kungas)</u>				
17-IX-75, 1007	Clear, calm	8,242	1.8	Number based on extrapolation
17-IX-75, 1007	Clear, calm	8,044	1.8	Individual count
21-IX-75, 1547	Clear, slight wind	500-600	-	Visual estimate
17-X-75, 1546	Clear, moderate wind	Walruses swimming near the rookery and on the ice in Kresta Bay		
<u>Rudderckoye rookery</u>				
21-IX-75, 1533	Clear, occasional light wind	445	-	Individual count
<u>Nuneanganskoye rookery</u>				
18-IX-75, 1153	Overcast, stormy	1,152	-	Individual count
19-IX-75, 0955	Overcast, windy	627	-	Individual count
21-IX-75, 1412	Clear, occasional light wind	19,977	1.54	Number based on extrapolation
9-X-75, 1033	Overcast, north wind	1,628	-	Individual count
<u>Arakamchechenskoye rookery</u>				
18-IX-75, 1215	Overcast, stormy	3,996	1.89	Extrapolation and individual count
19-IX-75, 1007	Overcast, windy	1,208	-	Individual count
21-IX-75, 1400	Clear, occasional light wind	41,882	1.56	Extrapolation and individual count
9-X-75, 1050	Overcast, north wind	Several thousand walruses sleeping in the water near the rookery.		
<u>Ratmanovskoye rookery</u>				
21-IX-75, 1142	Clear, occasional light wind	4,228	2.43	Individual count
21-IX-75, 1146 (second pass over rookery)	Clear, occasional light wind	3,516	-	Individual count
<u>Naukansskoye rookery</u>				
21-IX-75, 1132	Clear, occasional light wind	2,144	1.76	Extrapolation and individual count
5-X-75, 1233	Clear, calm	2,326	-	Walruses approaching from north
7-X-75, 1146	Clear, occasional light wind	2,417	1.32	Many walruses in the water



9-X-75, 1150	Overcast, south wind	3,357	1.88 ✓	Walrus approaching from north
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Inchounskoye rookery

21-IX-75, 1115	Clear, slight wind	5,029	1.70 .	Extrapolation and individual count
5-X-75, 1246	Clear, calm	7,742	1.67 ✓	Extrapolation and individual count
7-X-75, 1132	Clear, north wind	3,700	1.30 ,	Extrapolation and individual count
9-X-75, 1202	Light clouds, calm	5,700	-	Individual count

Cape Serdse-Kamen' rookery

5-X-75, 1320	Clear, calm	11,972	1.95 ✓	Extrapolation and individual count
9-X-75, 1245	Clear, calm	9,188	2.83	Extrapolation and individual count

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\*Translators note - Individual count refers to animals counted from photographs. JB

Table 2. Number of walruses on coastal hauling grounds and on the ice, based on aerial surveys in 1975.

Number	Date of count	Name of Rookery	Local time of survey	Number of walruses
1.	4 October	Ioanna Bogoslov	1313	220
2.	18 September	Meechkin Spit	1007	8,242
3.	21 September	Rudderskoye	1533	445
4.	21 September	Nuneanganskoye	1412, 1422	19,977
5.	21 September	Arakamchechenskoye	1400	41,882
6.	21 September	Ratmanovskoye	1142	4,228
7.	21 September	Naunkanskoye	1132	2,144
8.	5 October	Inchounskoye	1245	7,742
9.	5 October	Serdse-Kamen'	1315	<u>11,972</u>
Total on coastal rookeries:				96,852
10.	5-6 October	On ice floes in the region between Point Billings and Koluchin	-	26,600
11.	21 September	Swimming in Mechigmenskii Bay	1350	5,500
12.	5 October	Swimming in waters between Cape Deshnev and Cape Serdse-Kamen'	1235, 1315	<u>1,500</u>
Grand Total:				128-130 thousand







### Legend to Figures 1 through 4

- Fig. 1. Distribution of walruses on the ice and at shore rookeries, 17 to 21 September 1975. A = distribution on the ice; B = places of walrus concentration; C = groups of walruses in the water and the direction of their movement.
- Fig. 2. Distribution of walruses on the ice and at shore rookeries, 4-9 October 1975. Symbols as in Fig. 1.
- Fig. 3. The scheme of survey tracks flown on 20 September 1975. Dashed line indicates the ice edge.
- Fig. 4. The scheme of survey tracks flown on 6 October 1975. Dashed line indicates the ice edge.

