INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 877
(D. a. 60)

Document No. 27

ANNUAL MEETING - JUNE 1961

U.S.S.R. Research Report, 1960

A. Soviet Trawl Fishery in the Northwestern Atlantic, 1960

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The Soviet trawl fishery in the ICNAF area differed in 1960 from all previous years. In the course of ten months (January-October), the highest share of the total catch, about 40 percent, was taken in Division 3N where until that time practically no fishery had taken place. As before, 2J (about 30 percent) and 3K (30 percent) were of the greatest importance. In other divisions the fishery was insignificant and inconsistent.

In 3L and 3M, which in previous years played a significant role in the Soviet fishery, the catches in 1960 were inconsistent and the trawlers moved to these divisions only when the catches in other areas decreased.

Apart from this, the 1960 catches were characterised by the predominance of cod and haddock. It was only from February to April that redfish made up about 50 to 60 percent of the total catch. In January and May cod and haddock contributed about 50 percent, and in the second half of the year, 70 to 90 percent of the total catch.

Two periods may be clearly distinguished in the fishery: (1) from January to June when trawlers fished for redfish, mainly Sebastes mentella, and haddock on the northern Great Newfoundland Bank and off Labrador; (2) from July to November when the fishery was based on the haddock of the southeastern Newfoundland Bank.

In the course of the first period, redfish fishery on the northern slopes of the Great Newfoundland Bank was carried out continuously. Sebastes mentella, with an insignificant by-catch of large haddock, was found at depths of 290 to 350 meters.

Female redfish predominated in the northern part of the area, while males were predominant in the southern part. The fish concentrations gradually moved southward.

During this period, redfish fed on Ctenophores, krill, Calanus, Gammarus, prawns, young cod and lantern anchovy. During the daytime, catches were higher than in the evening or at night, which is connected with diurnal migrations of the redfish.

At the same time, fairly large concentrations of cod with redfish (mainly S. mentella) in the by-catch were fished on the Hamilton Bank and in the southern Labrador area. Here the fishery was sometimes hindered by approaching ice.

The appearance of ice on the fishing grounds was observed in late February, late March and in April. Cod was found at depths of 260 to 300 meters. Cod concentrations during this period (January-June) were stable and it was only in late June that the fish started moving to the northern ice-covered areas, and the trawlers proceeded to fish for isolated cod schools moving to this area from the south along the edge of the slope of the Newfoundland Bank and from the St. Lawrence Gulf via Belle Isle Strait.

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During the first period (January-June), cod and redfish catches did not exceed 2.5 tons per hour trawling. In January and May-June the greatest contribution to the catch came from 2J, but in February-April, from 3K.

In April and May an exploratory cruise was conducted in the Davis Strait. 353 tons of cod and redfish were taken on the whole, with a relatively low average catch per hour trawling (1.6 tons in April; 0.9 tons in May). The fishing operations were hampered by highly unfavourable meteorological conditions.

The size composition was very good. According to data supplied by research vessels 60-75 cm cod prevailed in the catches in 1C, while two size groups, 45-55 cm and 65-75 cm, predominated in 1D and 1E. 35-50 cm fish occurred only in 1F.

Redfish (S. marinus) were fairly large: in 1C fish below 30 cm in size made up 2 to 3 percent of the catch, while those above 40 cm contributed 55 percent; in 1E there were practically no fish below 30 cm, while redfish above 40 cm formed 65 to 75 percent of the catch. In 1D redfish were somewhat smaller: about 6 percent was made up by fish bel 30 cm, while about 46 percent consisted of fish above 40 cm.

In the second half of the year the most important fishery was carried out in 3N.

In January haddock concentrations were found in the southern and southeastern parts of the Great Newfoundland Bank, in July on the south-eastern Newfoundland Bank; at depths of 60 to 100 meters these fish formed commercial concentrations which were fished by trawlers.

The haddock stayed on a small bank with a sandy bottom covered with numerous molluscan shells. They fed on capelin eggs which were spawned there in July, and the great quantities of capelin eggs may have accounted for the stable concentrations and consistent catches of haddock during July. In later months (August-November) haddock concentrations were still fairly high, which may be due to the facts that this area was not covered by cold Labrador water and that the summer warming was rather high and reached to the bottom - there was an increase of the near-bottor temperature from 2° in August to 3° in September.

