International Council for the
Exploration of the Sea

C.M. 1968/H:11
Pelagic Fish (Northern) Committee

Soviet Investigations into the State of Stocks and Characteristics of Distribution of the Atlanto-Scandian Herring in 1967

by

I. G. Yudanov[x)]

I. Review of Investigations

During the whole of 1967 complex studies were carried out in the Norwegian Sea on the biological state and the characteristics of distribution of herring, depending upon the abiotic and biotic conditions in the different seasons. The investigations included the following points:-

1. Regular observations on changes in hydrographical conditions and productivity of food plankton. They were carried out on standard latitudinal sections by R/V "Professor Somov" from the continental slope in the east to the frontal zone of polar waters in the west. In connection with changes occurring in some months in the herring migration area, sections were laid from the Faroe-Shetland Channel up to 74°30'N.

Apart from this simultaneous investigations on 9 standard sections crossing the whole Norwegian Sea and the south-eastern part of the Greenland Sea along the latitudes were conducted from late May to 15th June. These investigations were undertaken by four vessels: "Academician Knipovich", "Fridtjof Nansen", "Professor Somov" and "Professor Mesyatsev". Simultaneously, the Norwegian R/V "G.O. Sars" and the Icelandic R/V "Ægir" carried out similar investigations between the Faroes and Iceland as well as around Iceland.

2. Monthly studies of changes in size and age composition of the commercial stock by mass measurements of herring and the taking of average samples for a full biological analysis.

3. Investigations on spawning efficiency of herring by catching larvae on spawning grounds, and on the survival of larvae together with the determination of the abundance of fingerlings of the 1967 year-class from September to February in all fishing areas of the Barents Sea. A simultaneous estimation of the 0-group of main commercial fish was also made from the end of August to 10th September on the whole area of the Barents Sea to the continental slope of the Norwegian Sea. This was carried out by two Soviet, two Norwegian and one English research vessels.

4. Hydro-acoustic investigation on the main wintering area of herring in mixed waters of the East-Icelandic Current in the second ten-days period of December, aiming at a quantitative estimation of the whole stock of adult herring and based upon three parametres: area, volume and density of their single concentrations, with a two-fold hydro-acoustic study of the latter.

---

x) Mr. I.G. Yudanov,
PINRO,
6, Knipovich Street,
Murmansk,
U. S. S. R.

II. General Development of Fishery and its Results by Seasons

Due to small reducing a cold wedge of the East-Icelandic Current in January, the main wintering area of pre-spawning herring extended 20 miles further to the north and 15 miles further to the east at the same time as in 1966. The fishery conditions for the whole month were very favourable, especially for the first half when the average catch amounted to 130 kg per net and 8.65 tons per drift.

A marked eastward advance of pre-spawning concentrations of herring from their main wintering area started from 13th January. The speed of movement during the first week did not exceed on an average 10-15 miles per day. The eastward migration activity increased particularly during the third ten-days period of the month, resulting in advanced shoals of pre-spawning herring coming up to the Norwegian Shelf already on 30th to 31st January or 3-4 days earlier than in 1966.

During the first half of February the largest pre-spawning concentrations were exploited by the Soviet fleet on the Griptarene Bank area, and smaller ones on the Frøya Bank. Due to homogeneity of the spawning stock because of the rich 1959-1961 year-classes, the spawning occurred simultaneously and chiefly in the territorial waters of Norway. Therefore the efficiency of the Soviet fishery during the mass-spawning from 16th to 26th February decreased sharply. At the same time the total efficiency of the Norwegian fishery increased by over 6 times against the first half of February.

In March, mainly post-spawning herring migrating from the major spawning areas of the Norwegian Shelf were caught. At that time the total efficiency of the Soviet drift fishery increased markedly in comparison with the second half of February when all herring spawned in the territorial zone of the Norwegian provinces Möre-Romsdal and Trøndelag. No herring approaches to the Lofoten Shelf for spawning were observed. Therefore, all control drifts made there in March and in the first half of April gave no results.

