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The Reports of Meetings of the Plenary, Panels and Committees together with Appendices are listed below. The page numbers referred to are those given at the bottom of the pages.

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Serial No. 2933
(B.v.)

Proceedings No. 1

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of Meeting of Standing Committee on
Research and Statistics (STACRES)

Chairman: A. S. Bogdanov

Rapporteur: V. M. Hodder

STACRES met on Monday, 15 January 1973, with representatives present from 11 member countries and observers from FAO and ICES. Bulgaria, Iceland, Italy, Romania and Spain were not represented at this meeting.

The main task of STACRES at this meeting was to consider the Reports of the Assessments Subcommittee and the Herring Working Group, both of which met during the week of 8-14 January 1973. These Reports, presented by their respective Chairman, Mr D. J. Garrod and Mr T. D. Iles, were adopted by STACRES and are included as Appendices I and II to this Report. Summaries of the two reports and a brief section on other business of STACRES follow.

I. Summary of Assessments Subcommittee Report

1. The Regulation of Mixed Fisheries: US Memorandum on the Regulation of Fishing Effort in Subarea 5 and Statistical Area 6 and the Related Canadian Questions (Comm.Doc. 73/3 and 73/4).

The general problem of the effective regulation of mixed fisheries was reviewed in relation to the US proposal to identify what form of management regime could overcome the difficulties created by the by-catch of regulated species in other fisheries for both regulated and unregulated species. The expansion of fishing in Subarea 5 and Stat. Area 6 and the current status of both the total resource and of its individual components were reviewed. This involved analysis of the interaction between fisheries for the separate resources and the development of an acceptable estimate of fishing directed to them on a standardized basis that would permit comparisons to be made.

Fishing effort was standardized to the days fished by US side otter trawlers in the 0-50 tonnage class, the unit most consistently available over the years, the average vessel comparabilities being used to judge the development of the fishery. Relationships between proposed objectives for 1973 and the 1971 situation were calculated by making comparisons of the catch-per-day of different fleets on a monthly basis for 1971 only. Other choices of standard vessel might have been made, but in effect this choice has no bearing on the answers to the questions posed, because

- a) the relationships between fleets are retained irrespective of the standard;
- b) proportional changes in fishing effort to meet Commission objectives for controlling fishing mortality are established by the independent measurement of this mortality, not the effort standard chosen.

The variability of vessel comparisons were studied and the conclusion reached was that they are not precise enough to measure exactly the national contributions to the fishery on a historic basis.

The current status of the resources is shown by the estimates of catches in Tables 4 and 9 of the Assessments Subcommittee Report (App. I).

The analysis of the species mixture, providing the estimate of fishing effort in particular fisheries and on particular species, is given in Table 10. These show that the overlap between groundfish fisheries is considerable. The pelagic and semi-pelagic (silver hake) fisheries are more distinct, especially in Stat. Area 6, but nevertheless they take a significant by-catch of groundfish species. The importance of mackerel and the tentative nature of the existing assessment of this species has influenced the precision of the conclusions that have been drawn in relating the 1973 situation to the

level of exploitation in 1971.

In the light of these considerations the answers to the questions posed in the Canadian Memorandum (Comm.Doc. 73/4) are as follows:

- Q.1 Subject to the qualification necessitated by lack of data on mackerel, three estimates of resource potential indicate the level of fishing intensity associated with the MSY of finfish resources to be 70-80% of the 1971 level.
- Q.2 Presuming mackerel catches in 1973 to be close to the 1971 level, the surplus yield as defined in the Assessments Subcommittee Report, is 846,000 tons, plus whatever catch is allowed for herring. The fishing intensity associated with this catch will be 80-100%, depending on the quota for herring.
- Q.3 The effect of maintaining fishing intensity at the 1972 level varies between species owing to the different levels of exploitation and recruitment prospects, and so it can only be expressed in qualitative terms. For resources having average recruitment and already exploited at or beyond the level associated with the MSY, maintaining fishing intensity at the 1972 level does imply a reduction in the stock, catch and catch-per-unit effort.
- Q.4 Maintaining the catch at the 1972 level for stocks that are expected to decrease will necessitate an increase in effort and intensify present problems. For stocks that might increase, effort would need to decrease and need to divert to other species/areas.
- Q.5 The higher the initial change, the shorter the recovery period, but the adjustment should be
& 6 sufficient to be detectable. For most stocks recovery would be complete after five years.
- Q.7 Days fished, monitored through days on grounds, would be the most efficient units for achieving regulation of fishing mortality in Subarea 5 and Stat. Area 6. A calculation is given in the Assessments Subcommittee Report to illustrate the conversion of standard to national units.
- Q.8 A first approximation indicates the 1973 level of fishing required to catch the established quotas for regulated species to be 62% of the 1971 level.
- Q.9 If estimates are pessimistic, when the error is detected (after 2-3 years) and the regulation amended, both stocks and catches will be better than anticipated, but, if estimates are optimistic, the resources will have deteriorated by the time the error is detected.

Presuming the desirability of protecting mackerel, pending its precise evaluation, and bearing in mind earlier assessments of other stocks, the conclusions presented are consistent with earlier advice. There seems to be no way in which freedom of fishing for mackerel could at the same time adequately conserve other regulated species (particularly herring). If a catch quota were to be put on mackerel, the exploitation of all finfish resources known to attract a major commercial fishery would be regulated by catch, and, since neither total catch nor total effort regulations by themselves solve the by-catch problem, the relative merits of the two approaches cannot be decided on scientific grounds. However, because this problem tends to generate over-exploitation, total catch or total effort regulations taken alone would need to be set at a level below that necessary to achieve the estimated MSY of each stock that would obtain if they could be fished independently.

2. The Status of Other Resources in the ICNAF Area.

The Assessments Subcommittee indicated that it is not yet aware of any significant unforeseen changes in the 1972 fisheries for regulated species. A review of Subarea 1 cod showed the expected catch of cod in 1974 to be about 75,000 tons, when fishing at a level appropriate to the MSY. This estimate may need to be modified slightly at the Annual Meeting.

II. Summary of Herring Working Group Report

- 1. The total herring catch in the ICNAF Area (including Stat. Area 6) declined from 729,000 tons in 1971 to 475,000 tons (with some non-member catches still to come) in 1972. This is only about one-half of the peak 1968 catch. The largest declines occurred in the Gulf of St. Lawrence stocks (Subarea 3 and Div. 4RST) because of continued poor recruitment, and in the Georges Bank fishery which was under quota regulation. It is likely that catches from this latter stock would have declined in 1972 even without catch limitation. The estimated fishing mortality in 1972 was 0.8. In the southern stocks (Div. 4W-X, Div. 5Y, Div. 5Z and Stat. Area 6) the 1970 year-class provided some improvement in recruitment prospects, but quantitative estimates could not be made with confidence.

2. The answers to the Commission's questions given in the Resolution on Herring Research Program (Special Commission Meeting on Herring, January - February 1972, Proc. No. 4, App. VI), insofar as they can be answered, are as follows:
 - a) It is impracticable to rely on closed areas and closed seasons to regulate the ICNAF herring fisheries, because the conservation effect depends critically on the behaviour of the fishing fleets (which is not regulated) outside the closed areas and closed seasons.
 - b) The 1972 quotas resulted in a 34% decline (by weight) in each of the Gulf of Maine and Georges Bank stocks; the effect on the Nova Scotia stock cannot be assessed with any precision.
 - c) The effect of the minimum size limit of 9 inches (22.86 cm) cannot be estimated.
 - d) The level of catch in 1973 to maintain stock size (age 4 and older) at the level at the beginning of 1973 for Div. 5Y is 20,500-30,000 tons, and For Div. 5Z and Stat. Area 6 is 175,000-225,000 tons. However, this criterion is not satisfactory, as the 1973 stock level was reduced even under quota regulation. Stock rebuilding is possible only by fixing the 1973 catch below replacement levels. For the Div. 4W-X stock, recruitment prospects are probably better and no change from the 1972 catch level is recommended.
 - e) For the Div. 5Z - Stat. Area 6 stock, if the 1970 year-class is as good as the 1966 year-class, the 1973 catch at the equivalent of MSY is 135,000 tons. This would result in a stock increase to the level obtained at the beginning of 1972. If the 1970 year-class is 75% of the size of the 1966 year-class, the corresponding 1973 catch would be 115,000 tons, which would result in a stock level of 85% of the stock size at the beginning of 1972.
 - f) For the Div. 5Y stock, the 1973 catch equivalent to MSY is 27,500 tons for the higher recruitment level and 24,500 for the lower recruitment levels. The effects on stock sizes of various catches in 1974 depends on the catches agreed to for 1973 and on the sizes of the 1970 and 1971 year-classes.
3. Assessment of herring stocks in the ICNAF Area is critically dependent on knowledge of future recruitment. No reliable method of determining this is available at the present time. The highest priority should be placed on research programs, especially juvenile and larval surveys, which help to develop a predictive capability. Improvements in statistics and sampling are also required.

III. Other Business

1. STACRES considered an invitation from ICES to participate in or contribute to the Northeast Arctic Fisheries Working Group, 12-17 February 1973 at Charlottenlund, under the chairmanship of Mr A. Høyen. It was agreed that Dr A. Meyer be asked to represent STACRES and to provide a report of the meeting to the May 1973 Meeting of STACRES.
2. STACRES considered an invitation to an ICES Working Group to be held in IJmuiden, 7-8 May 1973, to deal with the statistical aspects of measuring fishing effort in relation to stock assessments. It was agreed that the Secretariat, after consultation, ask two representatives (one from USA and one other) to attend the meeting at national expense.

Appendix I - Report of the Assessments Subcommittee

Chairman: D. J. Garrod

Rapporteur: V. M. Hodder

The Assessments Subcommittee met during 8-13 January 1973 with representatives present from all member countries except Bulgaria, Iceland, Italy and Romania. The main tasks of the Subcommittee were to consider the matters given in the US Memorandum (Comm.Doc. 73/3) and the questions posed in the Canadian Memorandum (Comm.Doc. 73/4) relating to the regulation of fishing effort in ICNAF Subarea 5 and Statistical Area 6.

A. Consideration of the US Memorandum in Support of the US Proposal for the Regulation of Fishing Effort in ICNAF Subarea 5 and Statistical Area 6¹ and the Related Canadian Memorandum (Comm.Doc. 73/3 and 73/4)

1. Introduction

The US Memorandum (Comm.Doc. 73/3) proposes the regulation of total effort in SA 5 and 6. So far as the regulation of a single stock fished in isolation is concerned, the question of regulating the amount in terms of effort, rather than catch, has been examined at length in the past, both by the Bio-economic Working Group and by the Research and Statistics Committee. Although both methods have disadvantages, the balance was considered to be in favour of regulation by catch. The Subcommittee found no reason at the present meeting to change this opinion, so far as isolated stocks are concerned.

In areas where several stocks occur it is highly desirable that the regulations should ensure that each stock is exploited at the proper rate. However, such separate regulations should not ignore the biological interactions that must occur to some extent whenever two or more species occur in the same area. These interactions must be taken into account in making assessments and in setting annual catch quotas. Provided that this is done, the best way, from the biological point of view, to manage a multi-species fishery would be to set individual quotas for each stock.

Such catch quotas now exist for many of the major stocks in SA 5 and 6. However, the current regime has several disadvantages; these include:

- i) by-catch of regulated species taken in other regulated and unregulated fisheries;
- ii) the danger, especially with highly mobile fleets, that particular stocks can be depleted before appropriate regulations are introduced; and
- iii) difficulties of enforcement, particularly of ensuring not only that the regulations are obeyed, but also that they are clearly seen to be obeyed. While fishermen will always suspect records of catch made by other countries, they can check for themselves whether or not the numbers of foreign vessels on the grounds have changed in accordance with agreements.

These disadvantages relate to the content of the US Memorandum, as a result of which the Subcommittee has considered at length the problems involved in the regulation of fishing mortality in the mixed fisheries of SA 5 and 6.

Catch and standardized effort statistics (see Section 5 below) for these areas are given in Tables 1 and 2 by country for the period 1961-71 and are summarized in Table 3. The total annual catches in Table 1 are the aggregate of catches from a number of different species fisheries, most of which have been assessed by the Subcommittee at previous meetings. The combining of these individual assessments into a single assessment of the total resource is described below.

2. The Current Status of Finfish Resources in SA 5 and 6

a) Catch/effort yield curves

The Subcommittee reviewed an assessment by Brown *et al.* (Res.Doc. 73/8) of the total finfish yield in relation to effort.² A Schaefer-type analytical procedure was used. The reasons and necessity for employing this approach and also the inherent problems were discussed. The finfish biomass expressed in this way necessarily involves interactions between species. The

¹ Subarea 5 and Statistical Area 6 are hereinafter referred to as SA 5 and 6.

² This yield does not include large pelagic fishes - sharks (other than dogfish), tunas, billfish and menhaden. The first three species contribute small catches (17,000 tons in 1971); the menhaden catch is a substantial one (240,000 tons in 1971), taken almost exclusively in a relatively small area of coastal waters in the southern part of SA 6. This stock is not considered to make a significant contribution to the biomass of the offshore resources, although some biological interaction may occur.

Table 1. Annual nominal catches (tons) by country associated with the total standardized effort in Subarea 5 and Statistical Area 6.

Year	BUL	CAN	FRA	FRG	ICE	JAPAN ¹	NOR	POL	ROM	SPAIN	USSR	UK	USA	NON-M	TOTAL
1961	-	846	-	-	-	-	140	-	-	-	68521	-	273491	-	342998
1962	-	7087	-	-	-	-	-	535	-	-	209370	-	317303	-	534295
1963	-	17958	-	-	-	-	-	-	-	-	238732	-	329262	-	585952
1964	-	23988	-	-	-	-	-	723	-	22	364023	1050	369717	-	759523
1965	-	29265	-	-	-	-	-	4543	-	69	534086	-	348399	3081	919443
1966	-	41639	-	-	-	-	-	16103	-	9531	587433	107	274172	5648	934633
1967	-	37086	-	28288	-	452	-	41264	1766	16250	314753	48	260115	22978	723000
1968	-	58793	53	71512	292	7260	-	92493	2892	18016	334670	-	183086	71702	840769
1969	-	18548	5	73797	12786	16922	-	66821	621	15526	482514	-	162962	91742	942244
1970	-	12142	-	92842	-	29659	-	143714	2720	8163	267405	-	157840	70905	785390
1971	44892	21668	-	59661	-	27909	-	220587	8694	13373	404646	-	148655	108035	1058420

Table 2. Fishing effort (days fished)², standardized to US small OT and adjusted for learning, in Subarea 5 and Statistical Area 6.

Year	BUL	CAN	FRA	FRG	ICE	JAPAN ¹	NOR	POL	ROM	SPAIN	USSR	UK	USA	NON-M	TOTAL
1961	-	88	-	-	-	-	16	-	-	-	2255	-	36592	-	38951
1962	-	720	-	-	-	-	-	96	-	-	18583	-	47813	-	67212
1963	-	1670	-	-	-	-	-	-	-	-	19689	-	39739	-	61098
1964	-	2437	-	-	-	-	-	239	-	3	47117	129	43494	-	93419
1965	-	2930	-	-	-	-	-	1136	-	6	59397	-	46801	303	110573
1966	-	4272	-	-	-	-	-	816	-	1288	81603	15	40063	440	128497
1967	-	4951	-	1278	-	72	-	2579	86	2689	54584	7	34695	2421	103362
1968	-	6953	8	9796	46	1164	-	12039	419	2712	62492	-	27787	9002	132418
1969	-	2939	1	14312	2691	3405	-	12282	191	2928	121387	-	25447	11791	197374
1970	-	2033	-	19380	-	3369	-	28459	764	1874	59192	-	27741	8563	150875
1971	7258	3165	-	11483	-	4750	-	38875	1568	3081	79093	-	25519	18884	193676

¹ Japanese figures adjusted during Subcommittee Meeting, January 1973, causing slight changes (1%) in the totals differing from those in Table 3.

² These estimates include the fishing effort of trawls and purse seines fishing for the catches given in Table 1.

