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FIRST RESULTS OF COD MIGRATION STUDYING OBTAINED BY MEANS OF
TAGGING BY THE POLAR RESEARCH INSTITUTE OF MARINE FISHERIES
AND OCEANOGRAPHY (USSR)

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Cod tagging in the areas of the Northwest Atlantic has been carrying out by the Polar Research Institute of Marine Fisheries and Oceanography since 1960. Tagging is carried out by the scientific workers and laboratory assistants aboard the research vessels. Cod is tagged with a tubular hydrostatic tag attached to the back of a fish with a chlorovinyl thread.

Table I shows the total amount of tagged cod and also recaptures for every year (numerator - amount of fish tagged, denominator - amount of recaptures). The paths covered by the tagged fish are traced on the charts (the tail of the arrow shows the tagging area, the point of the arrow - the area of recapture; on 1-4 charts, the tail of the arrow shows a month of tagging, the point of the arrow - date of recapture; on 5-6 charts, a number of the arrow corresponds to an ordinal number in Tables 3-4). Many of the tag returns was received from Canada, Portugal, England, Denmark, Norway, Spain, France and the Federal Republic of Germany.

Table I

Results of cod tagging in 1960-1962

Area Year	I			II			III						Total	
	IB	IC	ID	Total	2H	2J	Total	3K	3L	3M	3N	3O		3P
1960	-	<u>498</u> 35	<u>543</u> 58	<u>1041</u> 93	<u>30</u> -	<u>270</u> 16	<u>300</u> 16	<u>106</u> -	<u>46</u> -	<u>17</u> -	<u>26</u> -	<u>10</u> -	-	<u>205</u> -
1961	<u>373</u> 15	<u>214</u> 5		<u>587</u> 20	-	<u>637</u> 14	<u>637</u> 14	-	<u>257</u> 2	<u>260</u> 2	-	<u>363</u> 15	<u>464</u> 23	<u>1244</u> 42
1962			<u>1075</u> 12	<u>1075</u> 12	<u>97</u> -	<u>628</u> 17	<u>725</u> 17	<u>116</u> 3	<u>127</u> -	-	<u>130</u> -	<u>538</u> -	<u>190</u> -	<u>1101</u> 3
	<u>373</u> 15	<u>712</u> 40	<u>1618</u> 70	<u>2703</u> 125	<u>127</u>	<u>1535</u> 47	<u>1662</u> 47	<u>222</u> 3	<u>330</u> 2	<u>277</u> 2	<u>156</u>	<u>911</u> 15	<u>654</u> 23	<u>2550</u> 45

WEST GREENLAND

As it is evident from Table I and Figures 1-4, the main mass of the West Greenland cod was tagged in the Subareas ID and IC mainly on the Fylls and Banan Banks. During three years tagging in this area was carried out approximately at the same time - in spring period. The amount of tag returns was different for every year (Table 2); the quantity of the tag returns of fish tagged in 1960 constituted 4.9%, and in 1962 they composed 1.1%.

Table 2

Tag returns in the West Greenland area (%)

Year of tagging	Year of recapture		
	1960	1961	1962
1960	4.9	3.2	0.7
1961	-	2.0	1.4
1962	-	-	1.1

The total amount of the tag returns in 1960-1962 constituted 4.6%. As almost all the fishes tagged (except 1 specimen) were recaptured in the West Greenland area, so we evidently dealt with the local West Greenland cod stock completed migrations within this area. The problem of the seasonal cod migrations along the shores of West Greenland are considered in many papers (Hansen (2), (3); Rasmussen (5); Schmidt (6)).

The general pattern of cod migrations is presented in Rasmussen's paper (5). The results of tagging of the Polar Institute specify this pattern and give more details concerning areas and terms of migrations.

The catches of cod which were taken on the Banan and Fylla Banks and from which the specimens were chosen for tagging in May - June 1960 consisted of both the spawning fish, post-spawning and the immature ones wintering in this area.

