Fol. 41

This paper not to be cited without prior reference to the authors

International Council for the Exploration of the Sea

C.M. 1965
Herring Committee
No. 19

REPORT OF THE THIRD MEETING OF THE ATLANTO-SCANDIAN HERRING WORKING GROUP

Contents

-o-o-o-o-

REPORT OF THE THIRD MEETING OF THE ATLANTO-SCANDIAN HERRING WORKING GROUP

TERMS OF REFERENCE AND PARTICIPATION

The Atlanto-Scandian Herring Working Group set up in 1961, had its first meeting in Bergen in April 1963 and its second in Reykjavik in April 1964. A preliminary report was given for the first meeting in Bergen, and at the second meeting in Reykjavik a more extensive report was prepared including results and conclusions of both meetings.

At the Annual Meeting in 1964 the Herring Committee recommended that a third meeting of the Working Group should be held and, in accordance with this recommendation, the Working Group met at VNIRO, Moscow, 4-8 May, 1965. Representatives from Norway and U.S.S.R. participated.

Participation

Dr. K. A. Lamin (U.S.S.R.), CONVENER
Mr. F. Devold (Norway)
Mr. P. T. Hognestad (Norway)
Mr. O. J. Østvedt (Norway)
Mr. J. K. Benko (U.S.S.R.)
Mr. G. A. Bogdanov (U.S.S.R.)
Dr. S. S. Fedorov (U.S.S.R.)
Mr. A. A. Gankov (U.S.S.R.)
Mr. V. I. Pakhorukov (U.S.S.R.)
Mrs. E. I. Seliverstova (U.S.S.R.)
Mr. A. S. Seliverstov (U.S.S.R.)
Miss L. P. Telkova (U.S.S.R.)
Dr. I. G. Judamov (U.S.S.R.)
Mr. O. Dragesund (Norway), RAPPORTEUR

Unfortunately neither representatives from Iceland nor the Chairman of the Herring Committee attended the meeting. In the recommendation made by the Herring Committee Mr. F. Devold should be the Convener of the Working Group. However, after the opening remarks Mr. F. Devold proposed that Dr. S. S. Fedorov should convene the meeting. Unfortunately Dr. Fedorov was not able to attend the Group continously and Dr. K. A. Lamin was then proposed to act as Convener.

The thanks of the participants are due to the Soviet hosts for the excellent meeting, accommodation and facilities, and for the kind and generous hospitality.

AGENDA AND SUBJECT MATTER

The main items discussed at the two previous meetings were:-

(1) Description, identification and mixing of the various stock units with the Atlanto-Scandian "race".

(2) The present status of the stocks and the fisheries exploiting them.

(3) Possible causes of recent changes and fluctuations in the abundance of stock units.

In Bergen, 1963, the Working Group considered mainly items (1) and (2). At the second meeting, new information was added on the present status of the stocks and on exploitation in earlier periods. In Reykjavik, 1964, the Working Group also considered the approaches to elucidate the effect of the fishery of juvenile herring on the adult stock. At this meeting the Group stressed the importance of more accurate methods of estimating the relative size of the exploited inshore and unexploited offshore parts of the "småsild" population. However, to obtain a better understanding of the factors governing recruitment in herring, more detailed information on the abundance, distribution, condition and survival of larvae are needed. The Herring Committee therefore recommended that the third meeting of the Atlanto-Scandian Herring Working Group should mainly be devoted to the consideration of joint investigations of the biology of the early stages of herring in the Norwegian Sea and the Barents Sea. In addition, recent data on catch, effort, and stock estimates and analyses should be exchanged.

Thus the following main agenda items were discussed by the Working Group in Moscow:-

(1) Exchange of information.

(2) Joint investigations.

(3) Standardization of methods.

I. EXCHANGE OF INFORMATION

The different members of the Working Group presented short reports of the investigations and fishing on herring during the last few years. The main attention was paid to:-

(A) The distribution, movements and biological characters of the adult herring during the feeding period.

(B) The wintering areas, location and time of spawning and the biological characters of the spawners.

(C) The distribution and movements of the spawning products and adolescent pre-recruit herring.

(D) Catch and effort data, stock analysis and estimates.