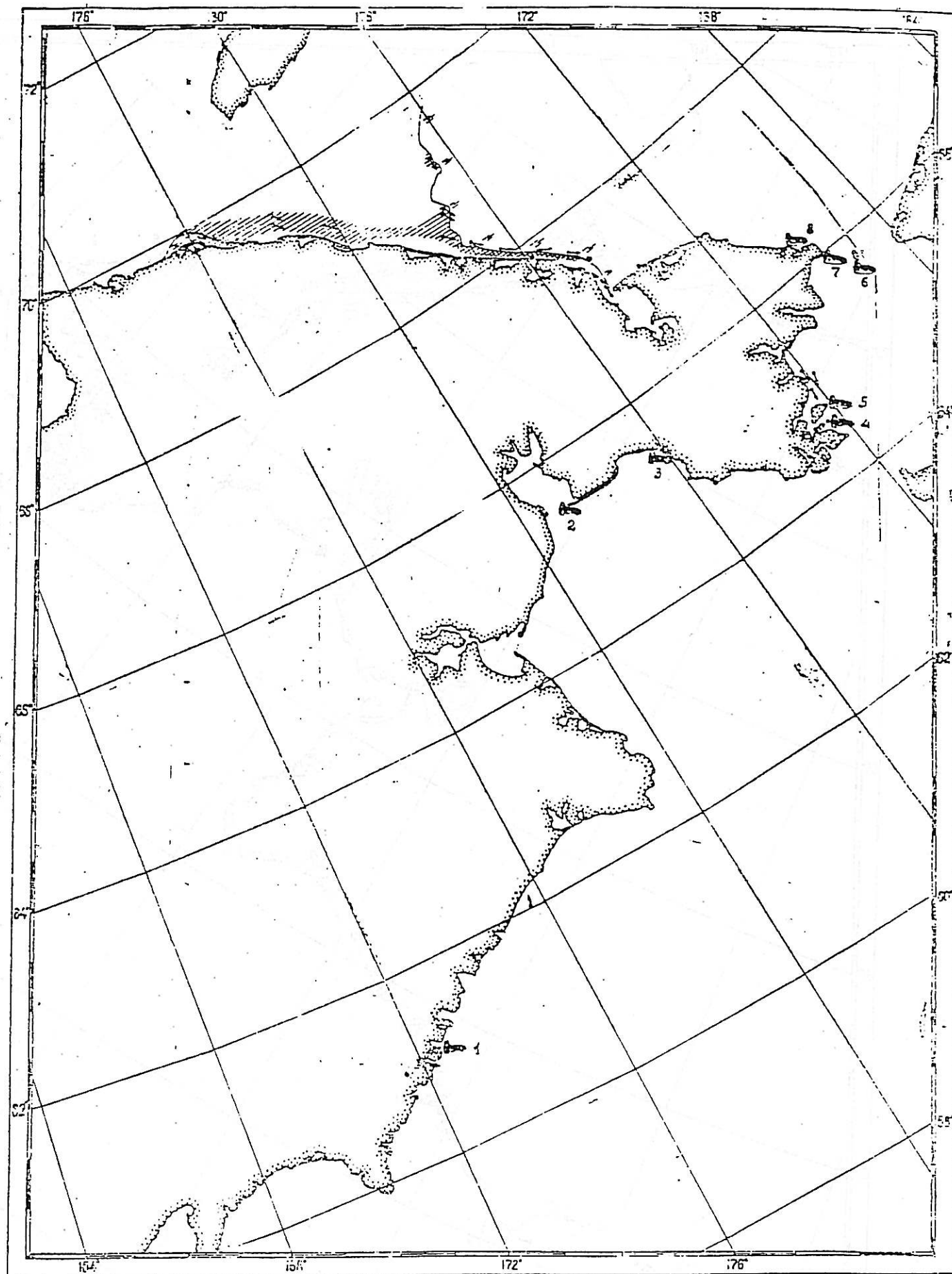


Рис. I. Распределение моржей на льдах и береговых лежбищах  
Fig. I. 17 - 21 сентября 1975 г.