Table 1 shows the importance of each bank of the Norwegian Shelf for the Soviet herring fishery by 5-days periods of each month in comparison with the efficiency of the drift fishery as well as with the total Norwegian catch in the same period.

The collection of herring larvae on all Banks of the Norwegian Shelf by the R/V "Fridtjof Nansen" from 20th March to 5th April and again on 12th to 26th April showed a very low degree of survival at the stage when the larvae start independent feeding. This fact gave the basis for estimation of the 1967 year-class of herring as a very poor one. The poor abundance of this year-class was confirmed by simultaneous estimation of the 0-group of principal commercial fish in the whole area of the Barents Sea carried out from the end of August to the first ten-days period of September by 5 research vessels (USSR, Norway and Great Britain).

In connection with the fishing conditions on the Norwegian Shelf getting worse in the second half of February, a significant part of the Soviet herring fleet rather successfully exploited the pre-spawning concentrations near the Faroe Shelf, which was of the greatest importance for the Soviet fishery in February and March until 1956. The fishing efficiency was much higher there than on the banks of the Norwegian Shelf.

While the spent herring migrated beyond both the Norwegian Shelf and Faroe Shelf the herring fleet gradually left the fishing areas, and by the end of March the drift fishery in the Norwegian Sea ceased completely. On the main departure ways of the herring, a small rest of the herring fleet conducted scouting and control catches by means of drift nets, but commercial catches were not taken.

Purse-seine fishery was more successful during that period. At the end of May the first two Murmansk SRT-Rs equipped for purse-seining took 95 tons in 9 hauls. In June altogether 10 such vessels had fished there, and from July to September their number increased up to 30 and even more. From the end of May to mid-June, the purse-seine fishing was carried out in the zone of the polar front (Jan Mayen). Then the fishery was gradually displaced eastwards along Mohn's Threshold, and during the second half of July it developed successfully north-east of the submarine Louise Boyd Elevation within the Spitsbergen Current. In August this kind of fishery reached the South Cape latitude off West Spitsbergen.

The hydrographical regime observed during the oceanological survey was characterised by marked slackening of the inflow of Atlantic waters through the Faroe-Shetland Channel. Owing to this negative anomalies for the 0-200 m layer on the latitudinal sections at 65°45'N and 67°30'N in all branches of the Norwegian Current, except the western branch, were approximately as those in the coldest years 1962 and 1965.

The development of spring processes in plankton was late. The average standing crop of plankton was 476 mg/m^3 less than in the same period in 1966, and 152 mg/m^3 less than in 1965. According to echo-recordings, single herring shoals of density 1-4 were observed mostly in the western half of the Norwegian Sea. A rather rapid displacement of such shoals were also observed in northern and north-eastern directions. Therefore, on 12th-13th June, there were many of them at 70°40'N. At the same time the ice-edge of the polar front had the easternmost position since 1918.

In spite of the fact that, in the whole way of the herring's northward migration along the polar front, the purse-seiners found very dense concentrations, taking 10-50 tons and over 100 tons per haul, drift nets did not take commercial catches. The possibility for carrying out drift fishery appeared only in the first 10-days period of September, when the herring started to form larger concentrations and most of them began gradually to depart southwards and south-westwards.

The drift fishery was more successful in September, especially in the third 5-days period, when mass migration of fattened herring started from the polar waters along the frontal zone. The greatest fishing efficiency was observed on the western edge of the Spitsbergen Current (2a)[x], and a little less was observed in the Central Plateau (3b). During the next 5-days periods the fishing efficiency decreased considerably, and for the second half of the month it did not exceed on an average 56 kg per net and 5.62 tons per drift. The main cause for this decrease was the uneven descent of the herring to depths of over 150-200 m at day-time and also its ascent to not higher than 70-90 m from the surface at night.