As it is evident from Figures 1-3, the feeding migrations of cod from the area of the Fylla and Banan Banks northward begin in May-June, and during some years they probably begin earlier. If in June 1960 the fishes tagged in this year were recaptured on the Lille-Hellefisk Bank and their longest path composed 105 miles, in June 1961 (in a year) the cod tagged in 1960 on the Fylla and Banan Banks were already met on the Store-Hellefisk Bank (160-200 miles from the tagging location). In 1962 one specimen tagged in 1960 was recaptured on the Store-Hellefisk Bank even in April. The Store-Hellefisk Bank is a main area of the summer-autumn fattening where cod may remain for a long period. The Store-Hellefisk Bank is not a point of the final completion of the feeding migrations of the Greenland cod despite the fact that in July/August we caught the greatest

amount of the recaptures on this Bank. Some of the specimens migrate much farther and enter the fiords being to the north from this Bank to fatten. Some specimens of fish tagged by the Polar Institute were recaptured in September approximately near 69°N (see Charts 1-4). It is to be supposed that the return migrations of cod southward, to the wintering and spawning areas, begin already from the end of September. However, the terms of the beginning of the return migrations are in the great dependence not only on the presence of food in this area and the fattness grade of fish but also on the hydrological conditions; in warm years cod remain on the Store-Hellefisk Bank longer than usually.

In the winter-spring period the tagged cod were recaptured, as a rule, on the Lille-Hellefisk, Banan and Fylla Banks, excluding the specimens migrated southward. One specimen from the tagging on the Fylla Bank in May 1960 was recaptured in the south at 170 miles from the tagging area, 1 year after being tagged (Fig.2). Evidently in this case the cod spawned far in the south. The other specimen tagged in the same area and month was recaptured in July 1961, 80 miles south on the Danas Bank.

It should be noted that the quantity of the recaptures obtained south of the tagging area was not great. Only one specimen was recaptured in the East Greenland area (the cod of 72 cm. long, from the tagging on the Fylle Bank on 10 May 1960, recaptured near East Greenland in June, 1961).

Sometimes, the rate of the cod migration was rather high. For instance, the cod of 76 cm. long, tagged on 28 May 1960 was recaptured at 230 miles to the north, 35 days after being tagged: its average daily rate was 6.5 miles. During the summer feeding the rate of cod migration northward constituted on the average approximately 5 miles for 24 hours.

Labrador and Newfoundland

In the Areas 2 and 3 of the ICNAF area the greatest amount of cod was tagged in the southern parts of Labrador and the Newfoundland Bank. In 1960/1962 the total quantity of the recaptures constituted 2.1%. The greater part of the tagged fish was recaptured in the Subareas 2J, 30, 3P (3.1%, 1.6% and 3.5% respectively).

The results of cod tagging in the Subareas 2J, 3K, 30, and 3P are analysed in the given paper. The results of the cod tagging in the Subareas 2J and 3K are presented in Fig.5 and Table 3, and in the Subareas 30 and 3P - in Fig. 6 and Table 4.

As it is established, there is a local cod stock in the Subareas of the South Labrador (2J) and North Newfoundland Bank (3K) (Fleming (1), Templeman (7), (8), Postolsky (4)).

The date of tagging (Fig.5) shows that in summer the cod in this subareas migrate from the open sections of the sea towards the coastal areas of the South Labrador and North Newfoundland. According to the data of the Polar Institute (PINRO), the spawning of the cod of this stock occurs in April on the continental slope of the South Labrador. After spawning cod migrate southward along the slope, and with the warming of the coastal waters they move in the western- and south-western directions. The migrations westward begin in June. The mass cod runs into the coastal waters of the Labrador and North Newfoundland are found in July. In summer the cod of the North Newfoundland Bank also migrate in the area of the northern Newfoundland coast. Some amount of the South Labrador cod migrate across the Strait of Belle Isle into the Gulf of St. Lawrence.