Table 3. Estimates of unadjusted effort, standardized effort without learning, standardized effort with learning, total catch, catch/unadjusted effort, catch/standardized effort without learning, and catch/standardized effort with learning for the years 1961-1971 in SA 5 and 6 (from Res.Doc. 73/8).

Year	Unadjusted effort	Effort without learning	Effort with learning	Catch	Catch per unadjusted effort	Catch/effort without learning	Catch/effort with learning
1961	36998	43710	38951	342998	9.27	7.85	8.81
1962	53555	67764	67212	534295	9.98	7.88	7.95
1963	48875	78121	61097	585952	11.99	7.50	9.59
1964	60831	97466	93418	759523	12.49	7.79	8.13
1965	64518	103550	110573	919443	14.25	8.88	8.31
1966	64513	114305	128497	934633	14.49	8.18	7.27
1967	63978	95845	103027	723027	11.30	7.54	6.99
1968	69776	121712	132887	840769	12.05	6.91	6.33
1969	88486	163938	198315	942244	10.65	5.75	4.75
1970	67824	127083	151883	782690	11.54	6.16	5.15
1971	71999	154415	191389	1065713	14.80	6.90	5.57

exact nature of these relationships is not explicit but it is desirable to somehow include them. Utilizing the total yields and total effort does, to some degree, accomplish this, albeit with several simplifying assumptions. To what extent the model does approximate the true underlying system cannot be very strictly evaluated, but the model does represent the first approximation.

A second aspect is the inter-calibration of different types of vessels and gears of different countries with respect to their ability to generate a unit fishing mortality. Some critical remarks were presented regarding the accuracy of the model used to estimate standardized days fished, but, taking into account the data available, it was agreed that these were the best estimates which could be provided at present. It was pointed out that the "standardized" effort derived for this study is really an index of fishing intensity appropriate for the period concerned, and not necessarily a measure of "fishing power" which might be desired for other purposes.

The effort was also adjusted for a learning factor. The discussion indicated that learning was a factor which had to be taken into account. Many options are available for doing this; the method used incorporates US research vessel survey data, and hence is as independent and unbiased as evaluation as is possible. The learning factor was estimated for several countries to give a mean value, but it was recognized that the factor may vary between countries, and an opinion suggesting a lower factor for Polish vessels was given by the Polish member of the Subcommittee.

Because learning tended to be higher in the early part of the 1961-71 period, the effect of using the learning factor actually reduces the estimated rate of increase in effort over years. However, in terms of conclusions, the effect is not to change the direction of indicated action, but rather the degree by about 50%. Overall, the possible inaccuracy appears less if the learning factor is used, and the main conclusions are based on this.

A third aspect of the method that was discussed was the length of time in which a species contributed to the fishery, and, hence, the "lag time" effect in trying to assess the equilibrium conditions from annual data over a period of continuing increase in fishing effort. This problem may be overcome by using a running average of effort over the appropriate time-span. In view of the species involved, the three-year running average seemed the most appropriate.

The yield-effort curves are given in Figs. 1 and 2, and the indicated current status of the total resource in Table 4.

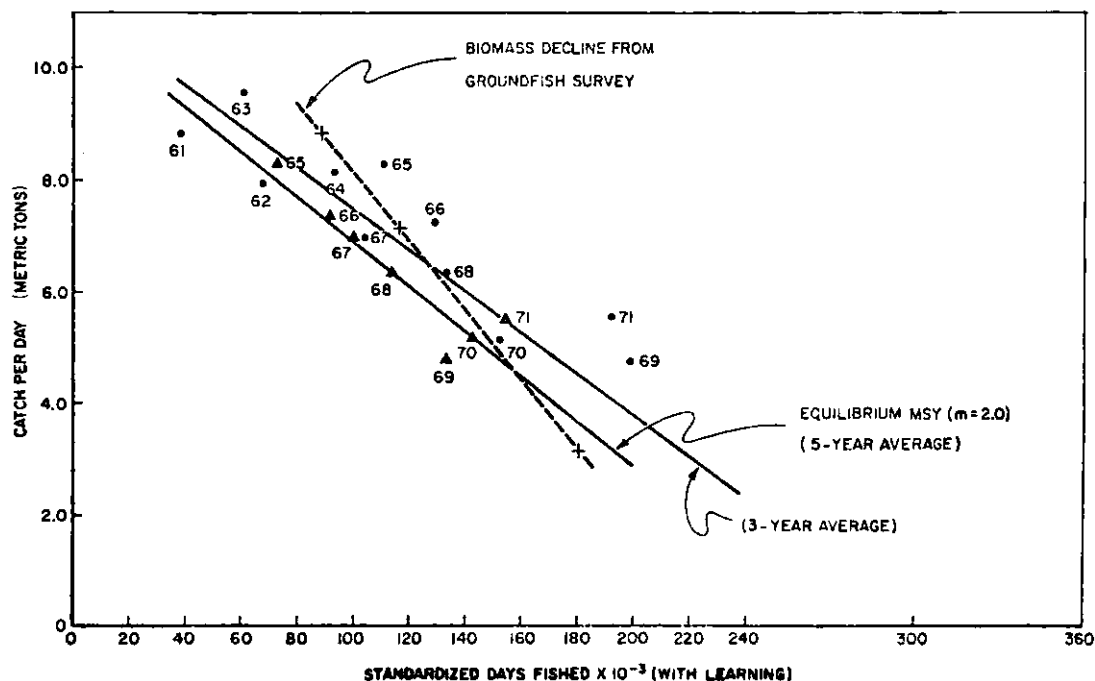


Fig. 1. Abundance of finfish biomass versus total fishing effort in SA 5 and 6.

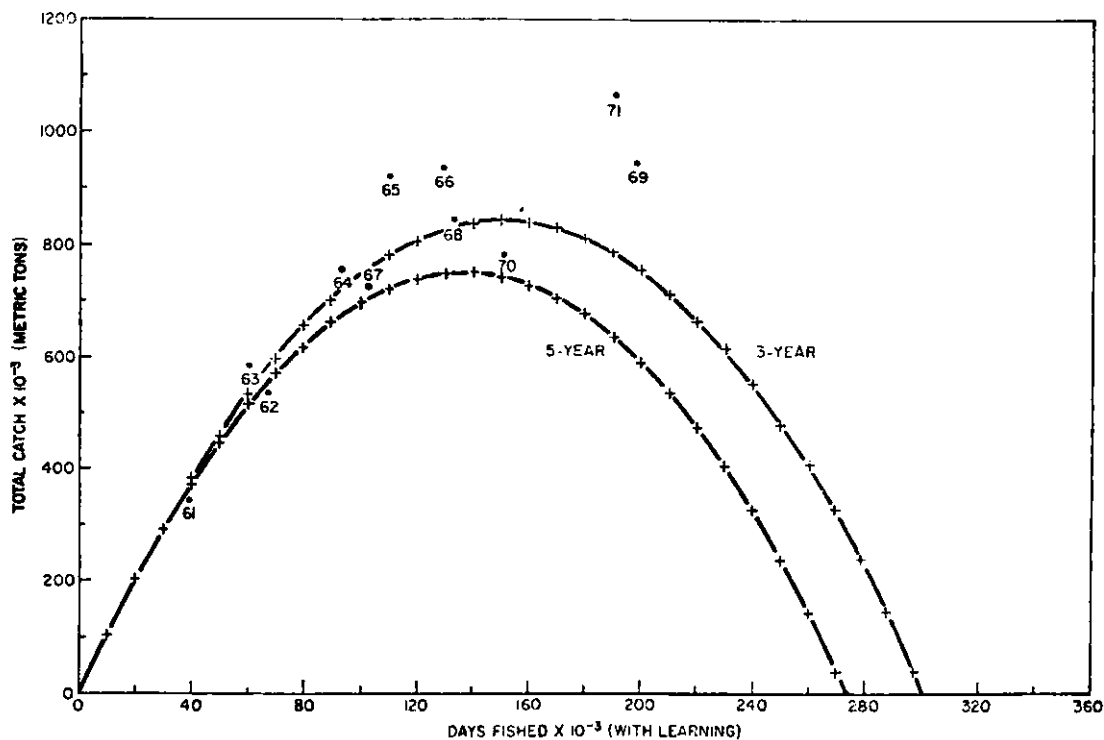


Fig. 2. Total finfish yield versus total fishing effort in SA 5 and 6.

Table 4. Summary of estimates of finfish maximum sustainable yield and effort.

Source	Max. Sust. Level		Ratio of MSY to 1971 catch	Standardized effort at MSY relative to standard effort for 1971
	Yield (¹ 000 tons)	Standardized effort		
Catch/effort yield curve	843	151 ²	843/1066 = 0.79	151/191 = 0.78
Yield per recruit curve	855	120 ²	855/1066 = 0.80	120/155 = 0.77
Sums of species assessments	1202 ¹	215 ²	1202/1066 = 1.13	215/287 = 0.75
Primary productivity	1000	-	1000/1066 = 0.94	-

¹ Includes 600 for herring and mackerel, and an allowance of 100 for other pelagics and other fish (see Table 9).

² These estimates cannot be directly compared with each other.

b) Yield-per-recruit assessment

Advice to the Commission is often given on the basis of consideration of yield-per-recruit. In particular, the Report of the Assessments Subcommittee in 1972 (*Redbook* 1972, Part I, p. 15-42) indicates that two points of reference are available: F_{max} and $F_{0.1}$, the latter being related to economic optimization. In Table 4 the yield and effort are related to the mid-point of these two values, which is probably very near the maximum sustainable yield. The curve is shown in Fig. 3.

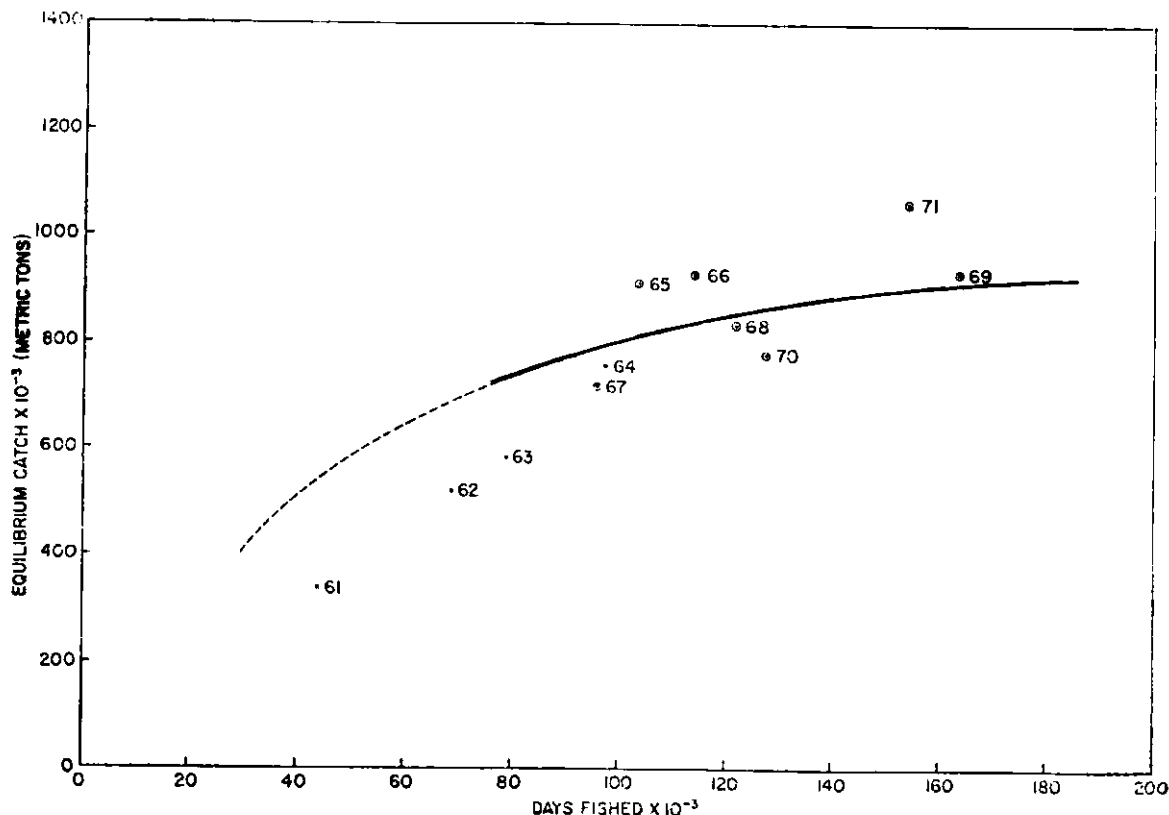


Fig. 3. Estimated equilibrium yield versus days fished for SA 5 and 6.

c) Individual species assessments

The assessments of yields of individual species have been obtained from analysis of catch/effort data and research vessel survey data. These data were given in previous Assessments Subcommittee Reports and in Research Documents. Also, the Subcommittee at this meeting prepared an analysis taking into account the aspects of mixed fisheries and the best available estimates of fishing mortality and effort.

The discussions related to this analysis clearly indicated that the variability of allowable effort in 1973 to achieve sustainable yields depended almost solely on the mackerel stock, but the level of effort required to achieve the MSY for mackerel was less critical to the MSY of the total resources because it could be taken from long-term considerations. Also, the effort was expressed in terms of that employed in 1971, rather than the 10-year average, and hence is more realistic. The relevant data are given in Table 4.

It should be noted that this type of estimation does not take into account the effect of species interrelationships. It was noted that mackerel and herring are interrelated to some extent, such that the potential total MSY of mackerel and herring may be less than the sum of the MSY of the individual species, when these are based on assessment of data collected over a short period.

d) Primary productivity

The USA presented an analysis of finfish productivity based on consideration of primary production. The values were taken from the estimation of previous studies and applied according to the method of Ricker. The estimate is given in Table 4. Previous studies have shown that this type of estimation can give an indication of production. It is, in any case, a useful reference point in relation to the subject of unexploited resources.

e) Trends in fishing effort in 1972

The USA conducts weekly overflights of the area which record the numbers and kinds of all fishing vessels. Tables 5A and 5B give the results of analysis of these data. In terms of vessels on the grounds, the number of vessel-months increased by 7% from 1971 to 1972 over the first 11 months of the year. The estimate for the year, based on vessel weeks, indicated an increase of about 10%. Virtually all of the increased effort appears to have occurred in the first half of the year (Table 5B).

The composition of the fleet in terms of size and type of vessel also changed. In particular, the ratio of large stern trawlers to medium side trawlers increased from 0.7 in 1971 to 1.02 in 1972. It has been estimated that large stern trawlers are about 3.5 times as effective as medium side trawlers. To evaluate the vessel increase in terms of effective fishing effort, the raw data of days fished for trawlers observed in 1971 and 1972 were converted by using the estimated ratio. The resultant increase in total effort was about 25% between 1971 and 1972.

Bearing in mind the variability of power factors and the increased proportion of stern trawlers in 1972, the Subcommittee concluded that the increase in fishing effort from 1971 to 1972 was considerably in excess of 10%. However, it is not possible to state to what extent the extra effort might have been diverted towards regulated or unregulated species.

The reduction from 1972 required to implement a given management policy based on the 1972 effort would need to be greater than the changes from the 1971 effort level set out in Table 4.

Table 5(A). Estimates of 1972 fishing effort, based on vessel sighting by USA flights.

Procedure

- 1) Vessels were identified by flights which occurred 2 to 3 times each week.
- 2) Vessel sight weeks were tabulated giving days on ground observed.
- 3) Days fished in 1972 were obtained by adjusting days observed by the ratio of days observed in 1971 to days fished reported to ICNAF in 1971.

Results

All countries: Days fished Jan-Dec 1972 - 79,000
 Days fished Jan-Dec 1971 - 72,000 = 9.7% increase

However,

Ratio of stern to side trawlers in 1971 was 0.7

Ratio of stern to side trawlers in 1972 was 1.02

Assuming all effort but Canada and USA to be in this ratio and these figures adjusted by relative catchabilities of 7.0 : 2.0 : 1.0 for stern : side : USA and Canada, then "effective" effort increased from 192,000 in 1971 to 240,000 in 1972, an increase of 25%.