As to October, the bulk of the herring migrated rather rapidly southward with a speed of 15 miles per day during the first half of the month, and up to 10 miles per day during the second half. They did not stop either in the Jan-Mayen area (4) or at the slopes of the submerged Jan-Mayen Ridge (22a). During this, their concentrations kept still deeper; at night they did not rise higher than 100 m from the surface. The densest concentrations were distributed especially deep down on the main wintering area in mixed waters of the West-Icelandic Current (22b). It was difficult to fish for them even with a purse-seine, and in the second half of the month the purse-seine fishery was of low efficiency and was stopped. The efficiency of the drift fishery decreased for the same reason.

In November and December the whole fishery was concentrated in the main herring wintering area which was considerably reduced as compared with 1966. The lowest fishing efficiency was in November, making on an average 31 kg per net or 2.85 tons per drift, and it was somewhat greater in December, amounting to 52 kg per net or 4.9 tons per drift.

In order to determine the total stock of adult herring, a double acoustic investigation on their main wintering area was made by BMRT-244 "Murmansk" in the second 10-days period, the weather conditions being relatively good. By measuring space, volume and density of single concentrations, it was found that in all stocks of the investigated area made up about 2.5 million tons. As compared to the similar estimation of the stock made at the same time in 1964 the total stock of adult herring had decreased by 3 times.

The total catch of herring by months and by areas is presented in Table 2. The position of fishing areas is shown in the chart.

To the catch taken for the whole year, the drift fishery contributed 254.37 thousand tons (83.5%) and the purse-seines 50.38 thousand tons (16.5%). The purse-seine fishery was carried out during 7.5 months on an average by 17.6 SRT-Rs which performed 3,343 hauls during the year. This gives on an average 2.86 thousand tons per SRT-R or 15 tons per haul.

---

x The chart of fishing areas of the Norwegian Sea is given in the report submitted to the 55th session of ICES (1967).

III. Biological Data

The length of about 131 thousand specimens of herring was measured during the whole year. Out of this number, about 2.5 thousand specimens were measured in the main wintering area and while migrating to the spawning grounds of the Norwegian Shelf. Over 34.5 thousand specimens were measured on the main spawning grounds; about 48 thousand specimens during migratings accompanied by intensive fattening; over 30.5 thousand specimens during migration back to the wintering area, and 15 thousand specimens in the main wintering area.

Table 3 gives the data on changes by seasons in the quantity of herring of each size-group and on changes in individual weight from average samples for determination of age composition. There are significant differences between the length and weight of herring in the main fishing area (2a, 3a, 3b), and in the southern area (22b) where during the whole 3rd quarter (July-September) only scouting was carried out and there was no fishery at all. Herring with largersize and relatively larger individual weight, especially of older age, were also observed during previous years.

Table 4 shows the age composition and the individual weight of each year-class. As shown in the Table, in July-September a great number of older year-classes (1956-1947) remained in the south-western part of the Norwegian Sea (22b) and made up almost 47% of the catches of scouting vessels, whereas in the northern areas of the main fishery the above-mentioned year-classes constituted less than 5%.

The maturity stages and sex composition of the herring in catches in relation to the time of fishing, are shown in Table 5. General data on fullness of herring stomachs and on their nutrition condition judged from steatosis of the inner organs, are summarised in Table 6. Data on the age when the year-classes become mature are included in Table 7.

The complex of Soviet investigations on the state of the stock of Atlanto-Scandian adult herring in relation to fishery, and examination of biological data summed up in the Tables allow to draw the following conclusions:-

1. As a result of insufficient recruitment with poor year-classes and intensive exploitation by USSR, Norway and Iceland, the commercial stock of the herring decreased by 40% against 1966 when the total herring yield was at a maximum for the whole period of intensive herring fishery in the Norwegian Sea.

2. The rich 1959-1961 year-classes being 8-6 years old and spawning mainly for the second time, were predominant in the catches. Therefore, almost the entire stock of pre-spawning herring concentrated in the main wintering area of mixed waters of the East-Icelandic Current, and a mass approach to the Lofoten Shelf for spawning was not observed. During 1966-1964 almost all the recruits of the above-mentioned year-classes wintered in more northern areas than usual, that is, adjacent to the frontal zone of the Mohn's Threshold, and spawned chiefly near Lofoten.