A. The Distribution and Movements during the Feeding Period

Special attention was paid to a written report by Jacob Jakobsson, Iceland, submitted to the meeting. According to this report the distribution of the herring off north-east Iceland in 1964 followed the same general trends as in 1963 although some differences were observed. Thus the main invading herring migrations to the coastal waters during June and first half of July were much stronger in 1964 than in the previous year. During the second half of the conventional season, i.e. August, the herring concentrations were scattered over wide areas which reached up to 25o n.m. east and north-east off Iceland. By the end of September the herring started to assemble in large schools and before the end of September they were located on the wintering grounds some 55-9o n.m. off the east coast of Iceland where they remained more or less stationary until the end of the year.

The relative strength of the tribes in 1964 is shown in Table 1. There was a further development of the trends that took place in the two previous years. Thus the Norwegian spring-spawners contributed 87.1% in 1964 and the Icelandic spring-spawners, which during the period 1957-1962 contributed over 5o.o%, had in 1964 a role of little significance and contributed only 11.9% to the samples. As in a few previous years the summer-spawners did not have any significant effect on the purse-seine fishery and constituted only 1.o% of the samples. The proportion of the strength of tribes in 1964 ressembled that of the period prior to 1956, although it should be stressed that the age-composition was then very much different.

Unlike the previous years the 195o year-class, although still well represented, was no longer dominant in the Norwegian herring north-east of Iceland. Its place in 1964 was clearly taken by the 1959 year-class (Table 2). It should be noted that the age-distribution showed in Table 2 is based on samples which have not been weighed up according to areas and months. Since relatively more sampling took place during the first part of the season than during the later periods and taking into account that the younger Norwegian year-classes entered the fishery mainly during the late summer, the older year-classes are probably over-represented in the Table.

The age-distribution of the Icelandic spring-spawners is similar to that of previous years. The year-classes from 1951, 1952, and 1956 are most abundant although one can hardly speak of any strong dominant year-classes in this group. The 1956 year-class which in 196o-1962 was promising has during the last two years been disappointingly weak in the north-east and east coast fishery. The presence of the 1961 year-class was noted. Only a total number of 39 summer-spawning herring appeared in the samples and their age-distribution appears similar to that of this stock in the winter and spring south coast samples.

As in previous years the tagging data clearly show the migrations of herring from the two main spawning centres (west coast of Norway and the south coast of Iceland) to the north and east coast feeding grounds. Thus in 1964, 151 tags released on the spawning grounds off Norway were recovered in Iceland. The ratio of returns from the two spawning centres is in good agreement with the relative strength of tribes derived from scale analysis. It was especially noted that 6 tags were returned from the 1964 Norwegian tagging experiments carried out during the late winter and early spring in the Lofoten area. Three of these tags were recovered in August, one in September and two in December, and all came from the east-coast fishing grounds.

In the central Norwegian Sea the herring had a wide distribution during the feeding period in 1964. According to Soviet investigations herring were distributed in the area from the Icelandic coast to 8-9°E between 63° and 73°N. An increase in length of the herring was observed from south to north and from east to west. As a rule the larger herring kept in water with the lowest temperature. In mid-July the most dense concentrations were found along the western side of the East Icelandic Current. During the first week of August, however, they approached the area south of Jan Mayen. The following weeks the herring moved towards north-east along the "Mohn Ridge". At Bank "600" the schools migrated in easterly direction and in early September the concentrations were observed at 14°E. The eastward migration in 1963 did not proceed further than 5-6°E. Reaching water with relatively high temperature (up to 12°C) the herring moved to the south and then turned to the west and north-west again. In mid-September 1964 the herring were widely spread in the "Mohn Ridge" area.

The herring observed in this north-eastern part of the Norwegian Sea consisted mainly of the 1959 year-class, followed by the 1960 and 1961 year-classes.

B. <u>The Distribution and Movements during the Wintering and Spawning Period</u>

During the further considerations of the movements of the different stock units from the feeding to the wintering areas and the subsequent migration to the spawning grounds, the Working Group was mainly concerned with the Norwegian spring-spawners.

It should be noted, however, that echo-surveys were undertaken during the last three months of 1964 to locate the Icelandic spring- and summer-spawners off the south-west coast of Iceland. In October and the first twenty days of November the herring were found 20-50 n.m. west of Snæfellsnes. During the period 20-25 November the concentrations started to move south and as they did so, the schools disintegrated and the search ships lost contact with them until about 20 December when good concentrations were found off the eastern part of the south coast whereas, as in previous years, the western migration had mixed with immature herring (2-3 ringers). The south and eastward winter migration started at least one month earlier than in previous years. During the years 1960-1963 the migrating winter schools were large and easy to follow (Jakobsson, 1963). Contrary to this behaviour pattern the schools seemed to disintegrate on their migrations route in December/January 1963/64.