A.  
≡≡≡

распределение на льдах;

B.

|||||

места концентраций;

C.

↗↘

группы моржей на  
плыву и направление их  
движения;



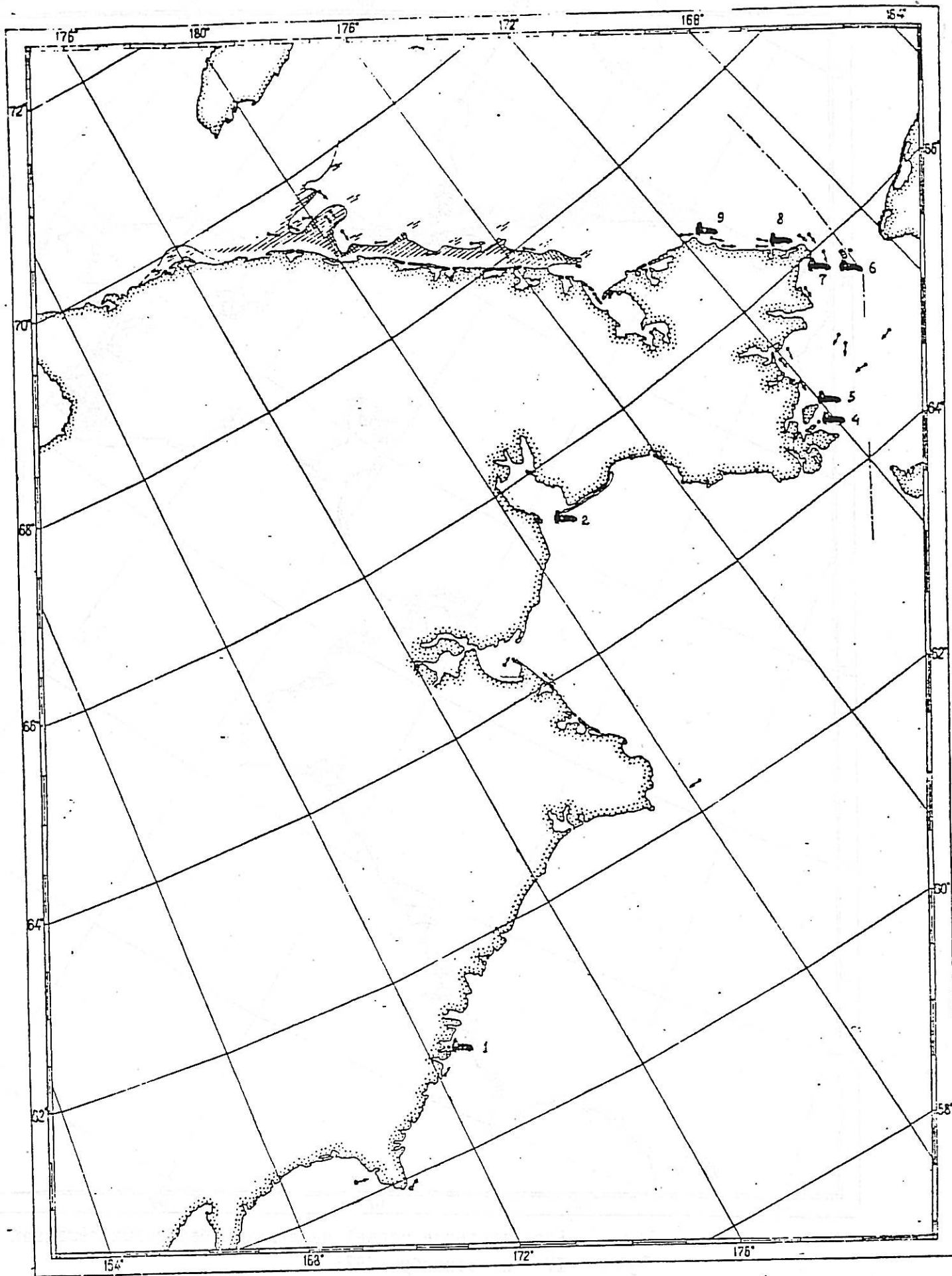


Fig. 2.  
Рис. 2. Распределение моржей на льдах и береговых  
лежбищах 4-9 октября 1975 г.  
(Масштаб обозначения на рис. 1.)