3. In the period of intensive fattening the main mass of the commercial stock was distributed in the northern areas beyond the frontal zone of the Mohn's Threshold. Judging from the considerably lower fatness of the herring from June to October, their feeding in the mentioned area was less effective than in 1966.

4. Judging from the condition of gonads the approach to the main spawning grounds of the Norwegian Shelf occurred some days earlier than in 1966.

5. As to the abundance, the 1967 year-class of the main spawning grounds of the Norwegian Shelf was very poor.

H:11/Yudanov

Table 1.

Yields of the Soviet drift fishery of adult herring in banks of the Norwegian Shelf by 5-days periods and the total yield of Norway at the same time of 1967 (in % and tons)

Names of banks	catches by 5-days periods of months (in %)							Total yield	
	I-5	6-10	11-15	16-20	21-25	26-28-31	total	in tons	per drift (t)
1	2	3	4	5	6	7	8	9	10
January									
Griptarene	-	-	-	-	-	100,0	100,0	12	3,00
February									
Griptarene	5,8	17,6	28,0	2,0	0,7	-	54,1	13,436	4,50
Frøya	12,4	6,0	4,7	4,0	0,6	-	27,7	6,879	2,87
Halten	2,5	0,6	+	2,3	9,9	2,6	17,9	4,445	2,84
Sklinna	-	-	-	-	0,2	0,1	0,3	75	1,50
Total	20,7	24,2	32,7	8,3	11,4	2,7	100,0	24,835	3,56
USSR, tons	5,142	6,010	8,121	2,062	2,631	869	24,835	-	-
Norway,"	16,367	6,647	28,360	130,573	153,420	28,360	363,713	-	-
March									
Griptarene	0,2	8,8	39,1	18,2	9,1	+	75,4	4,740	8,07
Frøya	0,3	1,4	2,6	0,8	2,5	+	7,6	478	4,60
Halten	13,9	2,5	-	-	-	-	16,4	1,037	2,75
Sklinna	0,6	-	-	-	-	-	0,6	31	0,70
Total	15,0	12,7	41,7	19,0	11,6	+	100,0	6,286	5,21
USSR, tons	943	798	2,619	1,194	730	-	6,286	-	-
Norway, "	1,445	3,545	1,907	-	-	-	6,896	-	-
Total USSR, tons	-	-	-	-	-	-	-	31,133	401,743
Norway, "	-	-	-	-	-	-	-	370,610	

H:11/Yudanov

Table 2. Total yields of herring in the Norwegian Sea by areas and months in 1967
(in metric tons)

Months	Total	Fishing areas									Total (in %)
		Northern			Central			Southern			
		Ia, 2a, 2b	3a, 3b	II	I0	4-8	9	I5	22a	22b	
January	64.859	-	-	64	-	-	9.64I	I0.855	-	44.299	2I.2
February	53.536	-	-	34.498	-	2II	I4.849	3.975	2	I	I7.6
March	23.928	-	-	II.334	-	-	2.058	I0.308	-	228	7.8
The Ist quarter	I42.323	-	-	45.896	-	2II	26.548	25.I38	2	44.528	46.6
April	5	-	-	-	-	-	-	-	2	3	+
May	II	-	-	-	-	-	-	II	-	-	+
June	2.I80	-	I.856	-	-	-	-	324	-	-	0,7
The 2nd quarter	2.I96	-	I.856	-	-	-	-	335	2	3	0,7
July	5.759	5.725	34	-	-	-	-	-	-	-	I.9
August	I8.204	I7.655	39I	-	-	-	-	-	-	I58	6.0
September	42.627	I2.320	27.750	-	-	2.385	-	-	-	I72	I4.0
The 3rd quarter	66.590	35.700	28.I75	-	-	2.385	-	-	-	330	2I.9

continued .....

H:11/Yudanov

Table 2 (ctd.)