Now there is no reason yet to consider that in summer period there are mass cod migrations northward despite the fact that two specimens of the fish tagged on 25 June 1960 in the southern part of the Subarea 2J were recaptured at 82-96 miles north of the tagging location (one specimen was recaptured on 21 August, the other one on 12 October 1960). There is no data on cod migrations from the coastal waters of the South Labrador and the northern coast of Newfoundland to the east and north-east in the open sections of the sea of the Subareas 2J and 3K. It can be assumed that similar migrations begin in September. This assumption may be confirmed by the stopping of the Canadian coastal cod fishery in the South Labrador area and also considerable decrease of the catches of cod near the northern coast of Newfoundland in October compared with that found in July and August. (Stat. bull., 1962).

The maximum distance considered along the straight line between tagging and recapture locations composed 305 miles. Of the fishes not a single specimen was recaptured south of 48°30'N.

The distance covered by cod in the Subareas 3O and 3P is considerably less than that found in the Subareas 2J and 3K. The maximum distance along the straight line between tagging and recapture locations composed 140-160 miles.

Table 3

Results of cod tagging in Subareas 2J and 3K in 1960/1962

Ordinal NN	L. of fish (cm)	Date of tagging	Date of Recap- ture	Distance covered by fish (mile)	Ordinal NN	L. of fish (cm)	Date of Tagging	Date of Recap- ture	Distance covered by fish (mile)
1.	47	24.VI.60	13.VII.60	20	14	65	4.V.62	28.XI.62	117
2.	51	24.VI.60	II.VII.60	82	15	62	4.V.62	II.V.62	70
3.	44	25.VI.60	7.VII.60	40	16	55	5.XII.60	10.X.61	110
4.	60	25.VI.60	12.X.60	82	17	68	5.XII.60	10.VI.61	95
5.	62	25.VI.60	21.VIII.60	96	18	50	17.IX.61	25.IX.61	35
6.	45	25.VI.60	I.VII.60	15	19	51	22.XII.61	15.V.62	95
7.	68	25.VI.60	I.VII.60	75	20	52	23.XII.61	2.VII.62	305
8.	54	23.VI.60	I.VII.60	50	21	54	22.XII.61	22.V.62	240
9.	56	26.IV.62	II.V.62	110	22	84	18.IX.61	5.VII.62	125
10.	61	5.V.62	13.V.62	30	23	59	8.I.62	21.VI.62	190
11.	57	21.IV.62	23.VII.62	300	24	71	8.I.62	28.VII.62	170
12.	50	5.V.62	3.VI.62	85	25	67	23.XII.61	22.VII.62	97
13.	53	21.IV.62	23.VI.62	230	26	56	20.XII.61	VIII.62	80

Table 4.

Results of cod tagging in Subareas 30 and 3P in 1961

Ordinal NN	L. of fish (cm)	Date of Tagging	Date of Recap- ture	Distance covered by fish (mile)	Ordinal NN	L. of fish (cm)	Date of Tagging	Date of Recap- ture	Distanc covered by fish (mile)
1.	61	7.V.61	15-19.V. 1961	52	II	50	18.II.61	II.VII.61	140-16
2.	65	7.V.61	15.19.V. 1961	58	12	63	12.II.61	5.VII.61	100
3.	68	6.V.61	3.I.62	30	13	57	14.II.61	26.V.61	120
4.	63	7.V.61	II.I.62	25	14	64	14.II.61	14.VII.61	120
5.	80	10.V.61	6.V.62	70	15	63	18.II.61	12.IX.61	70
6.	64	7.V.61	27.VII.61	25	16	56	12.II.61	10.VII.61	70
7.	72	12.II.61	24.II.61	30	17	63	14.II.61	28.XI.60	140-160
8.	58	19.II.61	20.VII.61	68	18	52	12.II.61	29.I.62	65
9.	50	14.II.61	3.IV.61	30	19	52	14.II.61	10.II.62	120
10.	55	12.II.61	15.VII.61	90	20	59	12.II.61	V.61	30-40

Table 5.