Table 5(B). US overflight observations in 1971 and 1972
 (all countries except USA and Canada).

Month	1971	1972	%
Jan	124	258	+108
Feb	257	291	+ 13
Mar	258	306	+ 19
Apr	288	329	+ 14
May	310	267	- 14
Jun	185	216	+ 17
Jul	126	165	+ 31
Aug	241	241	0
Sep	277	294	+ 6
Oct	271	272	0
Nov	274	147	- 46
Dec	?	?	?
Total			
Vessel Months	2,611	2,786	+ 7 ¹

¹ The equivalent % increase on the basis of vessel weeks is 10%.

f) Unexploited species potential

The Subcommittee reviewed the available information related to possible elements of the finfish biomass that might provide significant increases in catch. There are two sources of information: research vessel surveys and commercial catches. A large number of research vessel surveys have been conducted by various countries in the area. The results of these have been presented in a number of publications and in Research Documents. These surveys of the continental shelf down to 250 fm (457 m) have not produced evidence of significant resources that are not now included in the estimates of potential yield. The area is now comprehensively fished by the commercial fisheries. On the continental shelf there are no areas containing large resources which are not now fished. If there were such a large biomass of fish, some evidence of this would most likely show up in the catches. The fact that this has not been demonstrated is further evidence of the absence of any large finfish resources not now included in assessments.

The main conclusion to be drawn from Table 4 is that the 1971 catch was taken at or beyond the MSY and the effort was significantly beyond the level corresponding to the MSY. Thus, continuing the fishing at the 1971 level or greater would in the long term reduce stock abundance, catch/effort and total catch. However, it is evident that the overlap between the various fisheries would create considerable difficulties in controlling the fishing mortality on each species separately. The magnitude of this overlap is shown in the next Section.

3. The Overlap Between Fisheries Directed at Particular Species

The Subcommittee studied at some length the magnitude of the by-catch problem, using the detailed statistics for SA 5 and 6 in 1971 given in the Statistical Bulletin. In cases where no "main species sought" was indicated or it was shown as "mixed", the effort was allocated to species according to catch on a monthly basis. In virtually all cases this could be done without any doubt. Tabulations were made of the quantities taken of one species in a fishery apparently directed to other species (Supplement Tables 1 and 2). As an example, the data for Subarea 5 were summarized according to the impact of the fishery directed towards one species upon the by-catch of the first (incidentally sought) species, and classifications were made of the occasions on which (during 1971) the by-catch of a certain species formed a given percentage of the total catch, in all fisheries, of that species. The results are summarized in Table 6, in two parts. The first (Table 6A) gives, for each fishery, the species for which the by-catch of that species falls into certain percentage categories. Thus, for example, the silver hake fishery takes more than 10% of the total catch of each of the four categories of flounder, other groundfish, other pelagic fish, and other fish. The other part (Table 6B) shows, for each species, those fisheries which take a given percentage as a by-catch. For example, more than 10% of the total haddock catch is taken as by-catch in each of the cod and flounder fisheries.

The effects of by-catch on the potential yield depend on the sizes of fish taken as well as on the quantities caught. If the individual fish in the by-catch are the same size as in the directed fisheries, the effect of the by-catch is the same as if the same quantities were taken in the directed fisheries. The sustainable yield would be unaltered, although the magnitude of the by-catch should be taken into account in setting the quotas. However, the individuals in the by-catch are often smaller than those in directed fisheries and below the optimum size at first capture. This would tend to reduce the sustainable yield.

4. Methods of Regulating Fishing Mortality in a Mixed Fishery

In principle, the second objection referred to in the Introduction (Section 1) could be overcome by greater readiness on the part of the Commission to set preliminary and precautionary quotas before the detailed assessments are available; and it might be noted here, as an example, that in retrospect it might have been highly desirable to have set such quotas for mackerel in 1971. It may however be doubted whether the Commission will find it easy to reach such agreements. Also, if the present species quotas were extended to cover all the large number of species that occur in the southern part of the ICNAF Area in significant quantities, the problems of implementing and enforcing the regulations would become extremely complex. At the same time the Subcommittee noted that there was little evidence of any large unexploited resources of finfish in SA 5 and 6. Therefore there would be no losses (in terms of missed opportunities for expansion) by putting some limit on the overall amount of fishing in SA 5 and 6, but such a limit, considered as a supplement to the species quotas, could overcome some of the objections outlined in the US Memorandum.

An overall limit in terms of catch would be a partial solution. In effect it would be a combined quota for all unregulated species, which could be increased to the extent that quotas for the regulated species are not reached. If properly enforced it would reduce many of the problems concerning by-catches and rapidly developing fisheries, while still allowing a good deal of flexibility in actual operations. However, some of the questions of enforcement would still remain.

Alternatively, the overall limit could be set in terms of fishing effort. Two possibilities were considered: a limit on total effort (excluding certain fisheries, such as those for shellfish), and separate limits for separate fisheries, such as those for particular species or groups of fish; for example, pelagic and demersal. Undoubtedly the unavoidable by-catch (*i.e.* fish taken incidentally and unintentionally in an operation directed wholly at another species) would be better controlled by separate limits on each type of fishery; for example, a limit on demersal fishing controls haddock by-catches better than a limit on all types of fishing. However, a significant source of by-catches (and one that is important to the economic success of some fisheries) is the more deliberate opportunistic switching of attention from one (usually commoner) species to another more preferred species whenever concentrations of the latter are detected. For example, a vessel fishing mixed groundfish may change to herring if a school of herring is detected or good concentrations are reported by other vessels.

This adaptability, particularly marked in the fleets of large mobile vessels, makes difficult the enforcement of separate effort limits for different groups of species. Also, such separate limits might be less attractive than an overall limit; for example, 2,000 days fishing, which may be directed in the optimum manner under the conditions experienced in the year concerned (provided catches are kept within such species quotas as exist), are more valuable than 2,000 days fishing, 1,000 of which must be directed to pelagic fish and 1,000 to demersal fish. Therefore, if an effort limit is set, it should preferably be an overall limit of all types of fishing. Exceptions should, however, be made for certain specific fisheries (*e.g.* scallop) which are quite distinct from the major finfish fisheries in SA 5 and 6.

Table 6. Interrelationships between main species fisheries and the associated by-catch of other species based on 1971 data for Subarea 5.

A. Species affected, *i.e.* for which given percentage of total catch is taken as by-catch in fishery considered.

Fishery (main species sought)	>10	5-10	2-5
Cod	Had		
Haddock	Cod		Red,Flo,OG
Redfish			Cod,Had
Silver hake	Flo,OG,OP,OF	Cod,Had,Her	Red
Flounder	Cod,Had,Red	OG	
O. Groundfish		SHa,OF	Cod,Had,OP
Herring	OP,OF	Red,SHa,OG	Cod,Flo
Other Pelagic	Red,OF	SHa,Flo,OG	Her
Other Fish		OG	SHa,Flo

Note: For example, the silver hake fishery takes more than 10% of the total catch of each of the four categories of flounder, other groundfish, other pelagic fish, and other fish.

B. Fisheries which take given percentage of species considered.

Species	>10	5-10	2-5
Cod	Had,Flo	SHa	Red,OG,Her
Haddock	Cod,Flo	SHa	Red,OG
Redfish	Flo,OP	Her	Had,SHa
Silver hake		OG,Her,OP	OF
Flounder	SHa	OP	Had,Her,OF
O. Groundfish	SHa	Flo,Her,OP,OF	Had
Herring		SHa	OP
Other Pelagic	SHa,Her		OG
Other Fish	SHa,Her,OP	OG	

Note: For example, more than 10% of the total haddock catch is taken as by-catch in each of the cod and flounder fisheries.

5. Relative Performance of Fishing Vessels

An essential requirement in the derivation of a fishing effort regulation, as proposed in the US Memorandum for multi-national, multi-species, multi-gear and vessel type fisheries, such as those operating in SA 5 and 6, is the determination of the total fishing effort on a standardized basis. This necessitates the estimation of relative fishing performance factors for each of the main components of the total fishery, which can be used in computing total standardized effort and its allocation between countries.

Factors were estimated for each main component of the SA 5 and 6 fisheries for 1971, using the monthly catch and fishing effort data reported in Table 4 of the ICNAF *Statistical Bulletin*, and using the US class 2 (0-50 tonnage class) side trawlers as standard. Data for fishing directed specifically to shellfish and those for specialized fisheries for finfish (e.g. menhaden, and such large species as swordfish and tuna) were omitted from the analysis. Factors representing the ratios of the catch-per-unit-effort, in days fished, of the different components to the standard unit were first estimated for each month (Table 7), and the monthly values were then averaged to give for each component an unweighted mean annual estimate. These estimates are summarized in Table 8.

Table 7. Fishing performance factors relative to US OTSI Class 2 (0-50 tonnage class) in 1971.

Month	Catch/day fished		Relative fishing performance								
	US OTSI	US OTSI	US OTSI	CAN OTSI	USSR OTSI	POL OTSI	USSR OTSI	CAN OTSI	POL OTSI	FRG OTSI	USSR OTSI
	2	3	4	4	4	5	5	5	6	6	7
Jan	4.91	1.27	1.15	-	1.00	1.27	1.88	-	11.59	8.59	8.45
Feb	5.11	1.09	0.98	-	0.82	0.99	1.46	1.31	3.28	-	6.57
Mar	4.94	1.06	1.56	-	1.44	2.13	1.80	2.02	7.69	-	6.89
Apr	3.91	1.48	1.83	-	1.60	2.98	2.36	-	8.35	-	11.14
May	3.86	1.53	1.96	1.52	1.81	2.61	2.68	2.10	6.24	-	8.93
Jun	4.48	1.23	2.22	1.38	2.26	1.43	2.83	1.44	5.78	-	8.81
Jul	6.99	0.98	1.14	0.75	1.02	1.21	1.38	0.81	4.04	-	4.98
Aug	7.90	1.06	0.95	0.75	0.80	4.98	1.10	0.95	2.20	4.42	4.42
Sep	5.63	0.97	1.32	0.92	1.28	1.57	1.44	-	7.84	4.98	4.80
Oct	4.03	0.93	1.66	1.39	1.65	1.30	2.06	2.54	7.76	15.28	6.46
Nov	4.57	0.95	1.40	1.02	1.25	1.11	2.03	1.60	6.86	10.46	7.03
Dec	3.98	0.90	1.16	1.04	0.95	1.69	1.86	0.46	11.45	8.57	8.38
$\bar{x}$		1.12	1.44	1.09	1.32	1.57	1.91	1.83	6.92	8.72	7.26
s^2		0.04	0.16	0.09	0.19	0.49	0.61	1.23	8.36	15.70	4.01
$\bar{\ln x}$		1.10	1.40	1.06	1.26	1.42	1.84	1.61	6.28	7.99	7.00
$e \text{ var } \ln x$		1.03	1.08	1.08	1.11	1.25	1.08	1.31	1.28	1.24	1.08

Month	Relative fishing performance									
	POL OTSI	FRG OTSI	ROM OTSI	BUL OTSI	SPAIN PT	US PS	US PS	US PS	USSR PS	USSR PS
	7	7	7	7	4	2	3	4	4	5
Jan	12.71	4.33	-	8.76	-	-	-	-	-	-
Feb	5.66	-	-	8.34	3.37	-	-	-	-	-
Mar	9.01	-	8.19	10.23	2.63	-	-	-	-	-
Apr	9.06	-	5.12	12.70	-	5.11	-	29.40	-	-
May	8.15	-	7.59	9.53	1.81	-	-	-	4.01	4.71
Jun	7.38	-	3.33	9.20	1.19	-	-	-	5.09	5.00
Jul	3.98	7.76	2.87	4.36	1.88	11.59	-	-	2.68	3.17
Aug	2.02	4.16	2.38	3.33	3.23	4.60	16.30	26.80	-	-
Sep	6.91	7.90	2.47	3.79	4.57	2.13	38.40	44.00	-	8.13
Oct	10.35	18.46	4.25	6.43	5.13	-	-	94.30	-	6.02
Nov	7.77	9.52	3.66	6.12	4.66	2.40	-	51.00	-	5.03
Dec	15.49	9.60	5.29	9.42	-	-	-	-	-	14.40
$\bar{x}$	8.29	8.82	4.52	7.68	3.16	5.16	27.40	49.10	3.93	6.63
s^2	12.02	23.00	4.18	8.29	1.97	-	-	-	-	-
$\bar{\ln x}$	7.59	7.87	4.14	7.12	2.86	4.25	25.00	44.10	3.80	5.95
$e \text{ var } \ln x$	1.23	1.30	1.20	1.20	1.28	-	-	-	-	-

The Subcommittee wishes to draw attention to the following points:

- i) The principle of standardization of fishing effort is crucial to the conclusions of this report, but the choice of a particular national unit is not. As they have been calculated, the relativities between vessel types would not change if some other standard vessel had been chosen.
- ii) The estimates of percentage change in fishing effort from the 1971 level to meet a Commission objective depend primarily on the level of fishing mortality in that year and the relative size of the different species fisheries. They are not sensitive to the choice of vessel standard.
- iii) With regard to the implementation of a fishing effort regulation, the variability of the vessel comparisons between years and between countries would make it impossible to define the historic performance of a particular vessel/country category in precise terms. This again does not invalidate the overall proportional changes in effort necessary to achieve a Commission objective.

Table 8. Relative fishing performance factors for SA 5 and 6 fisheries in 1971 with US 0-50 vessel class side otter trawlers (OTSI 2) taken as the standard.

Component of fishery	Mean annual factor	Component of fishery	Mean annual factor	Component of fishery	Mean annual factor
USA OTSI 3	1.12	POL OTSI 5	1.57	BUL OTST 7	7.68
USA OTSI 4	1.44	POL OTST 6	6.92	USA PS 2	5.16
CAN OTSI 4	1.09	POL OTST 7	8.29	USA PS 3	27.40
CAN OTST 5	1.83	FRG OTST 6	8.72	USA PS 4	49.10
USSR OTSI 4	1.32	FRG OTST 7	8.82	USSR PS 4	3.93
USSR OTSI 5	1.91	ROM OTST 7	4.52	USSR PS 5	6.63
USSR OTST 7	7.26	SPAIN PT 4	3.16		
OTSI - side otter trawler		2 - vessel tonnage category 0-50 tons			
OTST - stern otter trawler		3 - vessel tonnage category 51-150 tons			
PT - pair trawler		4 - vessel tonnage category 151-500 tons			
PS - purse seine		5 - vessel tonnage category 501-900 tons			
		6 - vessel tonnage category 901-1800 tons			
		7 - vessel tonnage category over 1800 tons			

Note: It must be stressed that these factors do not represent relative fishing powers of the different country, gear and vessel type categories for individual species or groups of species, since they are based on ratios of catch rates of vessels fishing in different parts of SA 5 and 6 on different species and fish densities. Instead, they constitute measures of the relative amounts of fish caught per unit of effort (measured as days fished) within SA 5 and 6 in 1971. They therefore provide a basis for computing total standardized fishing effort on all fish resources combined in 1971, and for determining the total effort, and its allocation between countries and major fishery components, under a regulation involving a reduction in total fishing effort, provided that the distributions and patterns of fishing remain the same as in 1971.

6. Consideration of Questions Posed in the Canadian Memorandum (Comm.Doc. 73/4)

a) Preamble

Some of the methods used in this first assessment of mixed fisheries do not yet have a well-tried theoretical background; the attempt to aggregate features from diverse fisheries into a single estimate necessarily involves extensive assumptions and simplifications. The details of the results achieved depend on the exact nature of these adjustments, but, nevertheless, the Subcommittee feels that the assessments represent the overall situation and provide an adequate basis to advise in general terms on the questions posed.