1	2	3	4	5	6	7	8	9	10	11	12
October	50,767	-	7,006	-	-	7,816	-	409	3,959	31,576	16,7
November	17,905	-	-	-	-	-	-	179	-	17,726	5,9
December	24,968	-	-	-	-	-	-	-	-	24,968	8,2
The IV quarter	93,641	-	7,006	-	-	7,816	-	588	3,959	74,272	30,8
Total	304,750	35,700	37,037	45,896	-	10,742	26,548	25,729	3,961	119,130	100,00
%	100,0	11,7	12,2	15,1	-	3,5	8,7	8,4	1,3	39,0	100,00
1966	447,438	7,283	51,279	62,584	45,675	22,644	49,516	19,293	49,293	139,251	-
%	100,0	1,6	11,4	14,0	10,2	5,1	11,0	4,3	11,2	31,2	100,00

H:11/Yudanov

Table 3. Size composition (in ‰) and individual weight (in g) of herring caught by 1967 fishing seasons in the Norwegian Sea.

Length in cm	Size composition					Individual weight				
	January - March	April - June	July-September		October-December	January-March	April-June	July-September		October-December
			2a,3a, 3b	22 b				2a,3a,3b:	22b	
24	-	3	I	-	-	-	I52	I3I	-	I46
25	2	2	I	-	I	II8	I65	I50	-	I38
26	3	-	-	-	I	I39	-	-	-	I42
27	4	8	-	-	+	I55	I66	-	-	I60
28	7	6	I	-	I	I60	I76	2I5	-	I65
29	I0	I2	4	I	I	I92	206	262	254	206
30	26	30	I5	I	3	23I	223	280	264	232
3I	I02	I08	43	6	I7	273	242	298	272	266
32	276	255	II0	64	68	303	249	3II	289	285
33	295	282	287	I53	296	308	272	336	340	3II
34	I7I	I6I	347	I66	353	344	323	363	383	352
35	48	48	I30	I25	I79	386	349	392	4I8	387
36	24	43	32	I89	49	4I4	358	406	450	4I3
37	22	28	I3	I86	I5	436	362	428	482	452
38	8	I2	I0	80	II	464	403	446	502	468
39	2	2	6	26	4	483	467	474	5I0	479
40	+	-	-	3	I	565	-	-	5I0	533
4I	-	-	-	-	+	-	-	-	-	565
Total	I000	I000	I000	I000	I000	-	-	-	-	-
The number of specimens investigated	2200	II00	I950	700	2I00	2200	II00	I950	700	2I00
Average	32,36	32,97	33,62	35,07	33,92	249	257	352	425	330

Table 4. Age-composition (in °/oo) and individual weight(in g) of year-classes of herring in the Norwegian Sea by I967 seasons

Year-classes	Age	Age: January-March	Age: April-June	Age: July-September 2a, 3a,3b	Age: July-September 22b	Age: October-December	Individual weight: January-March	Individual weight: April-June	Individual weight: July-September 2a ,3a ,3b	Individual weight: July-September 22b	Individual weight: October-Decemb.
I964	3- 3+	7	-	4	2	+	I63	-	I72	I59	I74
I963	4- 4+	I0	23	I3	I3	5	I75	I63	279	282	25I
I962	5- 5+	5	3	7	-	2	227	246	328	-	305
I96I	6- 6+	I07	92	I0I	50	I63	258	273	344	332	332
I960	7- 7+	273	244	293	93	296	294	280	357	353	340
I959	8- 8+	530	53I	53I	330	485	3II	292	37I	386	362
I958	9- 9+	8	I4	8	24	5	356	343	389	4I4	393
I957	I0-I0+	3	3	I	I9	2	400	362	4I8	443	409
I956	II-II+	2	5	5	29	4	420	392	435	447	428
I955	I2-I2+	7	5	6	26	2	423	397	439	45I	450
I954	I3-I3+	7	8	6	55	4	425	406	45I	462	456
I953	I4-I4+	6	II	II	93	I0	433	4I2	457	47I	466
I952	I5-I5+	7	9	3	73	4	438	4I5	48I	476	467
I95I	I6-I6+	I7	3I	7	I23	I2	462	420	482	480	460
I950	I7-I7+	I0	I8	3	47	6	452	422	486	490	455
I949	I8-I8+	I	2	I	I6	+	4I2	420	478	53I	438
I948	I9-I9+	-	I	-	5	-	-	-	-	477	-
I947	20-20+	-	-	-	2	-	-	-	-	485	-
Total	3-20+	I000	I000	I000	I000	I000	-	-	-	-	-
Number of specimens investigated		2048	766	I706	649	I899	2048	736	I706	6I9	I892
Average		7,84	8,I8	8,48	II,43	8,38	25I	259	348	428	330