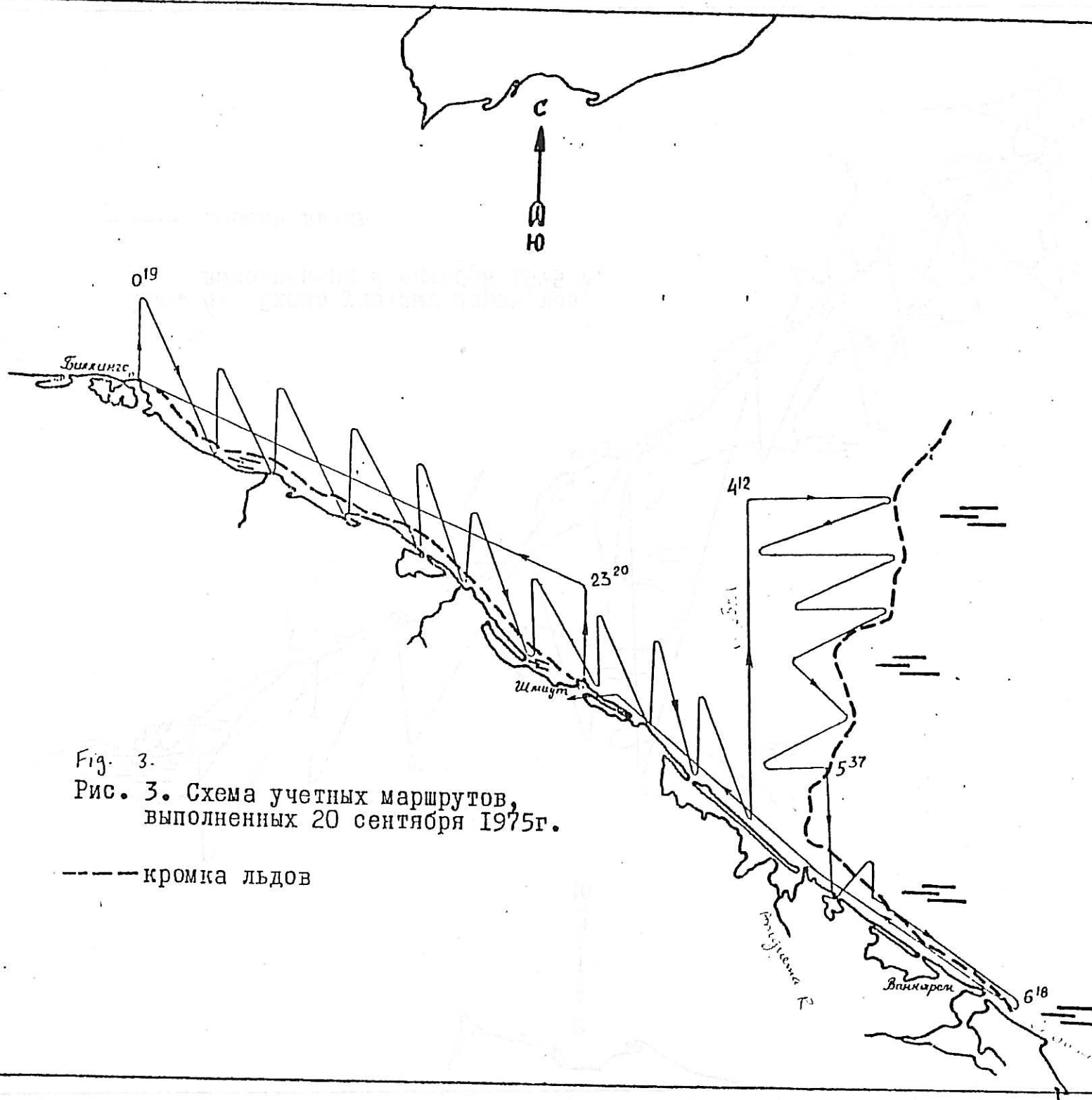


Fig. 3.  
Рис. 3. Схема учетных маршрутов,  
выполненных 20 сентября 1975г.