An attempt has been made to relate the estimates of fishing mortality, as prepared at the 1972 Annual Meeting for stocks in 1971, to the nominal catches in that year and to new estimates of the overall standardized fishing effort in SA 5 and 6. These estimates (Tables 9 and 10) are subject to two qualifications:

- 1) Statements based on these relationships will be influenced by the fishery in 1972, for which no complete catch and effort data are yet available.
- 11) It is also evident that the appropriate level of overall fishing effort is critically determined by the state of the fisheries for herring and particularly (because it is presently unregulated) for mackerel. The Subcommittee has been able to carry out only a very preliminary assessment of the mackerel stock, and estimates of MSY, the associated fishing effort and current status for this stock are tentative.

b) Question 1: What was the magnitude of fishing intensity in 1971 and 1972 relative to that corresponding to or needed to produce the maximum sustainable yield of finfish?

As noted above, the potential of the mackerel fishery has a critical bearing on the level of fishing intensity necessary to produce the MSY of finfish (mackerel represented 33% of total finfish catch as given in Table 1 for 1971). The level of fishing associated with the MSY on this fishery is not known precisely, but, on the basis of the age composition of the stock in 1972 and the principle that it is undesirable to reduce the mackerel stock to a level lower than that which existed in 1971, the Subcommittee considered that, for the time being at least, the fishing effort should not exceed the 1971 level. The problems in assessing mackerel are such that not all members of the Subcommittee could agree on its present status; therefore, the best advice that the Subcommittee can provide for the Commission in regard to this Question is that the level of fishing intensity associated with the MSY of finfish is estimated to be of the order of 70-80 percent of the 1971 level (which was estimated for 1971 to be 213,830 days fished, standardized to US OTSI 0-50 tonnage class vessels). At the same time the Commission should note that, in a mixed fishery of this type, the interactions between fisheries directed towards particular species are so complex that it may prove impossible to exploit all of them simultaneously at the MSY level. The MSY of the total finfish resource is expected to be lower than the sum of the MSY's of the individual resources, but at present we do not know how much lower.

c) Question 2: What is the harvestable surplus yield for 1973 and the magnitude of fishing intensity required to produce it?

Table 9 compares the nominal catches in 1971 with the long-term maximum sustainable yield of individual resources and with potential catches in 1973. For regulated species (except herring), these 1973 catches correspond to the quota (and in some instances exceed scientific estimates of the surplus yield); for unregulated species for which the MSY's are given (except mackerel), the potential catches are equivalent to the MSY's; for mackerel the potential catch is given as slightly lower than the 1971 catch but higher than the MSY; and for other unregulated groups of species the potential catches are taken to be equivalent to those in 1971. The potential yield of finfish in 1973 amounts to 846,000 tons (exclusive of herring, the catch of which in 1973 has yet to be determined by quota). The magnitude of fishing intensity associated with this total will be within 80-100 percent of the 1971 level, depending on the quota to be determined for herring.

Table 9. Estimates of catch characteristics of resources in SA 5 and 6.

Species	Long-term		1971		1973 (See Sect. 6, Quest. 2)	
	MSY	F	Catch	F		F
Cod	45	.3	35	-	45	.3
Haddock	50	.5	12	.5	6	.5
Silver hake	200	.5	108	.8	170	.5
Red hake	40	.5	40	.5	40	.5
Yellowtail	37	.8	38	.9	31	.8
Herring	350	.5	326	.8	?	.5
Redfish	30		20		30	
Pollock	(50) ³		15		(50) ³	
Mackerel	(250) ³		349		(300) ³	
Dogfish	50		1		50	
Other Flo.	20		27		27	
Other Pel.	?		17		17	
Other Fish	?		80		80	
Total			1,068 ¹		846 ²	

¹ This total differs slightly from 1,066 in Table 1 due to rounding error.

² Excludes herring.

³ Estimate very uncertain.

Table 10. Estimates of fishing effort in SA 5 and 6.

Species or species group	Fishing effort ('000 standard days fished)	
	In the directed fishery	On the species (Includes effort in the by-catch of other fisheries)
Cod	2,824	7,851
Haddock	4,475	11,588
Silver hake	28,697	41,630
All Flounders	14,754	21,486
Redfish	1,478	2,421
Other Groundfish (incl. Red hake)	11,442	33,581
Herring	63,351	76,266
Other Pelagic (mainly mackerel)	82,360	95,111
Other Fish	4,449	31,341
Total	213,830	

Note: Some of the species listed in Table 9 cannot be identified as separate fisheries within the ICNAF statistics and therefore do not appear separately in Table 10.

- d) Question 3: What is the consequence over the next 3 years, 1973-1975, of maintaining the fishing intensity at the 1972 level?

It is impossible to estimate the effect of maintaining the fishing intensity at the 1972 level in 1973 to 1975 in terms of the potential catches in these years, because data are not yet available to determine the effective fishing effort in 1972 or the recruitment to the stocks in the immediate future. Taking into account what little is known about recruitment, the following summary indicates the expected status of the resources in 1975 relative to that in 1971 for individual species, if fishing intensity remains at the 1971 level:

Species	Status
Cod	same
Haddock	lower
Silver hake	same, but depends critically on effect of fishery in 1972
Red hake	slightly higher, but depends critically on effect of fishery in 1972
Yellowtail	same, or perhaps lower
Redfish	same
Herring	much lower
Mackerel	unknown
Other demersal finfish	probably lower
Other finfish	unknown

An inference as to the effect of maintaining the fishing intensity over the next three years can be obtained from the yield curves (Fig. 1 and 2), assuming an average level of recruitment. Assuming a level of effort in 1972 which is 25% greater than in 1971, continuation at the 1972 effort through 1975 would imply that at the end of that period the catches would be approaching the equilibrium level, only 65% of MSY. However, the effort required to do this would then be 40% in excess of that which would produce MSY under equilibrium conditions, and catch-per-unit-effort would be only 41% of that MSY and equilibrium effort level.

- e) Question 4: What is the consequence over the next 3 years, 1973-1975, of maintaining the catch at the 1971 or 1972 level?

The implications involved in maintaining the catch at the 1971 or 1972 level are very complex, because for several species this implies a level of exploitation well in excess of the MSY and recruitment must also be taken into account.

It is possible that such a regulation would involve further increase in the amount of fishing in SA 5 and 6. The expected effects of maintaining the catch at the 1971 level, on both the stocks and the fishing associated with them, are as follows:

Species	Stock level	Fishing effort
Cod	same	same
Haddock	decrease	increase
Silver hake	increase	decrease
Red hake	increase (?)	decrease (?)
Yellowtail	same	same
Redfish	same	same
Herring	decrease	increase
Mackerel	unknown	unknown
Other demersal fish	decrease	increase
Other finfish	unknown	unknown

The exact effects depend on the by-catch of other species in fisheries directed toward particular species.

If the stock (of a species) increases through favourable recruitment, then the existence of a quota at the 1971 level of catch would in effect require less fishing effort to acquire the quota. Therefore, if the quota regulation is adhered to, there would be a surplus of fishing effort available to divert to other fisheries; but within SA 5 and 6 the only major unregulated finfish resource is mackerel (and possibly some dogfish and pollock). So the implication of

maintaining the catches of particular species at the 1971 catch level could lead to an undesirable increase in fishing directed toward mackerel (or one or two other minor species) or diversion of effort to other areas. Thus, if an increase in fishing on mackerel is to be avoided, it would be preferable to regulate the amount of fishing in SA 5 and 6 or to introduce a catch quota regulation on mackerel.

An inference as to the consequence of maintaining the catch at the 1971 or 1972 level over the next three years can be obtained from the yield curves (Fig. 1 and 2). Assuming that effort increased 25% in 1972 over 1971, to maintain the catch would require further increases over the next three years. Such an increase in effort may only in the short term be productive of more fish. In the long run the current level of catch would not be maintained even with increases in effort.

- f) Question 5: What are the consequences of adjusting fishing intensities to the level corresponding to the maximum sustainable yield in one or in more steps?
Question 6: What is the time period required to bring catches back to the maximum level under the schemes considered in Question 5?

In principle, the fishing intensity could be adjusted in such a way that there would be no detectable effect on total catches over and above the normal annual fluctuations. But this would imply such gradual adjustments that it would be impossible to ascertain if the regulation was being effectively implemented, especially since these small reductions in overall fishing effort could easily be offset by improvements in efficiency. It is necessary, therefore, that any reduction in fishing intensity should be set at a level that can be detected. This implies a more substantial immediate loss in catch but at the same time a shorter period for the stocks to recover to the intended level (regulation objective). This time period has not been estimated exactly, but in theory it would be expected to be about one-half of the period during which year-classes make a significant contribution to the fishery (in practice this would be somewhat less than 5 years for most species).

Inferences drawn from the yield/effort curves imply that the difference between one- and two-step adjustments is relatively small at the levels of reduction indicated. If, for example, a 25% decrease below 1971 is indicated, then the two-step values could be 15 and 12 percent. By comparison with a one-step reduction, increasing the number of steps beyond two or three would probably cause significant loss in interim potential catch, depending on the difference between the number of years that it takes to reach equilibrium MSY.

- g) Question 7: What are the options for selection of units of effort for management purposes, evaluated in terms of efficiency in achieving regulation of fishing intensity?

The rapid evaluation of the effects of fishing requires that the effort be determined from that measure most closely related to fishing mortality. This has been done through the use of days fished, because it is the measure generally available in the ICNAF *Statistical Bulletin*. However, the implementation of an effort regulation requires enforceability and credibility. The need for the first is obvious. The second can be just as important, for, if fishermen of one country or group within a country do not believe that the regulation is being enforced, then they themselves may all seek to disobey it and/or destroy the conservation measure.

Several other effort measures have been reported to ICNAF, i.e. vessels fishing in the area, days on grounds, and hours fished.

Regulation on the basis of days fished has the advantage of being the same measure as used in the assessments of SA 5 and 6, and thus should relate most closely to fishing mortality. There are, however, two drawbacks. One is the inability to monitor closely through international inspection the number of days being fished, without an extremely elaborate system of daily reports being made to ICNAF. The second is the credibility problem since fishermen from one country, although observing other vessels on the grounds, cannot determine whether a vessel is fishing, and thus may make erroneous conclusions concerning adherence to regulations. It should also be noted that "hours fishing" suffers from both these drawbacks in an accentuated form. Finally, there is the possibility of countries making changes in their methods of calculating days fished. Such changes should not be made without first relating the new method to the previous one. It is also true that the introduction of a regulation might change the seasonal pattern of fishing by a country, with a consequent effect on the conversion factors and the fishing mortality that can be generated.

The number of vessels fishing in the area is the easiest statistic to monitor. There will be small fishing vessels that are limited to fishing in SA 5 and 6, and for these the number of vessels fishing might be a reasonable measure, because the relationship between days fished and number of vessels would be fairly constant for given classes of vessels. However, for

distant-water fleets this freezes the option to utilize a vessel, because it makes no distinction between one day and 365 days in the area. Under an effort regulation of this type, countries would undoubtedly maximize the time per vessel while minimizing the number of vessels, thus altering previous relationships between days fished and number of vessels. Therefore, to ensure achievement of a reduction in fishing intensity by regulating the number of vessels, the number would have to be that which would be allowed if the vessels fished continuously throughout the year; this would thus be in reality a maximum days on grounds figure.

Days on grounds offers an alternative to the previously discussed measures. It may lack the precision of days fished in relation to fishing mortality but does not have the wide margin of potential deflection inherent in number of vessels. Days on grounds could be easily monitored for vessels of the distant-water fleets by requiring the reporting to ICNAF of the times of entrance and leaving the fishing area. These are easily observed by fishermen and thus such regulation would be credible. The lack of precision in relation to effective fishing effort is a drawback. In Table 11 are given the days-on-grounds/days-fished ratios for countries reporting such statistics to ICNAF in 1967, 1968, and 1969. There are obviously country and vessel-type differences, and thus each country would have to supply an acceptable conversion. There is also some indication (see data for Polish vessels) of a trend with time, increasing the number of days fished relative to days on grounds. It may therefore be possible for countries to optimize this ratio, thus reducing the effect of an effort regulation based on days on grounds. In Table 12 are given some monthly values computed for categories in which the amount of effort was reasonably large (*i.e.* close to or exceeding 100 days on grounds). It can be observed that changing seasonal fishing patterns will alter the yearly days-fished/days-on-grounds relationships. These ratios can, however, be adjusted yearly, giving only a minimum time-lag period. If days-fished/days-on-grounds relationships can be obtained, a regulation based on days on grounds appears to be feasible.

Another aspect of this question involves balancing the factors of precision in regulating the magnitude of fishing mortality with the practical task of managing and monitoring the actual performance of the fishing fleet. A method of calculating the actual allowable fishing effort of a particular fleet (country Z) from an allocation of standard allowable effort is illustrated by an example in Table 13. For convenience the US OTSI 0-50 tonnage class has been used. The calculation supposes, as an example, that the fishing effort of country Z is to be reduced by 25% as a result of Commission agreement. This country had the fleet composition shown in the column 1.

h) Question 8: What is the fishing intensity required to catch the quotas of fish established for 1973?

For the reasons discussed above, the by-catch of other species in the mackerel fishery makes it impossible to define a fishing intensity that would harvest the quotas of regulated species alone in 1973. Our best estimate of this would be the amount of fishing on all species (100%) less the fishing directed toward mackerel (38%), *i.e.* 62% of the standardized fishing effort. However, it is important to note that, in the event of such a regulation, the pattern of fishing between fisheries might well change unless further regulations constrained the direction of the fisheries.

i) Question 9: Within the probable range of scientific estimates concerning the status of resources, how will variations in these estimates change the impact on the resources of regulatory decisions?

The assessments of the status of the resource, and of the effect of different management measures, and also the answers to the preceding questions, depend on estimates of a range of different parameters (magnitude of current standing stock, fishing mortality coefficient, etc.), all of which are subject to error; also, the models used do not provide a completely accurate description of the biological situation. The possible errors in the estimates will have complex effects on the assessments which are not easy to describe in detail. Generally, however, the effect will be to make the assessments either too optimistic (*e.g.* the strength of currently recruiting year-classes is over-estimated, or the current fishing mortality under-estimated relative to the optimum fishing mortality), or too pessimistic (recruitment under-estimated, or fishing mortality over-estimated). The range of possible error varies with the stock, being least for these stocks with a long history of fishing and research (*e.g.* haddock) and greatest in newly developed fisheries (*e.g.* mackerel). For the former, the important quantities (fishing mortality, potential) are probably estimated with a margin of error of $\pm 10\%$; for the latter the error might be as much as $\pm 50\%$. For both, the errors concerning the current situation would be substantially reduced by more complete statistical data for the most recent year.

Table 11. Ratio of days on grounds to days fished, as reported in Table 5 of ICNAF *Statistical Bulletin* for SA 5 and 6.

Country	Gear	Tonnage Class	SA	Days on Ground/Days Fished		
				1967	1968	1969
Poland	OTSI	5	5	1.83	1.63	1.63
		6	6	-	1.77	1.45
			5 & 6	1.83	1.66	1.57
	OTST	7	5	1.60	1.50	1.43
			6	-	1.20	1.62
			5 & 6	1.60	1.47	1.44
Romania	OTST	7	5	1.09	1.13	1.08
Spain	PT	4	5	1.23	1.36	1.26
USSR	OTSI	4	5	1.25	1.20	1.25
			6	1.22	1.28	1.38
			5 & 6	1.25	1.20	1.30
	OTST	7	5	1.25	1.16	1.27
			6	1.27	1.48	1.42
			5 & 6	1.24	1.24	1.29
	OTSI	5	5	1.30	-	1.14
			6	1.32	-	1.34
			5 & 6	1.30	-	1.27
	PS	4	5	-	-	1.71
		5	5	-	-	1.51

Note: Ratios of "Days of Grounds" to "Days Fished" for other countries are not available because "Days on Grounds" were not reported in 1967-69. The category "Days on Grounds" has not been a requirement in reporting statistics since 1970.

Table 12. Ratios of "days on grounds" to "days fished" from ICNAF *Statistical Bulletin*, Table 4, for 1969.