The maximum haddock catches (4 tons per hour of trawling) were taken in July; in late November the catch dropped to 2 tons. During the entire period the highest catches were taken at night.

Another object of the trawl fishery was redfish, which was fished off southern Labrador and on the northern Newfoundland Bank at the beginning of the period (July) and along the edge of the northeast slope of the Bank and on the Flemish Cap from August to October. The average catch in the second period ranged from 2.2 to 2.6 tons per hour trawling.

In November the trawler fleet moved to the northern slope of the Great Newfoundland Bank and in December to the Labrador area, where Sebastes mentella concentrations appeared at depths of 250 to 300 meters, at that time not affected by winter cooling.

Tables 1, 2, 3 and 4 show size composition of fish from catches by research and exploratory vessels. In the Labrador area fishing was conducted for cod (Table 1) mainly 45-65 cm long and off Newfoundland for cod of 50-70 cm. Besides, larger fish (up to 105 cm) occurred in the Newfoundland area.

In the Labrador area Sebastes marinus was larger than on the Newfoundland and Flemish Cap Banks - the predominant sizes were 44-56 cm and 38-48 cm respectively (Table 2).

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TABLE 1. SIZE COMPOSITION OF COD CATCHES IN 1960 (ACCORDING TO DATA OF RESEARCH AND EXPLORATORY VESSELS).

cm-group		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	Total
Labrador	No.	4	56	180	486	1429	2710	3311	2517	1447	522	112	37	7	-	-	-	-	12818
	%	0.1	0.4	1.4	3.8	11.1	21.1	25.8	19.6	11.3	4.1	0.8	0.4	0.1	-	-	-	-	100
Newfoundland	No.	-	-	3	10	26	95	61	64	60	70	26	36	24	15	6	5	2	503
	%	-	-	0.6	2.0	5.2	19.0	12.2	12.8	12.0	14.0	5.2	7.2	4.8	3.0	1.2	1.0	0.1	100

TABLE 2. SIZE COMPOSITION OF S. MARINUS CATCHES IN 1960 (ACCORDING TO DATA OF RESEARCH AND EXPLORATORY VESSELS).

cm-group		22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	Total
Labrador	No.	-	-	-	-	-	3	3	12	7	4	13	29	26	25	26	26	23	25	17	5	1	3	248
	%	-	-	-	-	-	1.2	1.2	4.8	2.8	1.6	5.2	11.8	10.6	10.0	10.6	10.6	9.2	10.0	6.8	2.0	0.4	1.2	100
Newfoundland	No.	-	-	-	-	5	12	13	16	45	61	54	100	67	83	46	47	31	7	15	3	-	-	605
	%	-	-	-	-	0.8	2.0	2.2	2.6	7.5	10.0	8.8	16.6	11.1	13.7	7.6	7.8	5.1	1.2	2.5	0.5	-	-	100
Flemish Cap	No.	8	16	24	39	77	143	218	362	532	632	780	836	626	311	92	-	-	-	-	-	-	-	4696
	%	0.2	0.3	0.5	0.8	1.6	3.0	4.7	7.6	11.2	13.2	16.4	17.6	13.2	6.5	2.0	-	-	-	-	-	-	-	100

TABLE 3. SIZE COMPOSITION OF S. MENTELLA CATCHES IN 1960 (ACCORDING TO DATA OF RESEARCH AND EXPLORATORY VESSELS.

cm-group		20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	Total
Labrador	No.	-	2	7	25	97	151	403	668	523	346	315	222	229	130	62	19	7	-	1	3207
	%	-	-	0.2	0.8	2.7	4.7	12.6	21.0	16.4	10.8	9.9	6.9	7.2	4.1	1.9	0.6	0.2	-	-	100
Newfoundland	No.	1	9	30	117	319	577	1056	1846	2295	1790	1587	1625	1079	402	195	42	6	-	-	12976
	%	-	0.1	0.2	0.9	2.4	4.5	8.1	14.3	17.7	13.8	12.2	12.6	8.3	3.1	1.5	0.3	-	-	-	100
Flemish Cap	No.	1	3	20	20	52	337	992	1271	1291	1087	542	146	57	3	-	-	-	-	-	5822
	%	-	0.1	0.3	0.3	0.9	5.8	17.1	21.8	22.2	18.7	9.3	2.5	0.9	0.1	-	-	-	-	-	100