The Working Group strongly stressed the need of further information on the wintering areas of the Icelandic summer- and spring-spawning stocks.

According to the Soviet and Norwegian observations the main wintering area of the Norwegian spring-spawners is in the East Icelandic Current. A comparison between the years 1963 and 1964 was made, and the observations clearly show that an increase in the total area inhabited by the herring had taken place.

The Group noted with interest data showing that both in 1963, 1964, and 1965 the Norwegian stock spawned at two main localities in Norwegian waters, Møre-Sklinna and Træna-Lofoten.

Detailed observations of the migration route from the East Icelandic Current to the spawning grounds off Møre-Sklinna were presented and discussed. The departure from this wintering ground was almost at the same time both in 1963/64 and 1964/65. In 1965 the herring started its movement from the wintering area about the 22 January and during the next 20-25 days the herring migrated to the Møre coast, the schools gradually dispersing northward along the coast as far north as the Sklinna Bank (Devold, 1965). The main spawning in the Møre-Sklinna Bank area took place between Buagrunnen and Halten, and the spawning began in the first week of March, which was about the same time as in 1964.

The migration to the Lofoten area during the winter 1965 was investigated by Devold (1965). The observations showed that the herring approached the spawning grounds from the north along the coast, following the front between the coastal water and the warmer Atlantic water. The herring did not penetrate as far into the Vestfjord as in the previous year, and the main spawning in this area took place south and south-west of Røst and Skomvær. The spawning time was somewhat earlier than in 1964 and coincided with that on the southern spawning grounds.

The wintering area of the herring spawning off Lofoten was discussed, and the region between "Mohn Ridge" and the continental shelf between Bear Island-northern Norway seems to be the most likely area.

On both grounds the 1959 year-class predominated. It should be noted that in the Møre-Sklinna area the 1950 year-class constituted about 8.5%, whereas in the Lofoten area this year-class was insignificant. Preliminary analysis of the age-data show that in the Lofoten the 1959 year-class constituted almost 65%, the 1960 year-class 25%, and the 1961 year-class less than 10% of the catches. Although the recruit spawners predominated, it should be noted that also 2nd and 3rd time spawners of the 1959 year-class were present, varying from 10 to 30% in the samples.

C. The Spawning Products and the Adolescent Herring

Representatives from both the U.S.S.R. and Norway presented reports of larvae and 0-group surveys carried out during the last two years. The distribution of larvae and their drift-pattern along the Norwegian coast were discussed. The investigations show that the larvae are mainly concentrated in the upper 25 m at night, whereas during the day they are distributed throughout the upper 50 m (Dragesund, 1965). It seems likely that the larvae are transported passively by the coastal current from the spawning grounds. Passing the banks of Troms, the drift becomes more influenced by the Atlantic Current, which in this area is extensively mixed with coastal waters. Before reaching the entrance of the Barents Sea, the water masses split into several branches. In accordance with the system of currents the larvae will be dispersed over broad areas in the Barents Sea and to the north, west off Bear Island and Spitsbergen. Such a distribution is confirmed by observations made during the last few years although the distribution is varying from one year to another. Open ocean distribution was especially noted for the 1959 and 1960 year-classes, whereas the 1961 and 1962 year-classes showed a more coastal distribution. Also the year-classes 1963 and 1964 were distributed over broad reaches, these year-classes, however, being considerably less numerous than the 1959 and 1960 year-classes.

The movements from the "nursery" areas to the feeding grounds in the Norwegian Sea were discussed. It was stressed that only small concentrations of fat herring were present in the Barents Sea in 1964/65.

According to the information obtained from the reports the strength of the 1962, 1963, and 1964 year-classes are considered to be below average, the two last ones being somewhat more abundant than the 1962 year-class.

D. Catch and Catch/Unit Effort Data; Stock Estimates

Information on catch and stock abundance were presented at the meeting with special reference to the Norwegian spring-spawning stock. In Table 3 the total catch of adult and pre-recruit Norwegian spring-spawners is shown for the period 1960-1965. It should be noted that the total catch increased from 573 thousand tons in 1963 to 1127 thousand tons in 1964. This increase in catch is especially due to the Icelandic north- and east-coast fishery and the Norwegian winter-herring fishery. It is also clearly shown that the 1959 year-class predominated in the catches. The total catch in 1964 was somewhat lower than during the record period 1954-1956.