Data on the rate of cod migrations.

Area	Ordinal NN	Leng- th (cm)	Date of tagging	Date of Recapture	Number of days at sea	Distance co- vered by fish(mile)	Average daily rate (mile)
	2	51	24.VI.60	II.VII.60	17	82	4.8
	8	54	23.VI.60	I.VII.60	8	50	6.2
2	9	56	26.IV.62	II.V.62	15	110	7.3
	15	62	4.V.62	II.V.62	7	70	10
	I	61	7.V.61	15-19.V 1961	8-12	72	9-6
30	2	65	7.V.61	15-19.V 1961	8-12	80	10-7

The results of the cod tagging on the western slope of the St. Pierre Bank show the migration of fish to the southern coast of Newfoundland during summer (Fig.6, Table 4). The greatest amount of the cod tagged in February 1961 was recaptured in summer of the same year in Placentia Bay. One specimen was recaptured north of the Green Banks and one specimen - on the Burgeo Bank. Next year after the tagging only two tagged specimens were recaptured: one specimen was recaptured in February north of the Green Banks, the other one - in January at 65 miles south-west of the place of liberation.

Templeman (8) believes that during winter and early spring the St. Pierre Bank cod are observed on the western and southern slopes of the Bank and in the southern part of the Halibut Channel, and in spring they migrate into the coastal waters of the eastern part of the southern Newfoundland coast. The results obtained by our Institute correspond to the Templeman's conclusions.

The tagging carried out in May 1961 on the south-western slope of the Grand Newfoundland Bank show that throughout May/June cod migrate in the south-eastern direction along the slope. Two specimens liberated on the south-western slope of the Grand Newfoundland Bank in May 1961 were recaptured in January 1962 in the southern part of the Green Bank. This points to the mixing of cod stocks in these areas.

Headings for Figures

to the contribution by I.N.Sidorenko and A.I.Postolsky
"Results of Cod Tagging Obtained by the Polar Institute
(PINRO) in the ICNAF Area in 1960/1962".

- Fig.1 Migratory paths of the cod tagged in 1960 and recaptured in the same year.
- Fig.2 Locations of the cod tagging in 1960 and recapture in 1961.
- Fig.3 Locations of the cod tagging in 1960 and recapture in 1962.
- Fig.4 Locations of the cod tagging and recapture in 1961/1962.
- Fig.5 Migratory paths of the cod tagged in the Subareas 2J and 3K in 1960/1962.
- Fig.6 Migratory paths of the cod tagged in the southern parts of Newfoundland in 1960/1962.

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Figure 2. Locations of the cod tagging in 1960 and recapture in 1964.