Month	Spain	USSR		USSR		USSR		Poland	Poland
	PT 5Z	OTSI 4 5Ze	5Zw	OTSI 5 5Ze	5Zw	OTST 7 5Ze	5Zw	OTSI 5 5Ze	OTST 7 5Ze
Jan	-	-	-	-	-	-	1.3	-	-
Feb	1.4	-	-	-	-	-	1.6	2.5	-
Mar	1.2	-	-	-	-	-	1.4	2.2	-
Apr	1.1	-	1.3	-	1.4	-	1.4	1.6	-
May	-	1.3	1.2	1.6	1.2	1.1	1.3	1.5	-
Jun	-	1.3	1.2	1.4	1.2	1.2	1.3	2.3	1.4
Jul	-	1.2	1.1	1.5	1.2	-	1.1	2.0	2.0
Aug	-	1.1	1.1	1.1	1.1	-	1.2	1.4	1.7
Sep	1.1	1.4	1.2	1.1	1.1	1.2	1.3	1.1	1.1
Oct	1.3	1.6	1.4	1.4	1.2	1.1	1.2	1.4	1.5
Nov	-	-	1.5	-	1.4	1.4	1.2	1.8	1.6
Dec	-	-	-	-	-	-	-	-	1.6

The effect of possible errors on the future trends in the fishery will depend on the speed with which they are detected, and the necessary revisions which have to be made to the regulations. The most significant errors are likely to be those concerning the strength of the newly entering year-classes, and the current value of the fishing mortality. Both of these are likely to be detected within one or two years.

If regulatory decisions are taken on too pessimistic estimates, the immediate effect will be that the effort will be restricted more than is actually necessary, and the catches will also be less. However, when the errors are detected and the regulations amended, catches will be increased, and, if the adjustment is made reasonably quickly (say, within two years), the accumulated catch over a period will be little altered.

On the other hand, if action is taken on the basis of estimates that are too optimistic, then the stocks will decline. When the error is detected, there will need to be a cutback in effort and catch, almost certainly considerably more severe than the cutback that would have been needed earlier, if action had been taken sooner on the basis of more correct estimates. If the decline in stock causes a drop in recruitment, there will be a drop in the accumulated catch over a period.

7. Other Effects of the Regulation of Fishing Effort in SA 5 and 6

If an effort regulation was introduced involving a reduction of fishing in SA 5 and 6, then it is probable that a proportion of the surplus effort might be deployed in SA 1-4. Previous assessments indicate that the majority of stocks in SA 1-4 are fully exploited, and for several the amount of fishing mortality is already regulated by catch quotas. Other resources remain for which no data have been presented and which may or may not be fully exploited at the present time; these include silver hake and sand lance in SA 4, and sand lance, redfish, capelin, grenadiers and Greenland halibut in SA 1-3. Relevant information must be presented before the Subcommittee can express an opinion on their potential to absorb increased fishing without detriment to the resources already fully exploited.

8. Other Methods of Regulation

The Subcommittee has not examined the implications of other methods of regulation (*viz.* further regulation of the mesh size for species in SA 5 and 6, minimum sizes of fish, closed seasons, and closed areas).

9. Summary Remarks

The Subcommittee has reviewed and updated assessments of many stocks in SA 5 and 6 in recent years. The consensus of all these assessments has been that the resources are now fully exploited and some, notably haddock and herring, are over-exploited. Nevertheless, fishing activity has continued to increase in recent years, the increase being directed primarily at unregulated species, specifically mackerel and, to a lesser extent, squid. Having regard to the desirability of forestalling for mackerel the pattern of rapid over-exploitation which has been a feature of other species fisheries, and the need to reduce effort on other species to the MSY level, it is consistent that the present estimates should indicate some reduction in the overall level of fishing effort in the area.

The main problem lies in the need to allow continued exploitation in recently developed fisheries (*e.g.* mackerel) while controlling the exploitation of other species. In view of this, it might be considered more efficient to regulate fishing on the two resource components separately. But, because of the by-catch problem and the absence of a geographical separation of the mackerel stock from all other regulated species, the Subcommittee sees no way in which complete freedom of fishing for mackerel could at the same time enable the Commission to conserve adequately the other regulated species (particularly herring) according to its current objectives. Bearing in mind the history of exploitation of some of the other regulated resources, there is justification for a pre-emptive catch quota regulation of mackerel, pending a better assessment of its potential.

In that event all the resources known to attract a substantial commercial fishery would be regulated by catch, and, since overall effort regulation does not in itself solve the by-catch problem, the relative merits of the two approaches to regulation are difficult to decide on scientific grounds. However, because of the by-catch problem, catch quotas for the individual species would tend to generate over-exploitation, which could only be mitigated by total catch or effort regulation set below the level estimated to achieve the summed MSY's of individual resources, when these resources are fished independently.

Table 13. Example of the conversion of fishing effort in standard units into fishing effort in national units (Z refers to the hypothetical country).

Column Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	No. of vessels	No. of trips	Relative per- formance ratio		Actual	Standardized days fished		Ratio days on ground	Actual days on ground	Standardized days on ground		Z by conn. class	Days on ground		Actual days fished	
			To USA OTSI 2	To Z OTSI 5		To USA OTSI 2	To Z OTSI 5			To USA OTSI 2	To Z OTSI 5		To USA OTSI 2	To Z OTSI 5		
OTSI 5	28	330	1.57	1.00	5,852	9,188	5,852	1.69	9,890	15,527	9,890	20	10,801	6,880	6,880	4,071
OTST 6	8	100	6.92	4.41	1,873	12,961	8,260	1.60	2,997	27,039	13,217	40	21,601	13,761	3,120	1,950
OTST 7	12	144	8.29	5.28	2,874	23,825	15,174	1.50	4,311	35,738	22,762	40	21,601	13,761	2,606	1,737
Total 1971	48	577			10,599	45,974	29,286		17,198	72,004	45,869					
Total 1973 (25% less)						34,480	21,964			54,003 TAE _B	34,402 TAE _C		54,003 TAE _B	34,402 TAE _C	12,605	7,758

Explanatory Notes

Col. 1-5: would be given.

Col. 6: converts the days fished (Col. 5) to standard US days fished using the conversion factors in Col. 3 (Col. 5 × Col. 3).

Col. 7: converts the days fished (Col. 5) to days fished by a standard vessel within the fleet of country Z by the conversion factor in Col. 4 (Col. 5 × Col. 4).

Col. 8: is the given factor for converting days fished to days on grounds for country Z.

Col. 9: gives the actual days on grounds (Col. 5 × Col. 8).

Col. 10: converts days on grounds (Col. 9) to standard US days on grounds, again using the conversion factor in Col. 3 (Col. 9 × Col. 3).

Col. 11: converts days on grounds (Col. 9) to days on grounds by a standard vessel of country Z using the conversion factor in Col. 4 (Col. 9 × Col. 4). The sums of effort for 1971 (Col. 10 and 11) might then be reduced by a specified proportion, giving a total allowable days on grounds in the standard US units (TAE_B) at the bottom of Col. 10, or to a total allowable days on grounds in terms of the standard vessel of country Z (TAE_C) at the bottom of Col. 11.

Col. 12: gives the hypothetical choice of the proportional allocation of TAE_B or TAE_C between vessel categories.

Col. 13: applies these proportions (Col. 12) to TAE_B to give the total allowable days on grounds in US standard units (Col. 12 × TAE_B of Col. 10).

Col. 14: applies these proportions (Col. 12) to TAE_C to give the total allowable days on grounds in terms of the standard vessel of country Z (Col. 12 × TAE_C of Col. 11).

Col. 15: reconverts the allowable efforts per vessel category (Col. 13 or 14) to actual allowable days on grounds for country Z using the appropriate conversion factors of Col. 3 or 4 (Col. 13/Col. 3 = Col. 14/Col. 4).

Col. 16: converts the actual allowable days on grounds (Col. 15) for each class of vessel to actual allowable days fished (Col. 16) using the conversion factors of Col. 8 (Col. 15/Col. 8).

B. Other Assessments

1. Known changes in the fisheries for regulated groundfish stocks in 1972 in relation to TAC's¹ for 1973.

Due to the emphasis on consideration of matters relating to effort regulation, the Subcommittee had no time to consider in detail the assessments of regulated species. However, the remarks in the following Table reflect the consensus of the Subcommittee at this time:

Species	Subarea/ Division	TAC ('000 tons)		Remarks
		1972	1973	
Cod	2J-3L	-	575.5	The TAC for 1973 was based on evidence of an above-average 1968 year-class. Data from 1972 confirm this; the stock is developing as expected.
	3N-O	-	103.5	
	3Pa	-	50.5	
	4Vs-W	-	60.0	
	5Y	-	10.0	
	5Z	-	35.0	
Haddock	4W	4.0	4.0	Removals should be minimal.
	4X	9.0	9.0	Removals should be minimal.
	5Y-Z	6.0	6.0	TAC for 1972 over-fulfilled (6,232 tons by 15 December 1972). Stock continues to decline. Removals should be minimal.
American Plaice	3L-N-O	-	60.0	
Yellowtail	3L-N-O	-	50.0	
	5Ze	16.0	16.0	Fishery appears to be steady.
	5Zw	10.0	10.0	TAC for 1972 set to provide improvement in the stock. TAC was over-fulfilled by 1,000 tons by 15 December 1972.
Silver hake	5Y	-	10.0	Abundant 1971 year-class. Validity of TAC for 1973 depends on exploitation of the 1971 year-class as 1-year-old fish in 1972.
	5Ze	-	80.0	
	5Zw-6	-	80.0	
Red hake	5Zw-6	-	40.0	USSR 1972 catch increased over 1971.

2. Regulated species

The Subcommittee is not aware of any significant unforeseen changes in the 1972 fisheries for regulated species. So far as can be judged, except for haddock in SA 4 and 5 and yellowtail in 5Zw, the TAC's for 1973 are expected to achieve their objectives. But it has to be stressed that, for some stocks, we shall not be able to verify this properly unless countries participating provide more sampling information and more refined catch and effort statistics. An immediate improvement in the reporting of biostatistical data is required for 1973 and this is the subject of a Circular Letter to be distributed by the Secretariat in February 1973.

3. Unregulated species

a) Cod - Subarea 1

As stated in the Assessments Report (*Redbook* 1972, Part I, p. 20), the greatest uncertainty in the assessments at that time was connected with mean weight for the various age groups.

¹ TAC = The total catch that has been agreed by the Commission.

Samples from 1972, some of which were presented at this Assessments Subcommittee Meeting (January 1973), indicate that weight data as used in the 1972 Report were generally too high for age-groups dominating in landings (i.e. age-groups 5 to 7).

The actual level of fishing mortality in 1971-72 is not known precisely at present, and the same applies to strength of year-classes to recruit to the fishery in 1973-74. More precise assessment has to await the 1972 catch statistics and results of surveys in late 1972, but it is expected that this material can be taken into account at the 1973 Annual Meeting. However, as a preliminary guide to the Commission, the Subcommittee is confident that updated figures at the 1973 Annual Meeting will not differ significantly from present catch estimates, which (assuming F in 1971 to be 0.55 in Div. 1A-1D and 0.65 in Div. 1E-1F) for levels of F_{max} and F_{opt} as set by the ICES/ICNAF Working Group on Cod Stocks in the North Atlantic Area are (in thousand tons):

	Div. 1A-D		Div. 1E-F		Subarea 1	
	F_{max}	F_{opt}	F_{max}	F_{opt}	F_{max}	F_{opt}
$F_{1972-74}$	0.56	0.35	0.65	0.45		
Catch 1972	72	48	26	20	98	68
Catch 1973	66	51	20	17	86	68
Catch 1974	62	54	20	17	82	71

The difference between this level and the level given in the 1972 Report (1972: 97; 1973: 102 for Subarea 1 as a whole) are to some degree due to the differences between values of weight in the 1972 Report and those of the present assessment.

Also, there is some uncertainty as to a breakdown of the stock in Div. 1E-F plus Southeast Greenland in components inside ICNAF and NEAFC Areas. In the present estimates it has been considered that roughly half of the stock, the size of which is estimated in the Report of the ICES/ICNAF Working Group on Cod Stocks in the North Atlantic, is exploited inside the ICNAF Area (Div. 1E-F).

b) Cod - Div. 2GH, 3M, 4Vn

No detailed assessments.

c) Cod - Div. 4X

Canadian research vessel survey data presented in Res.Doc. 73/7 suggest that fishing intensity remains high and that recruitment is not improving. It may thus be desirable at the 1973 Annual Meeting to consider an appropriate level of catch quota for this stock.

d) Redfish - All Areas

No detailed assessments.

e) Other Species

Available information on mackerel and squid in SA 5 and 6 will have to be supplied at the Annual Meeting if adequate assessments of these species are to be made. Countries are also asked to submit information on unregulated stocks in other Subareas, for example, silver hake and pollock in SA 4, redfish in SA 1-4, and Greenland halibut, grenadiers, capelin and sand lance in areas where they occur.

SUPPLEMENT

Supp. Table 1. Estimated days fished for main species in SA 5 in 1971, standardized to US OTSI 0-50 tonnage class.

Main species sought	Stand. days fished ¹	Species Caught										% f as by-catch ³
		Cod	Had	Red	SH	Flo	OG	Her	OP	OF	Total	
Cod	2,824	2,824	2,279	34	130	378	483	6	0	3	6,137	54.0
Had	4,475	1,629	4,475	76	9	828	1,307	0	0	0	8,324	46.2
Red	1,478	238	310	1,478	86	180	452	13	0	1	2,758	46.4
SH	28,697	488	803	115	28,697	2,124	7,920	3,530	3,817	5,366	52,860	45.7
Flo	14,754	2,139	3,010	251	634	14,754	2,685	88	118	148	23,827	38.1
OG	11,442	194	332	11	3,066	561	11,442	904	881	2,140	19,531	41.4
Her	63,351	253	253	127	3,611	507	2,217	63,351	7,539	5,068	82,926	23.6
OP	82,360	82	82	329	4,365	1,647	4,530	8,236	82,360	14,166	115,797	28.9
OF	4,449	4	44	0	1,032	507	2,545	138	39	4,449	9,115	51.2
Total	213,830	7,851	11,588	2,421	41,630	21,486	33,581	76,266	95,111	31,341		
% f as by-catch ²		64.0	61.3	39.0	31.1	31.3	65.9	16.9	13.4	85.8		

¹ Actual standardized fishing effort in directed fisheries.

² Percent fishing effort on the species when it is taken as by-catch in other fisheries.

³ Percent of total fishing effort generated by a species fishery which has an effect on species taken as by-catch in that fishery.

Supp. Table 2. Landings standardized days fished, and C/E in SA 5 and 6, 1971.

Main species sought		Std ¹ days	Species Caught									Total ³
			Cod	Had	Red	SH	Flo	OG	Her	OP ²	OF	
Cod	OT	1,397	2,501	865	268	324	835	865	18	-	5	5,681
	PT	1,427	7,619	1,336	-	-	-	184	-	-	-	9,139
	Total	2,824	10,120	2,201	268	324	835	1,049	18	-	5	14,820
	C/E	-	3.584	.779	.095	.115	.296	.371	.006	-	.002	-
Had	OT	4,475	5,836	4,319	599	25	1,830	2,844	-	3	-	15,456
	C/E	-	1.304	.965	.134	.006	.409	.636	-	.001	-	-
Red	OT	1,478	855	300	11,727	215	396	984	53	1	6	14,537
	C/E	-	.578	.203	7.934	.145	.268	.666	.036	.001	.004	-
SH	OT	28,697	1,716	776	802	71,321	4,684	17,187	13,862	14,043	14,461	167,549
	C/E	-	.060	.027	.028	2.485	.163	.599	.483	.489	.504	-
Flo	OT	14,754	7,688	2,906	1,987	1,569	32,527	5,835	328	445	385	68,424
	C/E	-	.521	.197	.135	.106	2.205	.395	.022	.030	.026	-
OG	OT	11,442	707	317	43	7,627	1,240	24,879	3,561	3,255	5,768	58,839
	C/E	-	.062	.028	.004	.666	.108	2.174	.311	.284	.504	-
Her	OT	57,857	868	238	1,173	8,933	1,124	4,882	201,554	26,506	13,661	258,939
	PS	5,494	-	-	-	-	-	-	47,666	1,259	-	48,925
	Total	63,351	868	238	1,173	8,933	1,124	4,882	249,220	27,765	13,661	307,864
	C/E	-	.014	.004	.018	.141	.018	.077	3.934	.438	.216	-
OP	OT	81,610	233	80	2,669	10,849	3,565	9,848	32,389	301,296	38,046	398,975
	PS	750	-	-	-	-	-	-	82	1,855	-	1,937
	Total	82,360	233	80	2,669	10,849	3,565	9,848	32,471	303,151	38,046	400,912
	C/E	-	.003	.001	.032	.132	.043	.120	.394	3.681	.462	-
OF	OT	4,449	18	46	2	2,572	1,117	5,536	546	1,465	11,975	22,731
	C/E	-	.004	.010	.001	.578	1.251	1.244	.123	.329	2.692	-

Supp. Table 2. Continued.