The decline in catch and catch/unit effort in the Norwegian winter-herring fishery since 1957 (Figure 1) were distinctly noted in the purse-seine fishery, the catch per boat in 1960 reaching about 1/5 of the top level in 1954. The drift-net data, however, show a reduction to only one-half during the same period (Østvedt, 1964). The last year (1964) the catch per unit effort for the purse-seine fishery increased considerably and an increase was also noted in the Soviet drift-net fishery as well as in the Icelandic north and east coast fishery.

A comparison between catch per unit effort and stock size is shown in Figure 1. It is clearly demonstrated that catch per unit effort fluctuates in accordance with stock abundance. The discrepancy between stock size and catch per unit effort in the north and east coast fishery off Iceland is mainly due to the change in fishing technique.

Stock-size estimates derived from Soviet echo-sounder surveys and underwater photography experiments in the main wintering area off East Iceland in mid-December 1964 were presented. An increase in the total area and volume occupied by the herring has taken place as well as an increase in the size and density of the schools compared with the previous year (Table 4). The total abundance of herring within the wintering area increased by 13,5oo mill. specimens or 3.5 mill. tons, and the stock in 1964/65 was estimated to 6.8 mill. tons.

Unfortunately no stock-size estimate of the herring spawning off Lofoten has been made. However, in view of the Soviet observations on the spawning grounds this northern component of the stock is of considerable strength.

The Working Group did not consider the recent data on catch, catch per unit effort and stock strength of the Icelandic spring- and summer-spawners. For further studies on these stocks off the south coast of Iceland reference is made to the previous report of the Working Group (Anon., 1964).

Table 5 shows the landings of the small and fat herring in the period 196o-1964. Judging from the figures it will be seen that both the small and fat herring catches are somewhat lower in 1964 than in the previous years in this period, except for the fat herring fishery in 196o, when this fishery was at the same level as in 1964.

II. JOINT INVESTIGATIONS

The programmes for joint investigations both in the Barents Sea and off North and East Iceland were discussed.

The O-Group surveys

In accordance with a recommendation made at the Working Group Meeting in Reykjavik in 1964, a joint Norwegian-Soviet programme for O-group surveys in the Barents Sea was considered. It was decided that two research vessels from Norway and two from the U.S.S.R. should participate in the investigations in August/September 1965. Two of the vessels (one from each country) should cover the area west of Vardø - Bear Island and further to the north, west off Bear Island and Spitsbergen. The same two ships should also survey the area southward/towards the coast off northern Norway south to the Andenes region. The other pair of ships should cover the area east of the line between Vardø -Bear Island. More detailed plans for the routes, types of investigations and methods to be used were discussed and agreed upon. Before starting the surveys a short meeting will be held in Murmansk to make the final touch on the programmes. When the investigations are finished the research vessels will meet in Tromsø to compare the results and prepare a joint report.

The Investigations off Iceland and in the Central Norwegian Sea

As in previous years joint investigations between Iceland, Norway and U.S.S.R. will be carried out in the summer of 1965 (see previous reports of the joint investigations). The plans for the surveys in 1965 were discussed and special attention was paid to the question of obtaining comparable data on the distribution and abundance of herring.

The Group agreed upon a special key worked-out for classification of herring schools observed during the summer season off Iceland and in the Central Norwegian Sea.

III. STANDARDIZATION OF METHODS

The standardization of methods used in routine analysis of samples was discussed. It should be noted that the U.S.S.R. will report their length measurements according to the recommendation passed by the Herring Committee in 1962.

The application of a I-VIII scale for maturity stages was agreed upon. concerning the stages I, II, III, IV, VI, VII, and VIII. The latter stage should substitute stage VII-II earlier applied in the Soviet investigations. However, the Soviet representatives do not agree with the understanding of stage V, and keep still to the opinion that at this stage all eggs should be transparent.

V. REFERENCES

Anon. 1964 "Report of the Atlanto-Scandian Herring Working Group". ICES, C.M. 1964, Doc.No.8, 22 pp. (Mimeo.).

Devold, F. 1965 "Vintersildinnsigene 1965". Fiskets Gang, 51:378-8o.

Dragesund, O. 1965 "Forekomst av egg og larver av fisk i vest- og nordnorske kyst- og bankfarvann våren 1964". Fiskets Gang, 51:166-72.