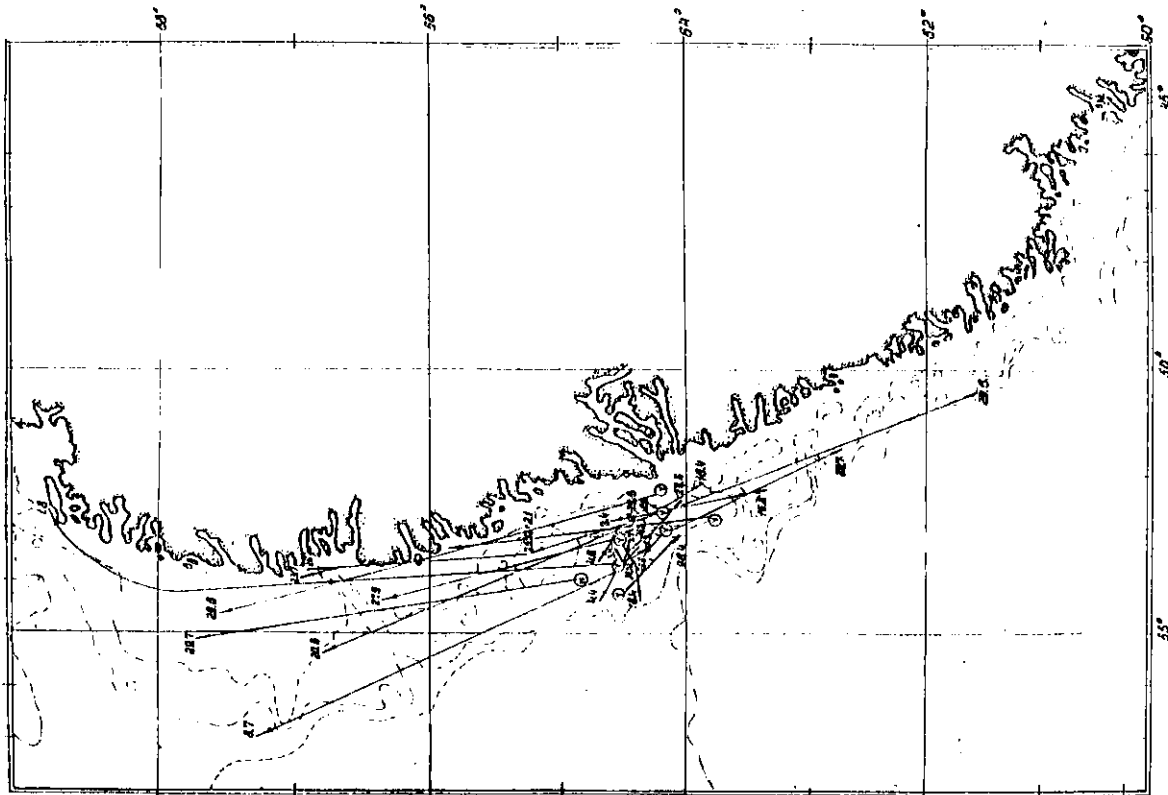


Figure 1. Migratory paths of the cod tagged in 1960 and recaptured in the same year.