Main species sought	Std! days	Species Caught									Total ³
		Cod	Had	Red	SH	Flo	OG	Her	OP ²	OF	
Total OT	206,159	20,422	9,847	19,270	103,435	47,318	72,860	252,311	347,014	84,307	956,784
PT	1,427	7,619	1,336	-	-	-	184	-	-	-	9,139
PS	6,244	-	-	-	-	-	-	47,748	3,114	-	50,862
Other	-	7,542	986	767	1,957	3,614	8,231	17,119	14,246	6,068	60,530
Total	213,830	35,583	12,169	20,037	105,392	50,932	81,275	317,178	364,374	90,375	1,077,315

¹ Standardized to US OTSI 0-50 tonnage class.

² Does not include menhaden (240,751 tons).

³ Does not include shellfish (564,957 tons).

Supp. Table 3. Relative catchabilities based on $\frac{\sum C}{\sum E}$ for each year.

		1963	1964	1965	1966	1967	1968	1969	1970	1971
<u>USA</u>										
OTSI	0-50	1(7.3)	1(8.3)	1(6.0)	1(6.8)	1(7.6)	1(6.7)	1(5.4)	1(4.1)	1(5.2)
	51-150	1.06	0.86	0.85	0.81	0.66	0.77	0.94	1.72	1.21
	151-500	0.99	0.83	0.95	1.01	0.81	0.91	1.28	2.26	1.66
OTST	0-50	-	-	-	-	4.25	11.90	4.83	10.85	3.60
	51-150	-	-	-	-	1.75	3.80	1.96	2.36	5.19
	151-500	-	-	-	-	0.93	1.04	-	2.65	1.88
PS	0-50	-	-	-	-	5.47	-	-	47.40	15.11
	51-150	14.65	6.90	-	10.00	16.00	12.32	20.14	25.05	38.48
	151-500	-	30.00	-	24.50	39.24	24.57	20.84	55.40	64.88
<u>CANADA</u>										
OTSI	51-150	0.84	-	0.71	0.84	0.35	0.63	0.44	0.87	0.78
	151-500	1.34	1.18	1.34	1.39	0.93	1.16	1.16	1.62	1.30
OTST	501-900	-	-	-	1.41	1.63	1.62	1.63	2.42	1.82
<u>GERMANY (FR)</u>										
OTST	901-1800	-	-	-	-	5.77	5.60	5.93	10.56	9.76
	>1800	-	-	-	-	6.95	6.50	7.70	14.92	11.94
<u>JAPAN</u>										
OTST	901-1800	-	-	-	-	-	-	-	0.36 ¹	0.16
	>1800	-	-	-	-	-	-	-	0.60	0.32
<u>POLAND</u>										
OTSI	501-900	-	-	1.28	-	1.64	1.04	1.51	2.69	1.82
OTST	901-1800	-	-	-	-	-	-	-	-	8.06
	>1800	-	2.56	3.98	5.80	2.75	2.55	4.06	8.96	9.16
<u>ROMANIA</u>										
OTST	>1800	-	-	-	-	3.13	2.95	-	4.17	4.73
<u>SPAIN</u>										
PT	151-500	-	-	1.99	3.22	2.35	2.15	2.75	5.26	4.36
<u>USSR</u>										
OTSI	151-500	0.84	0.86	1.29	1.51	1.11	1.03	1.07	1.95	1.43
	501-900	-	1.04	2.68	2.35	1.70	-	2.69	2.66	1.98
OTST	>1800	4.96	5.00	6.81	9.20	5.26	6.64	6.98	11.10	8.23
PS	151-500	-	-	-	-	-	-	2.06	3.22	4.51
	501-900	-	-	-	-	-	-	2.41	5.37	5.26

¹ Hours fished.

Appendix II - Report of the Herring Working Group

Chairman: T. D. Iles

Rapporteur: D. S. Miller

The Herring Working Group met during 8-14 January 1973 with representatives present from Canada, Federal Republic of Germany, Japan, Poland, USSR and USA. The main tasks of the Group were to revise the assessments made at the 1972 Annual Meeting for the Nova Scotia, Gulf of Maine and Georges Bank herring stocks, to advise the Commission on 1973 catch quotas for those stocks and to answer questions posed in the Resolution re Commission's Herring Research Program (Special Meeting on Herring, January - February 1972, Proceedings No. 4, Appendix VI). A small group of assessment biologists met at Hamburg, Fed. Rep. Germany, on 4-6 January 1973 to undertake analysis of any available preliminary data on the status of these stocks from the 1972 fishery. However, response to an earlier request that Member Countries forward any available data for 1972 to Hamburg was poor, and consequently much time was spent at the Rome meeting on the collation of data and making stock assessments, thus restricting the time available for detailed consideration of other aspects of the biology of herring stocks in the ICNAF Area.

On 17 January and again on 20-22 January *ad hoc* meetings of the Working Group were held to consider specific questions raised in Panel Meetings. Reports of these meetings, although not adopted by STACRES, are appended as Supplements 1 and 2 to this Report.

1. Stock Identity, Relative Size and Inter-relationships

a) Adult Stage

No additional information on stock identity and inter-relationships were available for consideration at this meeting.

b) Juvenile Stage

Although no new direct information on the relationship between juvenile and adult population was available, analysis of mortality coefficients based on various assumptions as to the way in which the juvenile and adult stocks are related does give a picture which is consistent enough to justify using working hypotheses. This information is given in Table 1.

Table 1. Fishing mortality coefficients calculated on different assumptions as to the relationship between adult and juvenile populations in the Gulf of Maine - Georges Bank area.¹

Juvenile (Age 2) catch from	Juvenile catch assumed to be associated with		
	Gulf of Maine adults (5Y)	Georges Bank adults (5Z+6)	Gulf of Maine and Georges Bank combined
Western and Central Maine (5Y)	0.62	0.19	0.14
All of Maine (5Y)	0.87	0.26	0.20
New Brunswick (4Xb)	2.62	0.85	0.64
Maine and New Brunswick combined	3.49	1.11	0.84

¹ Calculated from a division of catch by mean stock size averaged over the 1960-1965 year-classes for M increasing with age.

The working hypotheses are that abundance of juveniles in the Gulf of Maine fishery can give reasonable estimates of future recruitment to the Gulf of Maine (Div. 5Y) adult stock, and the abundance of juveniles in the New Brunswick (Div. 4Xb) fishery may indicate, in a more general way, future recruitment to the Georges Bank (Div. 5Z + Stat. Area 6) stock. It has already been established as a working hypothesis that juveniles in the Nova Scotia fishery recruit to the Nova Scotia (Div. 4Xa + 4Wb) adult stock, but at the present time the juvenile (weir) fishery of Nova Scotia does not necessarily reflect year-class abundance because of economic factors. While this

does not lessen the need for more research on the distribution, abundance and stock relationships of juvenile stages (see Section 4(c) below), there is no reason to believe that the conclusions reached in this report would be seriously affected by any new information that might become available. This is particularly so, when it is realized that the 1970 year-class was reasonably good in all areas covered by catch quotas.

c) Larval Stage

The ICNAF larval herring survey program was continued in 1972. Offshore cruises with standardized sampling methods at standard stations were carried out by the following vessels:

Wieczno (Poland)
Albatross IV (USA)
Argos (USSR)

Walther Herwig (Fed. Rep. Germany)
E. E. Prince (Canada)

The US vessels, *Albatross IV*, *Lucille B*, and *Duchess II* carried out four coastal cruises during the autumn of 1972 to study the coastal distribution, abundance, and dispersion of larval herring, and the Canadian vessel *E. E. Prince* surveyed the Bay of Fundy area in late autumn.

Preliminary reports containing some qualitative and quantitative results were available as follows:

Georges Bank: Larvae were detected over the entire area of the Bank with evidence that the spawning was most concentrated on the northern edge. Some larvae were found in waters north of the Bank, suggesting the influence of the counterclockwise gyro of the Gulf of Maine. Salinity isopleths on the southern edge of the Bank indicated the possibility of a dynamic boundary of seaward dispersal.

Nova Scotia: Larvae taken in this area were larger than those in the offshore area confirming that the Nova Scotia spawning was earlier in the autumn than that on Georges Bank.

Nantucket Shoals: Significant numbers of larvae were detected here in early October of 1972 compared with their occurrence in mid-November of 1971.

Coastal Gulf of Maine Area: There is an indication of five spawning areas as delineated by the occurrence and distribution of recently-hatched larval herring: east of Penobscot Bay, south of Boothbay Harbor, south of Portland, Jeffrey's Ledge and Stellwagen Bank.

A more complete analysis of the data will be presented at the 1973 Annual Meeting.

2. Fisheries Trends

Table 2 lists the herring catches by country and area for 1972; these data are comparable with those given in Tables 2 to 5 of the Report of the Herring Working Group at the 1972 Annual Meeting (*Redbook* 1972, Part I, p. 46-47). The total catch for 1972 of 475,000 tons is 65% of the 1971 catch of 729,000 tons and only 49% of the 1969 peak catch of 965,000 tons.

There was a marked decline in catches from the Newfoundland and Gulf of St. Lawrence stocks (Subarea 3 and Div. 4RST) from 264,000 tons in 1971 to 99,000 tons in 1972. This involved both the summer fishery in the Gulf of St. Lawrence and the winter fishery of migrants to southwestern Newfoundland. The decline was due to continuing low recruitment which has not been high enough to replace losses from fishing and natural mortality. Catches from the Banquereau stock (Div. 4V and 4Wa) were 38,000 tons in 1972, a decline from the 1971 catch of 66,000 tons.

Three major stocks were under quota regulation in 1972 and the catches for these stocks are given in Table 3.

The total catch from the Nova Scotia stock (Div. 4Xa and 4Wb) is estimated to be 90,000 tons, about the same as that for 1971, but this excludes gillnet catches in inshore waters by Canada, for which 1972 data are not yet available. Catches in the Gulf of Maine (Div. 5Y and 4Xb) were 111,000 tons (Table 2), an increase of 48,000 tons over the 1971 level. This was mainly attributable to an increase in catches in the juvenile fisheries of New Brunswick and Maine. The fishery on the Georges Bank stock (Div. 5Z and Stat. Area 6) declined from 251,000 tons in 1971 to 139,000 tons in 1972.

In the southern part of the ICNAF Area (from Div. 4Wb southward to Stat. Area 6), the most significant development of 1972 was the appearance of relatively good year-classes. In the Gulf of Maine and Bay of Fundy areas increases in catches of the juvenile fisheries tended to confirm the indication, as provided by the appearance of juvenile herring on the offshore banks in the early part of the year, that the 1970 year-class was larger than the three preceeding ones. In the Nova Scotian area, in addition to an apparent abundance of the 1970 year-class, three-year-old herring of the 1969 year-class were

Table 2. Provisional herring landings ('000 tons) by country and area (stock) in 1972. (A = adults, J = juveniles)

Country	Subarea 3	Div. 4RST	Div. 4Vn	Div. 4Vs	Div. 4Wa	Div. 4Wb	Div. 4Xa	Div. 4Xb	Div. 5Y	Div. 5Z	S.A. 6	Total
							A J	A J	A J			
Canada (M)	-	40	12	-	25	-	47 15	4 52	11 -	-	-	205
Canada (N)	49	10	-	-	-	-	- -	- -	- -	-	-	59
Germany (FR)	-	-	-	-	-	-	- -	- -	3 -	28	-	31
Japan	-	-	-	0	-	-	1 -	- -	- -	1	-	2
Poland	-	-	-	-	-	-	- -	- -	- -	41	8	49
Romania	-	-	-	-	-	-	- -	- -	- -	1	-	1
USSR	-	-	-	1	-	21	4 -	- -	- -	43	4	73
USA	-	-	-	-	-	-	- -	- -	19 20	3	0	42
Other Members	-	-	-	-	-	1	- -	- -	- -	1	-	2
Non-member ¹												
(GDR)	-	-	-	-	-	1	? -	- -	2 -	8	-	11
Total	49 50	12 1	25	23	52 15	4 52	35 20	126 12				475
	Gulf of St. Lawrence	Banquereau	Nova Scotia	Gulf of Maine	Georges Bank							

¹ Non-member catches were assumed from the 1972 quota proposals, or from USA surveillance flights, or, in the case of 4X, could not be estimated.

4Wa = Chedabucto Bay area
4Wb = Div. 4W offshore

4Xa = Div. 4X offshore and Nova Scotia inshore
4Xb = New Brunswick side of Bay of Fundy

Table 3. Herring catches and quota allocations (tons) for 1972.

Country	4Xa-4Wb		5Y		5Z+6	
	Catch	Quota	Catch	Quota	Catch	Quota
Canada	47,329 ¹ (62,626) ⁵	35,700	11,357 ¹	6,000 (9,000) ³	0	5,800
USA	-	-	18,989 ¹ (38,494) ⁵	21,000 (18,000) ³	3,813	4,000
Poland	-	-	-	-	49,492	49,400
Japan	924	1,000	-	-	1,161	1,200
USSR	24,882 ⁴	26,300 ⁴	-	-	47,089 ⁴	48,200 ⁴
Germany (FR)	-	-	2,936	2,500	27,704	31,600
Non-members	1,000 ²	1,000	2,000 ²	250	8,200 ²	8,200
Romania	-	-	-	-	600 ²	600
Other contracting governments	1,000 ²	1,000	-	250	1,000 ²	1,000
Total	75,135 (90,432) ⁵	65,000	35,282 (54,787) ⁶	30,000	139,059	150,000

¹ Catches from adult fishery.

² Assumed catches; no data available.

³ Adjusted quota - 3,000 tons assigned by USA to Canada.

⁴ USSR data for first 10 months only.

⁵ Total catch including juvenile fisheries.

⁶ Total catch including juveniles for Div. 5Y only; see Table 2 for Div. 4Xb catches.

abundant and were heavily exploited. The 1969 year-class in the Gulf of Maine and the Georges Bank areas were very small, and this marked lack of year-class parallelism tends to confirm the validity of the stock division boundary between the Nova Scotia stocks and those to the south and west.

3. Herring Assessments

a) Definition of stock size and recruitment for purposes of herring assessment

The term "stock size as at the beginning of the year...." has been referred to often, both in reports of the Herring Working Group and in Commission proposals and resolutions. There is a possibility of misunderstanding as to precisely what is meant by this term. In this report the stock size is defined as that for herring of age 4 and older at the beginning of the calendar year. This is the adult (spawning) population remaining after the previous year's fishing.