Jakobsson,J. 1965 "The Icelandic herring fishery in 1963". Annls.biol. Copenh., 2o:154-9.

Østvedt, O.J. 1964 "Comparison between catch per unit effort in the Norwegian gill-net and purse-seine fishery for herring". Rapp.P.-V.Cons.permint.Explor.Mer, 155:9o-93.

Table 1. The strength of the tribes off North and East Iceland, 1964. (According to Jakobsson).

Type	Number	%
Norwegian spring-spawners	3416	87.1
Icelandic spring-spawners	467	11.9
Icelandic summer-spawners	39	1.o
T o t a l	3922	loo.o

Table 2. Age-distribution (%) of the north and east coast summer and autumn herring, 1964. (According to Jakobsson).

Year-class	Age	NN	NS	ISPR	ISUM	?	T o t a l
1962	2		o.2			15.3	+
1961	3	1.4	6.6	2.1	17.9	46.2	3.6
196o	4	12.1	8.1	o.6	2o.5		9.4
1959	5	5o.5	43.o	1.3	7.7	23.1	41.6
1958	6	o.2	o.5	4.3	2o.5		1.o
1957	7		o.1	7.7	7.7		1.o
1956	8	o.1		14.4	17.9		1.9
1955	9	o.1	1.o	5.6			1.1
1954	1o	o.4	1.5	6.2	2.6		1.5
1953	11	1.6	2.6	12.6	2.6		3.2
1952	12	1.4	3.8	16.7	2.6	7.7	4.o
1951	13	4.o	6.4	17.3		7.7	6.4
195o	14	21.5	2o.9	5.6			19.2
1949	15	1.8	1.5	3.4			1.9
1948	16	1.9	1.1	o.9			1.5
1947	17	1.4	1.5	o.2			1.3
1946	18	o.4	o.2	o.9			o.4
1945	19	o.6	o.7	o.2			o.6
1944	2o	o.4	o.3				o.3
1943	21	o.1					o.1
1942	22						
1941	23	o.1					+
T o t a l		loo.o	loo.o	loo.o	loo.o	loo.o	loo.o
NO		21o8	13o8	467	39	13	3935
Mean		8.1	8.3	lo.5	5.7	4.8	8.4

NN: = Northern Norwegian Spring-Spawners ISPR: Icelandic Spring-Spawners

NS: Southern Norwegian Spring-Spawners ISUM: Iceland Summer-Spawners

Table 3. Total catch (000's m. tons) of adult and pre-recruit Norwegian spring-spawners 196o-1965.

Year	Norwegian west coast fishery	Soviet summer*) and winter fishery	Icelandic and Norwegian **) summer fishery	T o t a l
196o	3oo	465	45	81o
1961	69 Proportion of 1959	285	127	481
1962	83 year-class in landings	2o9 (25%)	216	5o8
1963	6o (15-2o%)	33o (5o%)	242	573
1964	27o (6o-7o%)	4oo ( )	457	1127
1965	179 (62%)	-	-	-

*) Total catches of Soviet summer and winter fisheries for adult and pre-recruit herring in the Norwegian Sea.