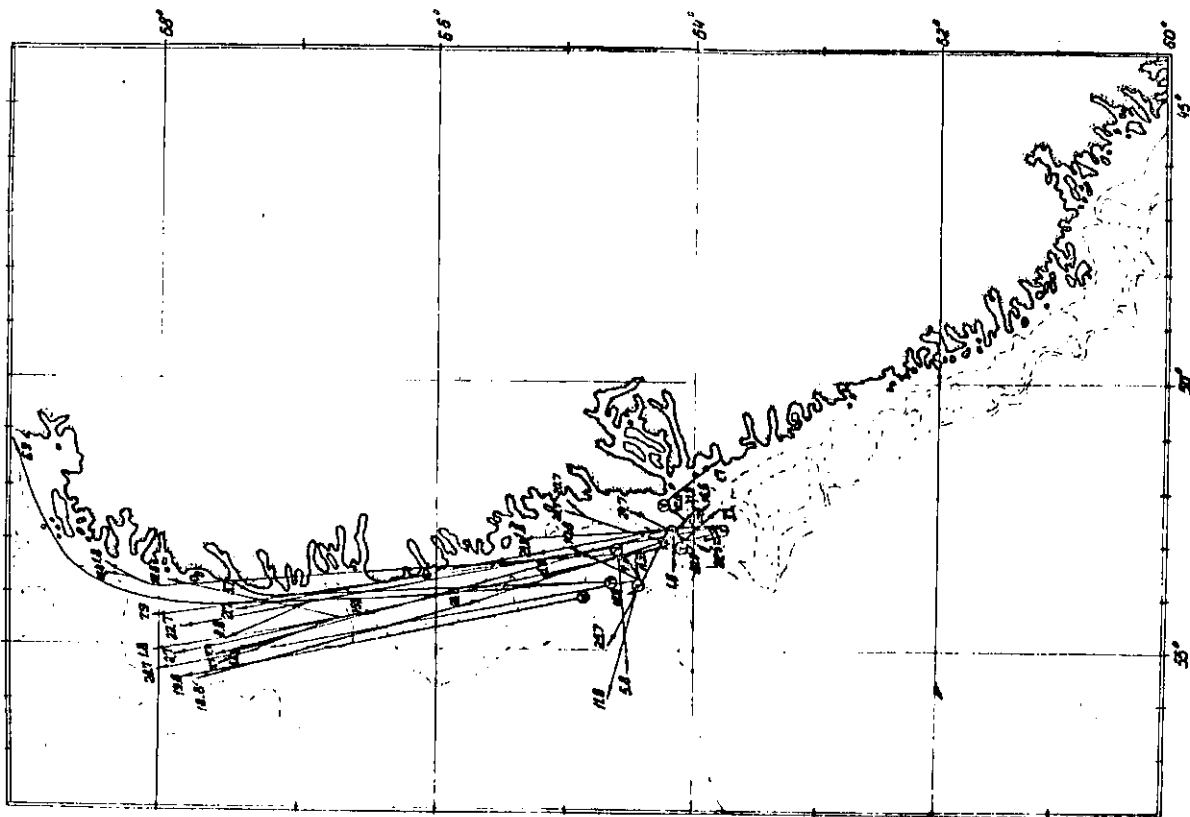


Figure 4. Locations of the cod tagging recapture in 1961/62.