This definition differs from a commonly used conventional definition which includes also the potential recruits during the year, i.e. in this context, 3-year-old fish. It is also necessary to bear in mind the distinction between recruitment to the fishery and recruitment to the adult (spawning) population. In some areas there is no difference; the fishery exploits only adults. In other areas, e.g. Jeffreys Ledge (Div. 5Y) and Nova Scotia (Div. 4X), juvenile fish which will not spawn during the fishing year may be in the same general area as adults and can be fished at the same time.

b) Div. 5Y Herring Assessment

Catch statistics: The total catch of herring by the USA, Canada and Fed. Rep. Germany was 52,787 tons in Div. 5Y in 1972 (Table 3). Non-member countries fished in the quota area but no catches have been reported. A 2,000-ton catch by non-members was assumed for assessment purposes, giving an estimated total catch of herring from the Div. 5Y adult fishery of 35,282 tons or 18% more than the allowable quota of 30,000 tons and 53% more than the catch of 23,000 tons recommended by the Herring Working Group at the 1972 Annual Meeting. The total (adults and juveniles) catch in 1972 from Div. 5Y was at least 3,000 tons higher than the 1971 catch of 50,000 tons. While the 1972 adult catch was lower than that in 1971, the reduction was more than compensated for by an increase in the juvenile catch from 12,400 tons in 1971 to 19,500 tons in 1972.

Year-class abundance: The age composition of the Div. 5Y adult fishery (Table 4) indicates the continued decline in older fish and the greater dependence of the fishery on current recruitment. The good year-classes of 1960 to 1963 constituted 53%, 21% and 3% of the total catch (by weight) in the years 1970, 1971 and 1972 respectively. The very poor year-classes of 1968 and 1969 produced 2%, 13% and 23% in the same years. In 1972, age 2 herring were taken in significant numbers (about 2,000 tons) in the adult fishery. The catches of the 1966 year-class (the best since 1963) has also declined, so that recruitment to the adult spawning stock (age 4 and older) will continue to be very poor until the 1970 year-class recruits in 1974 and 1975. The increase in catch in the Maine fishery in 1972 was due to the fairly good 1970 year-class (Table 5). This year-class appears to be less abundant than the 1966 year-class but larger than the 1967, 1968 and 1969 year-classes.

Table 4. Percentage age composition of herring (by number) in the Div. 5Y adult fishery.

Year	Age							
	2	3	4	5	6	7	8	8+
1967	0.06	0.94	8.75	21.95	39.59	24.28	1.95	2.48
1968	0.38	11.95	11.77	19.85	19.73	18.85	12.39	5.08
1969	1.21	27.43	4.35	6.92	15.79	18.70	14.84	10.76
1970	1.91	5.21	14.73	10.25	14.99	15.05	13.04	24.82
1971	0.35	12.77	12.52	18.76	20.29	14.54	8.84	11.93
1972	11.85	8.24	19.65	18.95	20.49	13.96	4.89	1.97

Table 5. Total herring catches (millions of fish) by region and age in the Maine (Div. 5Y) fishery, 1968-1972.

Region	Year	Age									Total
		1	2	3	4	5	6	7	8	8+	
Western Maine	1968	4.6	128.0	36.7	1.6	0.2	-	-	-	-	171.1
	1969	3.0	52.6	63.9	3.8	-	-	-	-	-	123.3
	1970	0.4	65.4	17.8	3.0	1.9	-	-	-	-	88.5
	1971	38.5	38.7	4.0	0.3	0.8	1.2	0.5	0.4	0.3	84.7
	1972	0.1	85.6	5.9	1.5	1.0	0.5	0.3	-	-	94.9
Central Maine	1968	8.4	195.4	59.8	1.1	1.2	-	-	-	-	265.9
	1969	1.1	60.2	93.9	3.0	0.6	0.5	0.3	0.2	0.2	160.0
	1970	1.4	104.9	24.4	9.8	5.6	1.2	0.3	0.3	-	147.9
	1971	26.9	21.3	12.2	20.7	7.0	0.4	-	-	-	88.5
	1972	-	202.7	1.2	1.7	0.4	0.9	0.6	-	-	207.5
Eastern Maine	1968	3.9	307.4	160.4	5.6	8.8	-	-	-	-	486.1
	1969	1.6	103.8	91.1	4.7	-	-	-	-	-	201.2
	1970	0.1	12.8	3.0	4.4	1.0	2.3	1.4	1.3	0.5	26.8
	1971	43.6	1.9	1.4	-	-	-	-	-	-	46.9
	1972	0.1	49.7	0.2	0.0	-	-	-	-	-	50.0

Estimates of fishing mortality: Sampling of the Div. 5Y adult fishery in 1972 produced sufficiently accurate estimates of catches by year-class to provide the basis for a virtual population analysis (Tables 4-8). The age composition data prior to 1972 were limited and the estimates of fishing mortality (Table 6) are therefore approximate. The average F (based on age 4 and all older fish) increased from 1967 to 1971 and then declined slightly from 0.63 to 0.53 in 1972. Estimates of F for ages 4-8 only (which are probably more reliable) increased to 0.52 by 1971 and 0.50 by 1972. From yield-per-recruit considerations, this fishing mortality on the stock should not exceed those latter values. Fishing mortality estimates (Table 7) were also made for the Maine juvenile fishery (specifically on age 2 fish) using age 2 stock sizes as determined from the adult fishery and the catches of age 2 fish from Maine juvenile fishery. For the 1960 to 1962 year-classes the estimates of F are in reasonable agreement with previous ones, but estimates for the 1965 to 1968 year-classes (F about 0.6) are smaller than previous estimates (about 0.8); however except for the 1965 year-class, all estimates exceed 0.5.

Table 6. Estimates of fishing mortality for the ICMAF Div. 5Y adult herring fishery from virtual population analysis assuming a constant M of 0.2.

Year	Year-Class															Average F for ages 4 and older
	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	
1967	3.23 ¹	.25	.12	.10	.22	.19	.10	.04	-	-	-	-	-	-	-	.13
1968	-	3.43	.74	.37	.38	.30	.29	.26	.14	.09	-	-	-	-	-	.27
1969	-	-	2.58	.57	.42	.38	.45	.33	.11	.04	.18	.01	-	-	-	.24
1970	-	-	-	3.01	1.52	1.34	.94	.83	.46	.16	.18	.06	.02	-	-	.48
1971	-	-	-	-	3.88	2.17	2.17	2.43	1.18	.57	.37	.19	.15	.05 ⁴	-	.63
1972	-	-	-	-	-	1.92 ²	3.27 ²	3.42 ²	1.53 ²	.79 ²	.70 ²	.40 ²	.30 ²	.25 ³	-	.53

¹ Average of mortalities at age 11 for 1968-1971.

² From iteration of exploitation rate where N_1 for 1972 = $N_{1-1}e^{-Z_{1-1}}$

³ From iteration of exploitation rate with N_3 determined from $N_2e^{-.63-.2-.11-.05}$ where .63 is F from the Maine juvenile fishery, .2 is M at age 2, .11 is F age age 3 in the Maine fishery and .05 is M for the first quarter of age 3.

⁴ Assumed same proportional change in 1971 over 1970 as occurred with age 3.

Table 7. Estimates of fishing mortality in the Maine juvenile fishery from a comparison of stock sizes calculated from the Div. 5Y adult fishery and the Maine juvenile catch.

Year-class	Age 4 year class size of adult fishery (millions)	Age 3 catch		Total age 3 catch (millions)	Maine fishery (age 2)		
		Maine fishery (millions)	Adult fishery (millions)		Catch (millions)	Year-class size (millions)	Fishing mortality
1960	211.1 ³	497.9	0.0	497.9	2,238.4	3,460.8	1.20
1961	288.1 ³	22.5	0.0	22.5	771.8	1,313.1	1.02
1962	227.2 ³	57.8	-	57.8	474.9	941.8	0.80
1963	178.2 ³	208.5	0.0	208.5	932.9	1,578.3	1.02
1964	147.2 ³	122.1	0.6	122.1	292.7	708.7	0.71
1965	174.1 ³	256.9	17.7	256.9	268.1	926.7	0.38
1966	176.1 ³	249.0	39.0	249.0	631.4	1,349.3	0.71
1967	144.1 ³	45.2	9.3	45.2	218.3	529.8	0.60
1968	128.8 ³	26.8	23.1	26.8	186.5	465.6	0.58
1969	40.8 ⁴	7.3	12.7	20.0	73.7	172.2 ²	0.63 ¹
1970	?	82.7 ⁵	-	-	338.0	789.6 ²	0.63 ¹

¹ Assumed from an average over year-classes 1966-1968.

² From $N_0 = \frac{Z C}{\hat{F}(1-e^{-Z})}$ assuming an average F over the 1966-1968 year-classes of 0.63 at age 2.

³ From $N_0 = \frac{Z C}{\hat{F}(1-e^{-Z})}$ with $\hat{F}$'s estimated from virtual population method.

⁴ Assuming F at age 2 of 0.63 with known catches at age 2 and 3, and F at age 3 in the juvenile fishery of 0.11 and in the adult fishery of 0.25.

⁵ Assuming F at age 3 to be the same as the average for the 1966-1969 year-classes.

Estimates of stock size: Due to low recruitment, the adult stock size in Div. 5Y has been declining (Table 8). The stock size (age 4 and older) for 1973 is estimated to be about 33% by weight of that estimated for 1967. The decline was especially rapid after 1970 due to the poor 1967 and 1968 year-classes and recruitment in 1973 will be low due to the poor 1969 year-class. However, recruitment should improve substantially in 1974 due to the relatively good 1970 year-class. If the fishing mortality in 1973 lies between 0.1 and 0.5, the recruitment should vary between limits of 15,000 and 33,000 tons giving a stock size in 1974 of from 43,700 to 75,000 tons (Fig. 1). The stock sizes (age 4 and older) in 1972 and 1973 were estimated to be 77,000 and 50,000 respectively.

Estimation of recruitment: The relative year-class size, as determined from the Maine juvenile fishery, is assumed to provide a quantitative measure of recruitment to the Div. 5Y adult fishery. Two levels of the 1970 year-class size at age 3 were determined, assuming fishing mortality rates of 0.63 and 0.80 in the juvenile fishery. The average fishing mortality for age 2 of the 1966, 1967 and 1968 year-classes was 0.63 which, with a fishing mortality of 0.29 at age 3 (averaged over the 1966-1969 year-classes in the juvenile fishery), produced a maximum year-class size entering the Div. 5Y adult fishery in 1973. An F of 0.8 in the juvenile fishery produced the assumed minimum estimate of recruitment for 1974.

Catch quotas: Figure 1 shows the relation of a range of 1973 catches to resulting 1974 stock sizes (age 4 and older) based on the two estimates of recruitment. To maintain the stock size in 1974 at the same level as at the beginning of 1972, a maximum of 5,000 tons should be harvested, if recruitment is assumed to be the larger of the two levels and all age 3 fish are available to the fishery. An F slightly less than 0.5, the maximum (according to yield per recruit considerations) that should be placed on the total stock (age 3 and older), would allow a catch of 30,000 tons but would, at best, maintain the very low 1973 stock size of 50,400 tons. If recruitment were at the lower of the two levels, the catch should be only 20,500 tons (F = 0.36) to maintain the 1973 stock level. Since the 1970 year-class appears to be the best year-class since that of 1966, the catch in 1973 should be reduced perhaps to no more than 7,500-17,500 tons, which would allow this year-class to increase the stock size toward the 1972 level, i.e. to regain 50% of the loss in stock size from 1972 to 1973.

Table 8. Stock sizes of the Div. 5Y herring fishery (millions of fish).

Year-class	Year						
	1967	1968	1969	1970	1971	1972	1973
1956	0.4	-	-	-	-	-	-
1957	3.5	2.1	-	-	-	-	-
1958	7.2	5.0	1.9	-	-	-	-
1959	16.3	11.2	6.6	3.0	-	-	-
1960	97.9	63.8	35.2	19.0	3.5	0.1 ¹	-
1961	182.2	118.5	73.3	40.9	8.8	0.8 ¹	0.1 ³
1962	184.0	131.7	80.4	41.6	13.3	1.1 ¹	0.05 ³
1963	178.2	141.3	87.7	52.0	18.7	1.3 ¹	0.05 ³
1964	-	147.2	104.2	79.7	41.2	10.4 ¹	1.8 ³
1965	-	227.0	174.1	136.6	92.4	42.8 ¹	15.9 ³
1966	-	-	260.7	176.1	120.5	68.1 ¹	27.7 ³
1967	-	-	190.9	176.5	144.1	97.6 ¹	53.6 ³
1968	-	-	-	190.5	182.7	128.8 ¹	78.1 ³
1969	-	-	-	-	-	64.0 ²	40.8 ³
1970	-	-	-	-	-	-	245.2 ⁴
Total stock size age 4 and older	669.7	620.8	563.4	548.9	442.5	351.1	218.1

¹ From $N_i e^{-(F_i + 0.2)}$ where i refers to the year-classes in the year 1971;
 F_i from virtual population analysis.

² Assuming F at age 2 in Maine juvenile fishery of 0.63 (the average over the
1966-1968 year-classes).

³ From $N_i e^{-(F_i + 0.2)}$ where i refers to the year-classes in the year 1972.

⁴ Assuming F at age 2 in Maine juvenile fishery of 0.63 and F at age 3 of
0.29 (the average over the 1966-1969 year-classes).

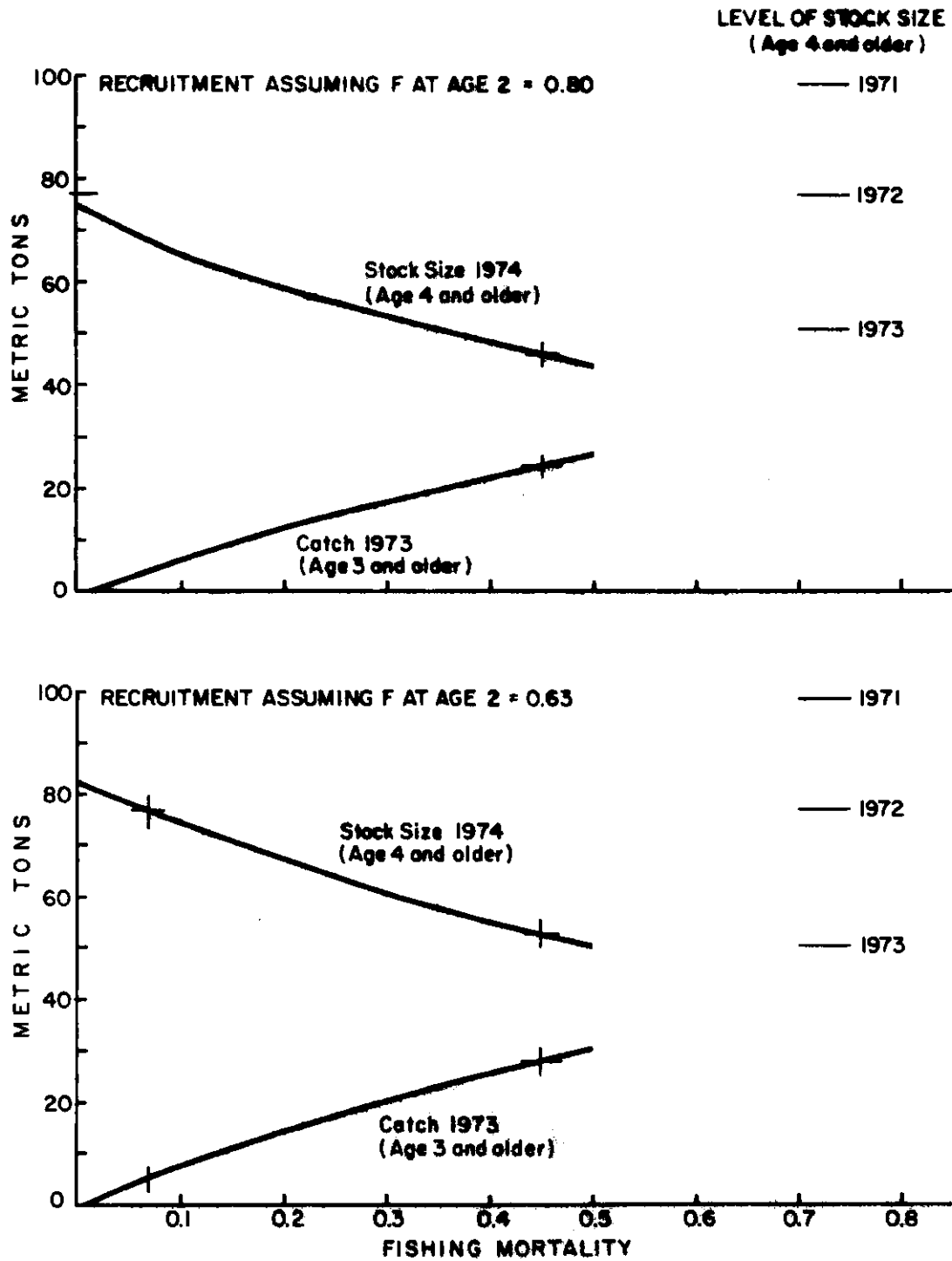


Fig. 1. Catch quota options and resulting stocks for Div. 5Y.

c) Division 5Z - Statistical Area 6 Herring Assessment

At its mid-term meeting in January 1972, the Herring Working Group indicated that an allowable catch of 95,000 tons in 1972 would result in no increase in stock size (age 3 and older) from the level at the beginning of 1972. This assumed that recruitment in 1972 would be the same as in 1971. However, an allowable catch of 150,000 tons was adopted by the Commission for 1972, a catch which was considerably greater than that which would have allowed stock replacement. In addition, it is now known that recruitment in 1972 was less than that which was assumed, so that the stock size at the beginning of 1973 is estimated at 158,000 tons compared with 240,000 tons at the beginning of 1972, i.e. a 34% decline in one year.