TABLE 4. SIZE COMPOSITION OF HADDOCK CATCHES IN 1960 (ACCORDING TO DATA OF RESEARCH AND EXPLORATORY VESSELS).

cm-group		25	30	35	40	45	50	55	60	Total
Newfoundland	No.	49	741	1310	212	62	16	6		2396
	%	2.0	31.0	54.8	8.8	2.6	0.6	0.2		100

The larger sizes of Sebastes mentella occurred in the Newfoundland Bank and Flemish Cap areas (Table 3).

The number of larger fish increased in northern areas, for both S. marinus and S. mentella. Thus, in the Labrador area S. marinus above 50 cm in length made up 40.2 percent of the catch, on the Newfoundland Bank only 17.1 percent, while on the Flemish Cap Bank fish above 50 cm did not occur.

As shown by the 1960 data supplied by exploratory vessels, haddock ranged in size from 30 to 60 cm (Table 4).

According to preliminary data, the total catch by the Soviet trawler fleet in the ICNAF area in 1960 was about 220,000 tons.

B. Redfish Stocks Distribution in the ICNAF Area

by V. Travin, K. Janoulov, A. Postolaky, G. Zaharov

The Soviet investigations which began in 1957 have, only for the last two years, covered most of the ICNAF subareas. For this reason, the Soviet scientists do not possess sufficient quantity of data on the redfish biology, distribution of adult fish concentrations, and dispersal of the larvae and young during the first years of life, for allowing final conclusions as to the existence of separate local stocks of redfish in the different parts of the Convention area. Our earlier considerations of the possibility of the existence of several local stocks of S. mentella in the regions of Labrador and Newfoundland were based both on the analysis of the seasonal fishery, which partly reflected the displacement of commercial stocks, as well as on the analysis of age/length composition, sex ratio and maturity of the gonads, of the catches; further, on the observation of so-called "natural marks" (parasites, external and internal spots on the skin and muscles), and finally, on the morphometric measurements of the samples taken in different parts of the Convention area.

As the Soviet investigations were mainly conducted in the most important fishing areas, the data on the distribution of local redfish stocks were collected for the main species characteristic of the particular regions: S. marinus in Davis Strait, S. mentella off the Labrador coast and in the Newfoundland divisions. Data collected in Subareas 4 and 5 are insignificant and fragmentary, so they cannot be used for the solution of this problem.

Our views on the distribution of redfish stocks are as follows:

Subarea 1 - West Greenland - Fig. 1

Catches of the research and scouting vessels included, besides cod, a large number of S. marinus. The limits of the distribution of this fish extend to at least 69° N, but commercial stocks are mainly found up to 66°N (Division 1C inclusive). Within these limits (from Cape Farewell up to 66°N), commercial stocks of S. marinus may be found all the year round, but the largest catches come, as a rule, from the northern divisions (1C and 1D) in March to August. In the other months rich catches were made in the more southern divisions (1E and 1F).

Redfish schools keep along the west slopes of the banks, spreading into the guts between the banks, sometimes moving to the deeper grounds

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east of the banks when the waters are warmed up, and westward to greater depths when the waters are cooled. The catches consist of fish of all age and size groups, from the smallest and youngest to 20-year-old and older.

However, mature fish are hardly found in any of the seasons in the areas off West Greenland, neither at the embryonal stage of development, nor at the pre-extrusion or post-extrusion stages: even the biggest specimens, both males and females, have as a rule resting sexual glands. This fact testifies against the spawning of S. marinus in the waters off West Greenland; this stock is not genetically independent and must be linked to the more southern regions of the North Atlantic: Iceland and the Danish Strait. Larvae from the spawning grounds of these subareas apparently drift to the coasts of West Greenland (where they grow up) with the branch of the Irminger Current branch of the West-Greenland current. The return of the adults from the West Greenland coasts to Iceland or the migration of mature post-spawning specimens from Iceland to West Greenland were, however, not observed. It is quite possible that the young fish drift and the adults swim from West Greenland into the Labrador region in a relatively warm stream which branches off the West Greenland Current at the latitude of Godthåb and joins the Labrador Current on the western side of Davis Strait.