Table 5. Maturity stages and sex composition of herring depending upon time of fishing(in %)

Maturity stages	Sex	January	Febr.	March	April	May	June	July	August	Sept.	October	Nov.	December
II		- 0,4	0,I 0,I	I,3 I,I	- 2,5	0,5 0,2	0,7 -	- 0,2	0,6 0,4	I,7 0,6	0,7 0,4	0,7 0,3	0,3 0,I
II-III		- 0,2	0,2 0,I	4,4 3,0	3,8 0,9	48,2 45,0	49,3 3I,2	4I,I 28,8	23,0 8,4	6,7 I,6	0,6 0,6	- -	0,4 0,5
III		I,I -	0,4 -	0,2 0,I	- 0,4	I,0 0,3	7,8 7,4	9,5 I7,9	25,8 23,2	30,7 7,3	I2,I 2,0	3,3 0,7	0,3 0,3
III-IV		2,7 0,2	0,6 0,I	0,5 0,3	- 0,4	- -	0,3 -	- 2,0	I,3 I5,0	9,7 23,0	25,0 I8,4	I0,7 3,0	0,7 0,3
IV		I7,6 4,7	II,9 I,9	0,4 0,9	0,9 -	- -	2,3 I,0	0,I 0,4	0,4 I,6	3,2 I2,0	8,7 27,7	29,6 22,0	I6,4 II,6
IV-V		30,2 26,9	24,I I3,9	0,3 0,4	- -	- -	- -	- -	- 0,3	0,I 3,4	- 2,9	8,0 I5,7	25,9 29,0
V		3,6 I2,4	II,0 27,9	6,3 I0,7	- -	- -	- -	- -	- -	- -	- -	- 6,0	8,3 4,4
VI		- -	4,9 2,8	I6,5 I5,8	6,2 3,3	- -	- -	- -	- -	- -	- -	- -	0,5 I,0
VII		- -	- -	I,8 3,0	9,6 2I,2	0,5 -	- -	- -	- -	- -	- -	- -	- -
VIII		- -	- -	I4,9 I2,8	3I,6 I9,2	3,0 I,3	- -	- -	- -	- -	- -	- -	- -
Total		55,2 44,8	53,2 46,8	46,7 53,3	52,I 47,9	53,2 46,8	60,4 39,6	50,7 49,3	5I,I 48,9	52,I 47,9	50,9 49,I	52,3 47,7	52,8 47,2
Number of specimens investigated		45I	857	836	240	402	296	I042	688	900	895	300	III6

H:11/Yudanov

Table 6. Index of stomach content and nutritional condition of the Atlanto-Scandian herring by steatosis of pyloric appendages and intestines by 1967 months in points, % .