-----кромка льдов

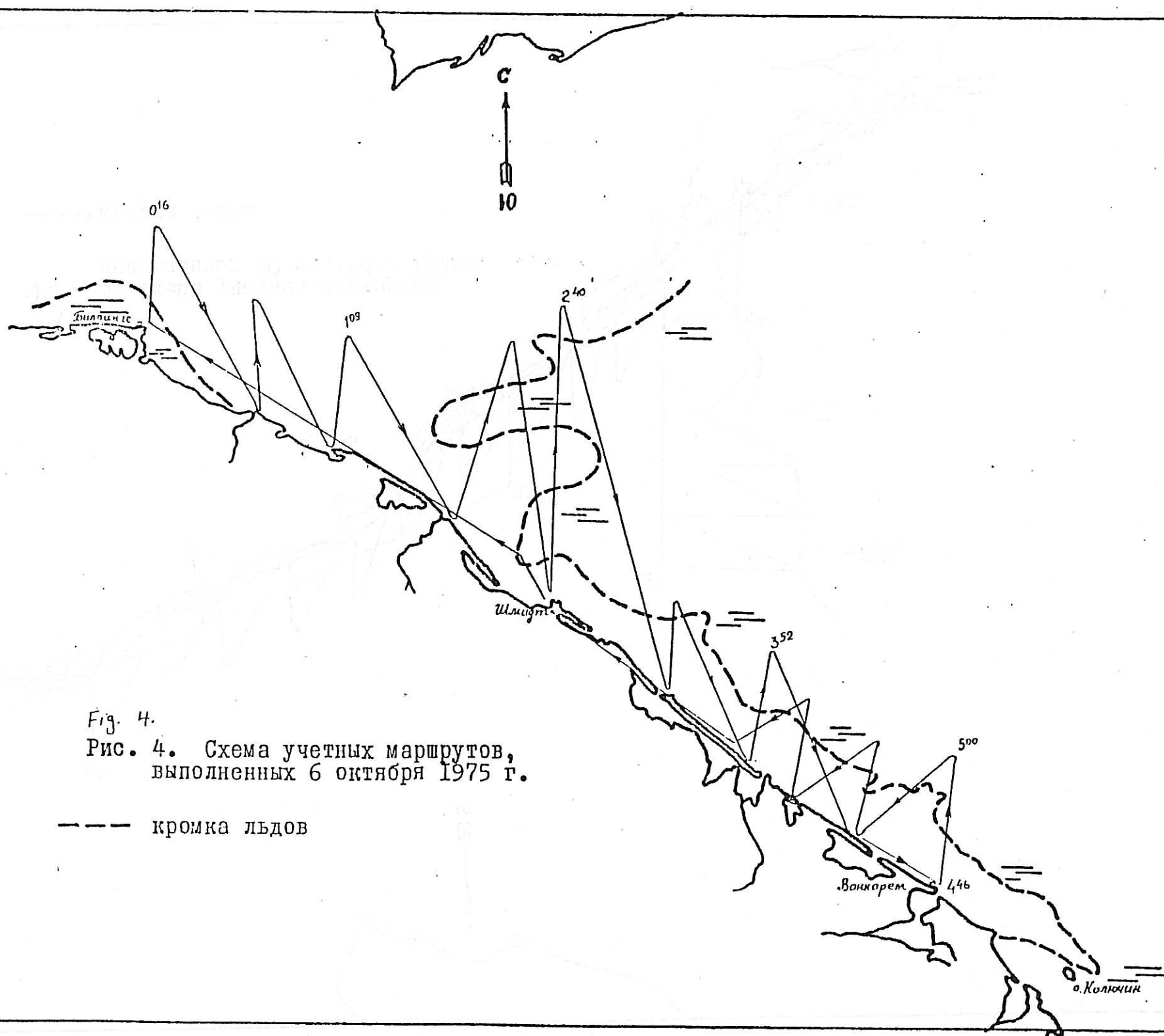


Fig. 4.

Рис. 4. Схема учетных маршрутов,  
выполненных 6 октября 1975 г.



## Л И Т Е Р А Т У Р А

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