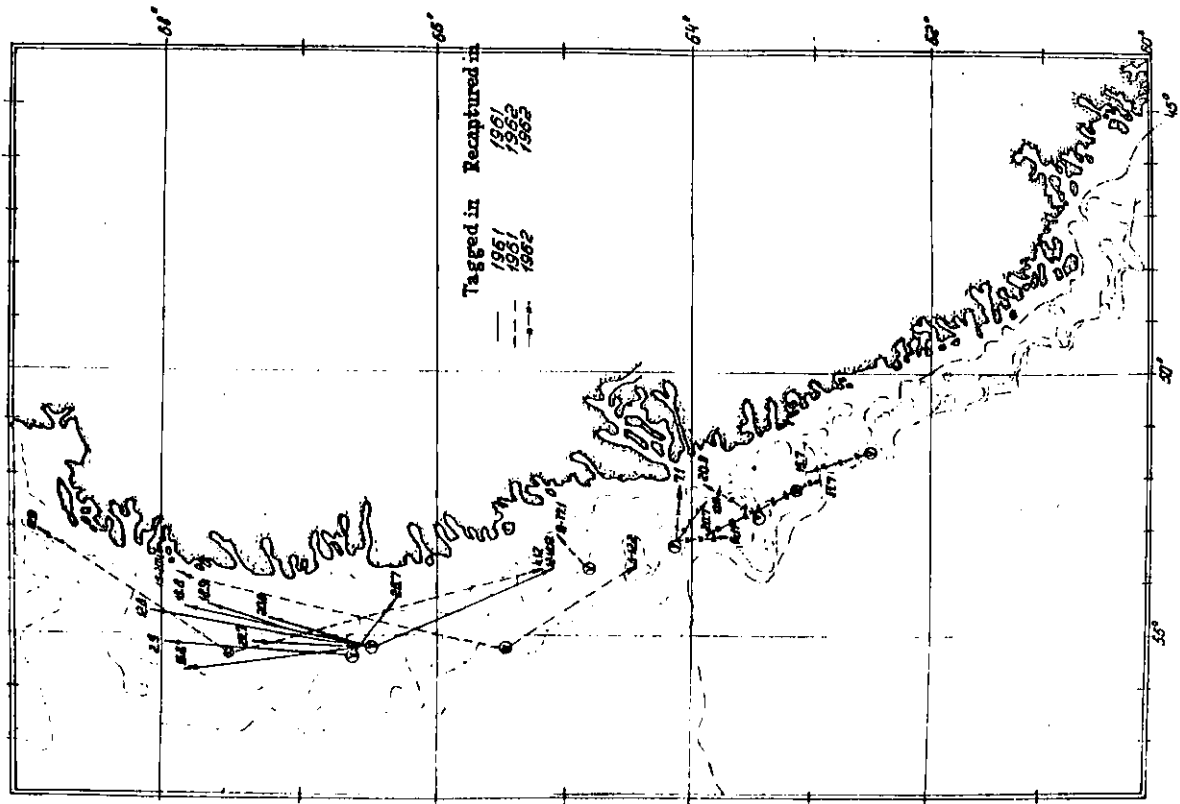
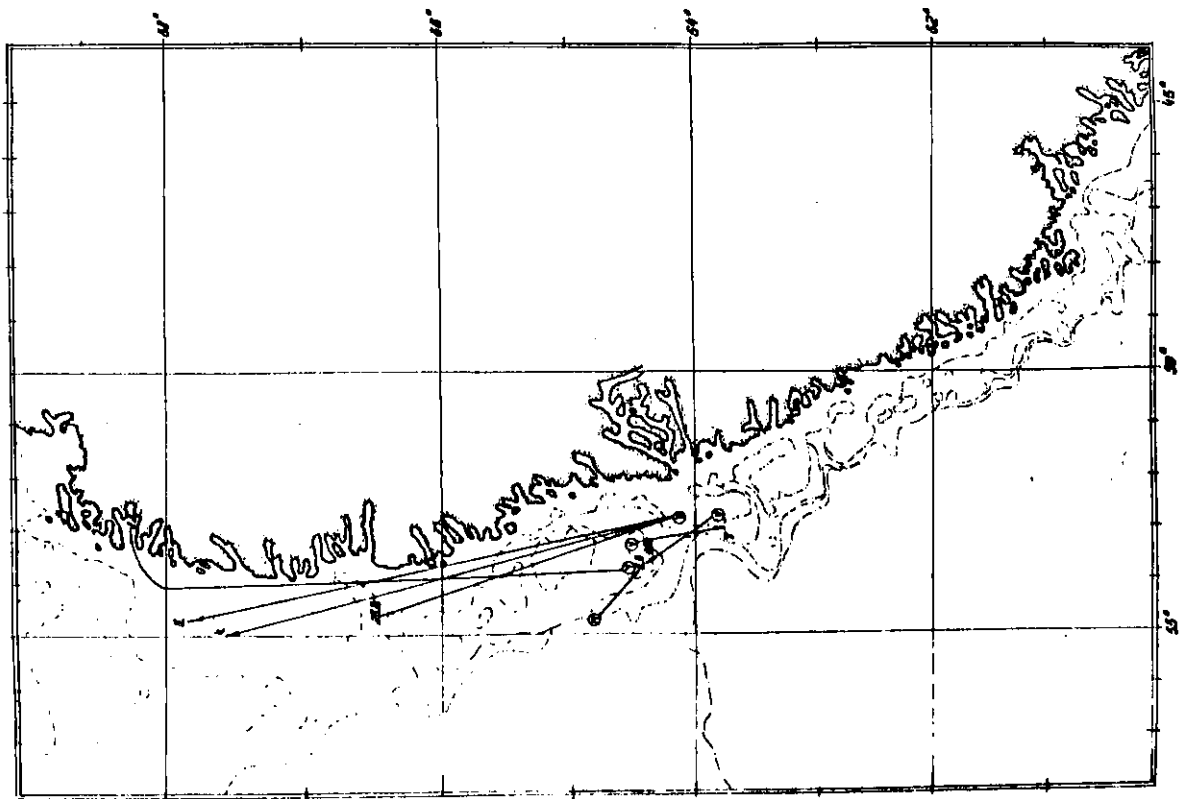


Figure 3. Locations of the cod tagging in 1960 and recapture in 1962.