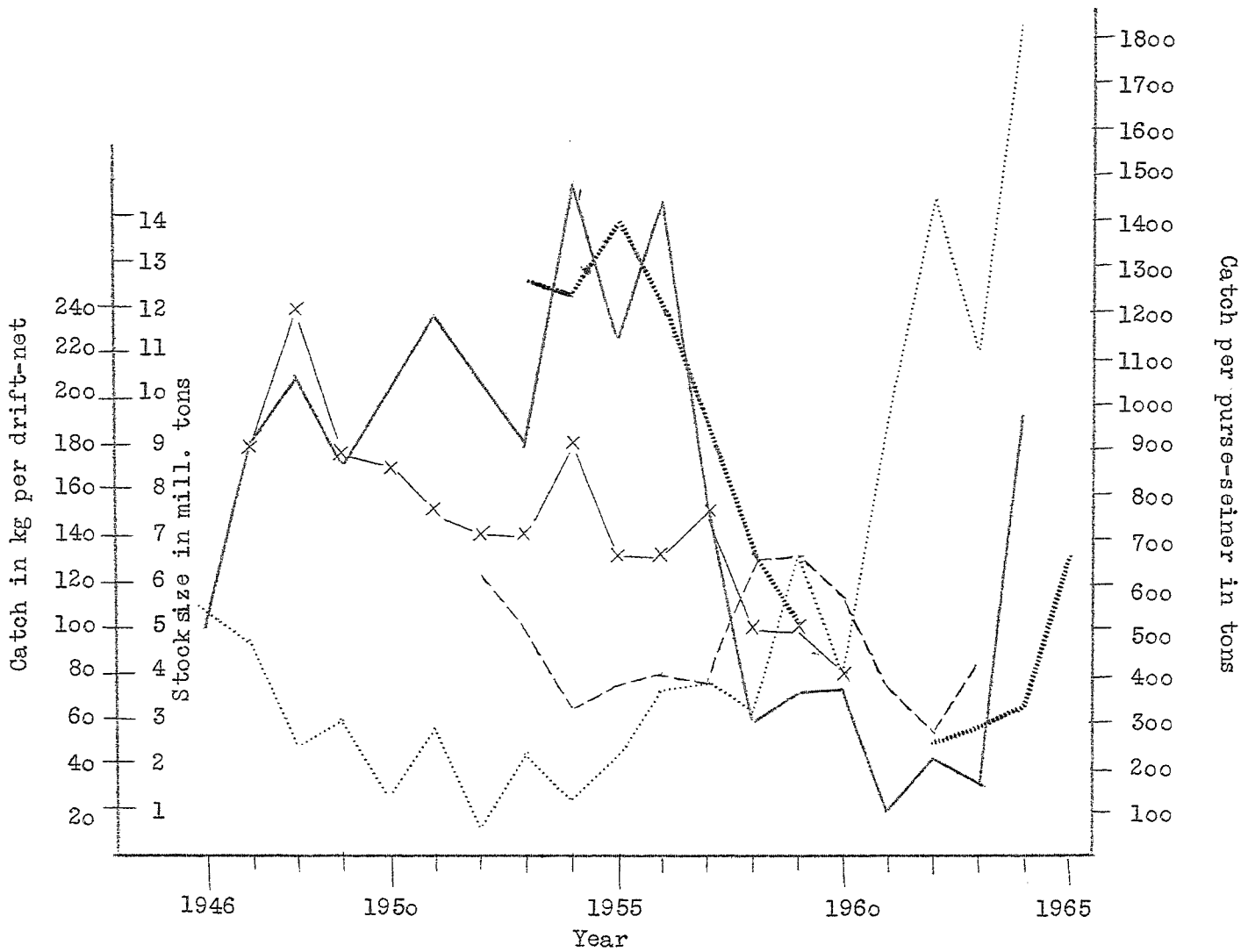
**) Estimated from total catch in Icelandic and Norwegian summer fisheries from analysis of the relative proportions of Norwegian and Icelandic scale types in the period 196o-1964.

Table 4. Estimates of absolute abundance of adult stock of Norwegian spring-spawners 1953-65 (in 000's m.tons).

From Tagging		From Echo-surveys and Underwater Photography (the area east of Iceland in December)			
Years	Data	Total	Year-class 1958 and older	Year-class 1959 and younger	Year-class 1959 only
1953	12,462				
1954	12,183				
1955	13,857				
1956	11,997				
1957	9,393				
1958	6,6o3	6,o46	6,o11	35	
1959	5,o22				
196o	-				
1961/62	-	2,5o4	2,464	4o	
1962/63	-	2,847	1,3oo	1,547	1,495
1963/64	4,836	3,256	655	2,6o1	1,847
1964/65	-	6,8oo	-	-	-

Table 5. Total catches of small and fat herring (in 000's m.tons) taken by Norway and U.S.S.R., 196o-1964.

Year	Small Herring			Fat Herring		
	Norway	U.S.S.R.	Total	Norway	U.S.S.R.	Total
196o	212.o	5.7	217.7	62.2	o.8	63.o
1961	222.7	o.9	223.6	1o8.5	o.1	1o8.6
1962	124.5	o.7	125.2	171.3	o.9	172.2
1963	157.9	-	157.9	143.8	12.o	155.8
1964	1o6.8	-	1o6.8	67.o	-	67.o



Stock size

Catch per purse-seiner (in tons), Norwegian winter-herring fishery, (January-April)

Catch per drift-net (in kg) (Jan.-Apr.) " " " "

Catch per drift-net (in kg) Soviet fishery in the Norwegian Sea (Febr.)

Catch per purse-seiner (in tons), Icelandic summer fishery.