Months	Number of specimens investigated	Stomach content						Nutritional condition					
		0	I	2	3	4	Average	0	I	2	3	Average 1967	Average 1966
January	500	98,2	I,2	-	-	-	0,06	93,4	4,6	I,4	0,6	0,08	0,I3
February	900	89,9	9,8	0,2	0,I	-	0,I5	94,2	5,0	0,5	0,3	0,06	0,03
March	887	72,I	I2,3	8,5	6,3	0,8	0,44	84,3	7,0	5,2	3,5	0,I2	0,07
Ist quarter	2287	86,8	7,8	2,9	2,I	0,3	0,22	90,6	5,5	2,4	I,5	0,09	0,08
April	250	42,2	48,2	6,7	I,9	I,0	0,67	68,4	29,2	2,4	-	0,27	0,I4
May	390	8,7	5I,4	29,8	9,4	0,7	I,33	50,0	43,0	6,7	0,3	0,73	0,73
June	350	I2,8	25,I	56,7	5,I	0,3	I,53	6,0	2I,3	59,2	I3,5	I,68	I,90
II quarter	990	2I,2	4I,6	3I,0	5,5	0,7	I,I8	4I,5	3I,2	22,8	4,5	0,89	0,92
July	I045	I7,6	34,8	3I,9	II,9	3,8	I,48	0,4	II,5	54,0	34,I	2,25	2,35
August	700	37,0	29,7	II,7	I5,0	6,6	I,2I	3,3	28,0	43,2	25,5	I,88	2,52
September	900	52,4	25,7	I0,I	4,8	7,0	0,83	I2,4	44,I	32,5	II,0	I,30	2,33
III quarter	2645	35,7	30,I	I7,9	I0,5	5,8	I,I7	5,4	27,9	43,2	23,5	I,8I	2,40
October	900	6I,3	24,6	8,4	4,0	I,7	0,54	24,2	57,6	I5,9	2,3	0,72	I,4I
November	300	95,2	I,7	0,5	0,5	2,I	0,04	38,7	46,9	I3,0	I,4	0,38	0,70
December	II40	97,2	2,6	0,I	0,I	-	0,02	45,6	49,0	4,7	0,9	0,I6	0,60
IV quarter	2340	84,6	9,6	3,0	I,5	I,3	0,20	35,2	5I,2	I4,5	I,6	0,42	0,90
Total	8262	57,3	22,I	I3,7	4,9	2,0	0;69	43,3	29,2	20,7	0,8	0,80	I,I0

Note. Points of stomach content: 0 - the stomach and bowels are empty; I - low content; 2 - average content; 3 - the stomach is full, its content being high; 4 - the stomach is stretched; its walls are stretched so that food is visible. Points of nutritional condition(fatness) of herring. 0 - no fat on inner organs; I - small quantity of fat hardly observed near the stomach and the bowels; 2 - substantial accumulation of fat near the stomach and the bowels and on the peloric appendages; 3 - all inner organs are covered with a great layer of fat.

H:ll
Yudanov

Table 7. Maturity age of year-classes of Atlanto-Scandian herring in I967 catches (in %).

Year-classes	Immature	Age of recruits						Number of specim. investigated
		3	4	5	6	7	8	
I964	I00	-	-	-	-	-	-	27
I963	96,5	-	3,5	-	-	-	-	I04
I962	5,9	II,8	55,8	26,5	-	-	-	34
I96I	0,6	3,2	63,6	3I,4	I,2	-	-	722
I960	0,I	0,7	I7,2	60,0	22,0	-	-	I896
I959	-	0,2	I9,5	44,2	35,6	0,5	-	3620
I958	-	8,0	38,6	29,0	22,8	I,6	-	62
I957	-	4,2	75,0	20,8	-	-	-	24
I956	-	I6,3	5I,I	25,6	4,7	2,3	-	43
I955	-	2I,3	49,0	I7,0	8,5	4,2	-	47
I954	-	3,7	44,0	47,6	4,7	-	-	82
I953	-	7,2	4I,8	38,I	8,2	4,5	0,2	II0
I952	-	4,5	29,3	32,6	20,3	I3,2	0,I	89
I95I	-	2,6	2I,6	3I,4	I6,3	26,8	I,4	I53
I950	-	I,4	24,3	2I,4	I8,6	32,8	I,5	70
I949	-	-	I0,0	20,0	39,8	26,6	3,6	I5
Total number of specimens	I32	9I	I769	3I88	I80I	I04	I3	7098
%	I,7	I,3	24,9	45,0	25,4	I,5	0,2	I00,0