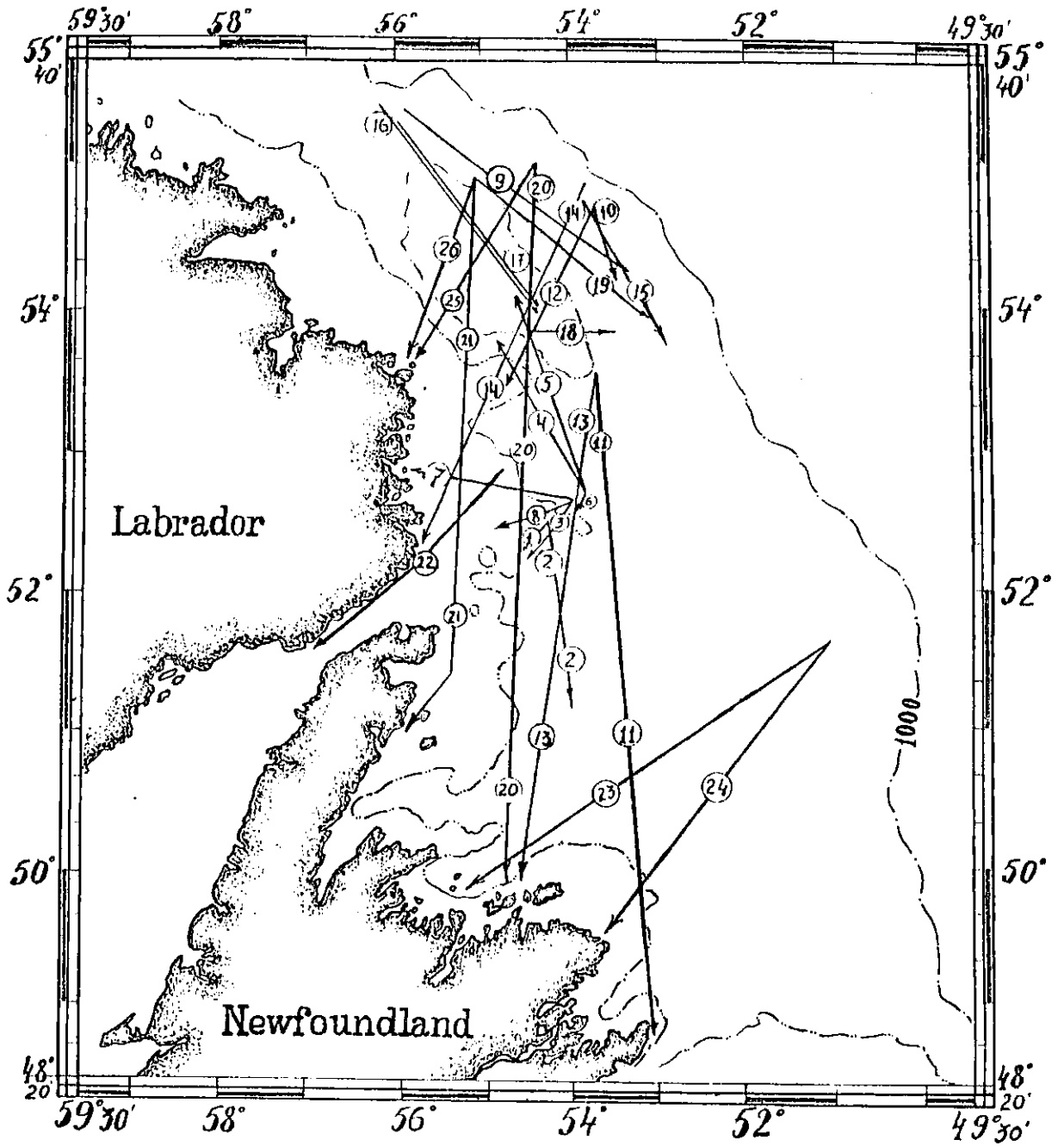


Figure 5. Migratory paths of the cod tagged in the Subareas 2J and 3K in 1960/62.

Figure 6. Migratory paths of the cod tagged in the southern parts of Newfoundland in 1960/62.