This may explain the presence of S. marinus concentrations in the waters of the continental shelf of the Labrador coast, which are fished from time to time by the Soviet fishing vessels.

Subarea 2 (Labrador coast) - Fig. 2

Catches of S. mentella (the main object of commercial redfish fishing in this subarea) display great seasonal and yearly fluctuations; however, if permitted by the ice and meteorological conditions, it would have been possible to conduct the fishery all the year round.

The northern limit of S. mentella's distribution has not been established, but it undoubtedly extends far to the north of the Hamilton Bank area (2J) where the Soviet fishing fleet is mainly operating. The richest catches on this bank are observed from October until February, when redfish concentrations move from 3K and 3L, first to the north and then to the south. The approximately equal distribution of sexes in catches during all seasons indicates the absence of the seasonal separation of male and female schools, so characteristic of the Bear Island-Spitzbergen stock of S. mentella. Extrusion of larvae takes place on the eastern slope of the Hamilton Inlet Bank in May or at the beginning of June. Only a very small number of females with their larvae not liberated are observed toward the end of June.

The problem of larval drift has not yet been fully studied, in spite of its great importance for the understanding of the position of the Labrador stock of redfish.

We believe that the main drift proceeds along the extreme eastern (warm) component of the Labrador Current which flows along the edge of the slope of 2J, 3K and on the northern side of 3L, where it deflects to the southeast, then (north of Flemish Cape) to the north and northeast, forming a cyclonic eddy. Only such a pattern of distribution of larvae and young fish can explain the existence of a S. mentella stock, off the Labrador coast and in the northern regions of the Newfoundland shallows (3K and 3L), which is confirmed by the available data.

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Subarea 3 (Newfoundland Bank) - Fig. 2

In this subarea the existence of the following three S. mentella stocks, with only little intermingling in the marginal regions, can be outlined:

1. The northern stock in the Labrador region and northern parts of Newfoundland (3K, northern part of 3L);
2. The Flemish Cape stock in Division 3M;
3. The south Newfoundland stock on the southeast and south slopes of the Newfoundland Bank (3N, 3O, 3P).

This division of stocks appears from some morphometric differences as well as from differences in parasites, already referred to. It is further confirmed by a considerable difference in the length-composition of catches observed rather consistently during the various seasons (Table 1).

Table 1. Middle sizes of S. mentella in the catches of the Soviet research vessels in different regions (in brackets - months when samples were taken.

Region	Sex	Middle sizes by years			
		1957	1958	1959	1960
2	male	34.45	33.48	34.29	33.81
	female	35.91	37.45	37.94	37.54
		(X-XI)	(VIII-XII)	(VI-VIII)	(I-II-V-VI)
3K	male	34.49	34.41	35.22	33.20
	female	39.45	36.72	37.96	37.61
		(X)	(X-XII)	(I-VIII-XII)	(I-VII)
3L	male	33.91	34.54	34.20	34.20
	female	35.93	37.10	37.51	38.83
		(X-XII)	(IV,VIII-XII)	(I-VIII,XII)	(I-VIII)
3M	male	34.80	32.72	33.21	33.13
	female	37.05	34.42	35.65	35.02
		(I-VI)	(III,IX,XII)	(III-IX, XII)	(I-VII)
3	male	-	-	39.59	29.35
	female	-	-	31.56	31.01
				(I,VIII)	(I-VIII)
3O	male	-	-	36.07	26.48
	female	-	-	27.65	28.27
				(III-VIII)	(I-VIII)
3P	male	-	-	-	27.94
	female	-	-	-	28.93
					(I-II,VII-VIII)

The Flemish Cape stock is more distinctly isolated, especially by morphometric and parasitologic indices. It can only accidentally be recruited from specimens of the southern stock, whose larvae can be brought there in years when the waters of the Gulf Stream penetrate to the southern slope of Flemish Cape. The southern and northern stocks are also delimited by morphologic indices and average sizes; they are intermingling in Division 3N and in the southern part of 3L, in both cases due to the penetration of adults and to a small-scale southward transport of larvae from the northern stock with the main branch of the Labrador Current.

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