The Commission's Resolution on the herring research program (Special Meeting on Herring, January - February 1972, Proceedings No. 4, App. VI) specified that the Working Group provide an estimate of the level of catch in 1973 that would maintain the stock size at the level obtaining in the beginning of 1973. This implies that the deterioration of the stock situation during 1972 is acceptable to the Commission, whereas it was stressed in the 1972 Report of the Herring Working Group, and is re-emphasized here, that stock level was already so low as to cause concern about the possibility of maintaining optimum recruitment. It is for this reason and for others which will be dealt with in their proper place, that the advice to the Commission, in regard to the Div. 5Z - Stat. Area 6 stock, is framed in such a way as to indicate a wide range of optional actions which allow the possibility of stock rebuilding.

The method for the assessment of the Div. 5Z - Stat. Area 6 herring stock was substantially as described in the 1972 Annual Meeting Report of the Working Group (*Redbook* 1972, Part I, page 53). Data from the 1972 fisheries were collated and incorporated into the analysis. Age frequencies from individual countries were weighted by catch to derive the final age composition of the catch by numbers for age groups.

Fishing mortalities for three years prior to 1972 (1969-1971) were averaged for each age group to determine the distribution of F by age groups. The age group contributing most to the 1972 catch was adopted as the standard and values of F on other age groups were expressed as percentages of this standard.

A mean F for all ages from 3 years was derived by applying the 1972 catch data in Fig. 6 of the 1972 Working Group Report (*Redbook* 1972, Part I, page 65). This value was $F = 0.8$, and it was adjusted for each age group from the percentages derived from the 1969-1971 data. These values for F were applied to individual age groups in the 1972 catch to determine year-class abundance for 1972 and total stock size for 1972. Cohort analysis then gave estimates of stock size and fishing mortality for earlier years.

The results of this analysis are presented in Table 9, and these form the basis for catch prediction in 1973 and stock size estimates at the beginning of 1974, which are illustrated in Fig. 2 at two assumed levels of abundance for the 1970 year-class and summarized in Table 10. For the two assumptions as to the size of the 1970 year-class, Table 10 gives the initial 1973 stock size (age 4 and older), the 1973 recruitment of 3-year-old fish, the resulting 1973 stock size (age 3 and older), the 1973 catch which includes that of the recruiting 1970 year-class, the resulting initial 1974 stock size (age 4 and older) and the F values associated with the catch.

Concerning the Commission's request that the Working Group provide the best possible information on the level of catch in 1973 that will maintain the stock size at the level obtaining in the beginning of 1973 (Special Meeting on Herring, January - February 1972, Proceedings No. 4, App. VI, item 2(d)), the Working Group considered two options:

- i) if the 1970 year-class is the same size as the 1966 year-class, the 1973 catch level to maintain the 1973 stock size is 225,000 tons; and
- ii) if the 1970 year-class is 75% of the size of the 1966 year-class, the corresponding catch level is 175,000 tons.

However, these catches achieved only at values of F (0.92 and 0.82 respectively), which are much higher than the F equivalent to MSY ($F = 0.45$). Such heavy exploitation of 3-year-old herring is biologically wasteful. Moreover, even if a high proportion of 3-year-olds matured in 1973 (and this cannot be guaranteed), they would be contributing to the stock's spawning at considerably less than their maximum reproductive potential, since egg production per unit weight of fish increases with size and age over the life span of the fish. Because the stock size has been markedly reduced in recent years, the question of ensuing future recruitment potential must be considered.

A proportion of the 1970 year-class will not exceed the minimum size limit of 9 inches (22.86 cm) total length, and these would be protected particularly in the early months of the year, i.e. before the main period of growth. Table 11 gives mean lengths of 3-year-old herring in the Gulf of Maine inshore juvenile fishery and in the Georges Bank fishery; these indicate that during the first six months of the year a substantial proportion of the 1970 year-class could be under the size limit. In the last six months of the year, when the main fishery occurs, the majority of age-3 fish are likely to exceed the size limit of 22.86 cm and are likely to contribute substantially to the fishery even if the minimum size limit is adhered to. Finally, there can be no guarantee that the 1971 year-class will be large; if it is significantly smaller than the 1970 year-class, then the 1974 prospects could be very poor unless part, at least, of the potential of the 1970 year-class is reserved.

Table 9. Herring stock size (millions), catch (millions), and fishing mortality for the Georges Bank stock (Div. 52 + Stat. Area 6).

Year	Age									Stock size for age 3 and older		Stock size for age 4 and older	
	9+	9	8	7	6	5	4	3	2	Number (millions)	Wt('000 tons)	Number (millions)	Wt('000 tons)
Stock													
1967 ¹	20	23	133	1100	1302	973	1402	1201	-	6154	1322	4953	1136
1968 ¹	13	64	557	839	699	1093	977	1454	-	5696	1232	4242	1007
1969 ¹	47	152	295	361	591	735	1143	1627	-	4951	988	4324	4072
1970 ¹	35	67	125	232	351	745	1291	1012	-	3858	761	2846	604
1971 ¹	43	56	106	177	365	649	715	565	-	2676	550	2111	462
1972	33 ¹	41 ¹	51 ¹	140 ¹	274 ¹	336 ¹	162 ¹	565 ³	-	1602	328	1037	240
1973	25 ²	10 ²	45 ²	113 ²	124 ²	55 ²	333 ²	1220-1627 ⁴	-	1925-2332	347-410	705-705	158-158
Catch													
1967	10	11	49	379	251	108	61	7	2	878	219		
1968	7	22	337	433	233	336	72	52	3	1494	373		
1969	24	110	191	189	278	277	210	46	-	1324	306		
1970	18	30	52	93	122	270	451	125	13	1173	247		
1971	22	14	50	104	176	285	276	333	13	1271	263		
1972	17	23	36	79	125	170	87	28	22	587	138		
F													
1967	-	0.74	0.53	0.48	0.24	0.13	0.05	0.01	-	0.18 ⁵			
1968	-	0.46	1.10	0.85	0.46	0.41	0.08	0.04	-	0.40 ⁵			
1969	-	1.61	1.25	0.86	0.74	0.54	0.23	0.03	-	0.42 ⁵			
1970	-	0.63	0.60	0.58	0.48	0.51	0.49	0.15	-	0.41 ⁵			
1971	-	0.33	0.75	1.04	0.76	0.66	0.56	1.05	-	0.74 ⁵			
1972	-	0.95	1.41	0.94	0.69	0.80	0.88	0.33	-	0.64 ⁵			

¹ Stock size calculated from $\frac{C Z}{F(1-e^{-Z})}$

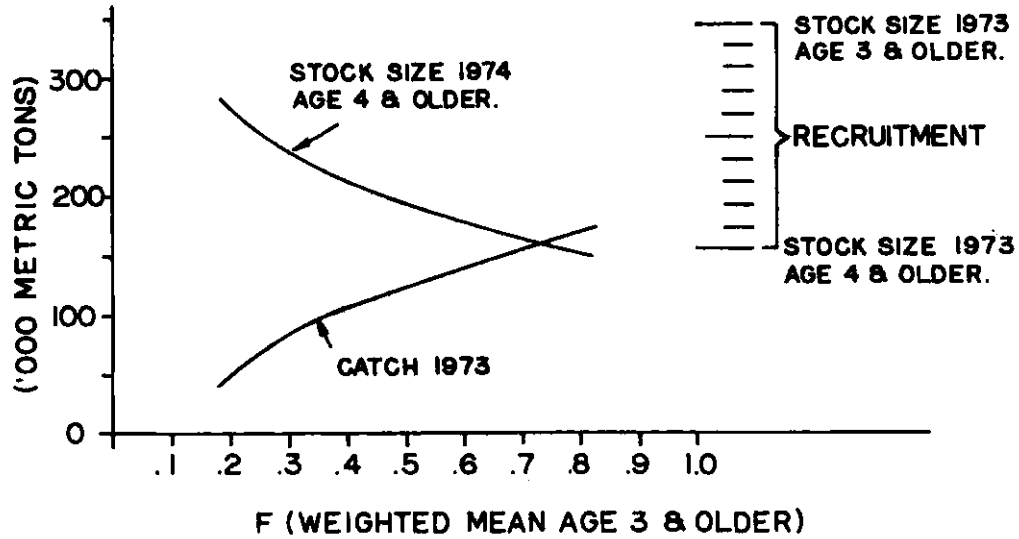
² Stock size calculated from $N_{i+1} = N_i e^{-Z_i}$

³ Assumed to be the same as for 1971.

⁴ Assumed to be within the range of 75% to 100% of the 1966 year-class at age 3.

⁵ The average F is weighted over year-classes by stock size in number.

A. RECRUITMENT 1970 YC = 75% OF 1966 YC.



B. RECRUITMENT 1970 YC = 1966 YC.

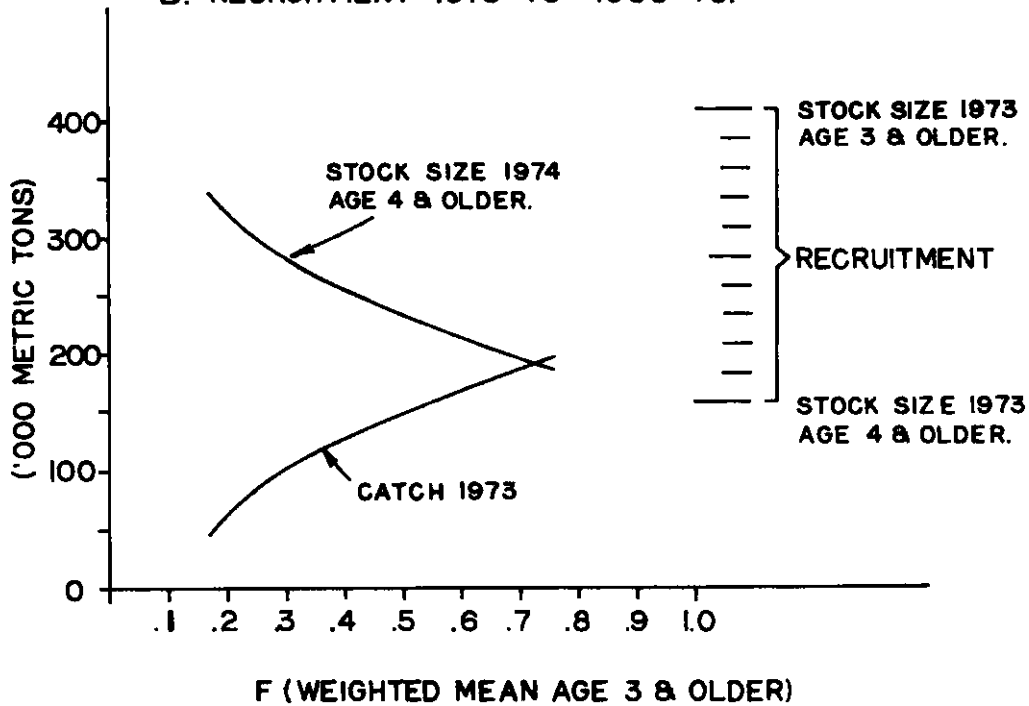


Fig. 2. Georges Bank herring (Div. 52 and Stat. Area 6): stock sizes at beginning of 1973 and 1974 in relation to 1973 catches, assuming two estimates for recruitment (1970 year-class) in 1973.

As a guide to the Commission in interpreting these factors in conjunction with the data in Table 10, and in answer to the Commission's question concerning yield-per-recruit considerations, the following facts can be pointed out:

- 1) Assuming that the 1970 year-class is about equal to the 1966 year-class, with $F = 0.45$, i.e. corresponding to MSY, the 1973 catch would be 135,000 tons, the 1974 stock size would be 250,000 tons, i.e. about that for 1972 (240,000), and just over 60% (by numbers) of the 1970 year-class would survive into 1974.
- 11) Assuming that the 1970 year-class is 75% of the size of the 1966 year-class, with $F = 0.45$, the 1973 catch would be 115,000 tons, the 1974 stock size would be 204,000 tons, and again, just over 60% of the 1970 year-class would survive. On the same assumption as to 1970 year-class size, to regain the 1972 stock level (age 4 and older) would involve an F of 0.29 and a catch of 83,000 tons.

Table 10. Effect of the 1973 catch in Div. 5Z and Stat. Area 6 on stock size at beginning of 1974 with associated F values.

Stock size 1973 (Age 4 and older) ('000 tons)	Recruitment 1973 ('000 tons)	Stock size 1973 (Age 3 and older) ('000 tons)	Catch 1973 ('000 tons)	Stock size 1974 (Age 4 and older) ('000 tons)	F
(Assuming 1970 year-class is same size as 1966 year-class)					
158	252	410	225	158	0.92
158	252	410	197	186	0.76
158	252	410	174	209	0.63
158	252	410	149	234	0.50
158	252	410	121	263	0.37
158	252	410	88	297	0.25
158	252	410	47	340	0.17
(Assuming 1970 year-class is 75% of 1966 year-class)					
158	189	347	175	149	0.82
158	189	347	155	169	0.68
158	189	347	132	191	0.54
158	189	347	108	216	0.40
158	189	347	79	246	0.27
158	189	347	42	285	0.18

Table 11. Monthly mean lengths of herring at age 3.

Month Year	1	2	3	4	5	6	7	8	9	10	11	12
Western Maine (US data)	21.0	22.6	21.2	21.8	22.8	23.1	24.1	25.4	25.0	25.1	24.6	24.3
Georges Bank (US data)	20.8	20.2	19.4	21.2	22.8	22.8	25.1	24.8	24.6	24.6	24.5	24.8
Georges Bank (USSR data)	-	-	-	-	-	-	24.2	24.2	24.2	-	-	-

d) Division 4X Assessment

It is not yet possible to complete a formal assessment of the Nova Scotia stock. Sufficiently detailed information on catch location for mobile fleet operations is not yet available and, in any case, cannot now be provided for earlier years for comparison. Because the same fishing areas in the Canadian fishery may contain juvenile, pre-spawning and spawning fish in proportions which vary from year to year and from week to week within a fishing season, the problems of determining the numerical exploitation of individual year-classes are great. Recommendations to the Commission as to catch level can therefore be framed only generally, and for 1973 are best defined in terms of recruitment prospects.

Fig. 3 shows the Div. 4X portion of the areas where the Canadian mobile fleet effort is concentrated in fishing for herring. Area A also contains much of the inshore weir fishery (which extends somewhat further into the Bay of Fundy) and is also the area where a discrete section of the Canadian fleet, mainly small boats of about 20 m, concentrates its activity in the early and late part of the season. Herring in Area C are exploited mainly by larger vessels (based at Yarmouth and East Pubnico), usually in the early part of the season. Area B is the spawning area for the stock to which effort is diverted from Areas A and C during the main spawning season in August (see Res. Doc. 72/11).

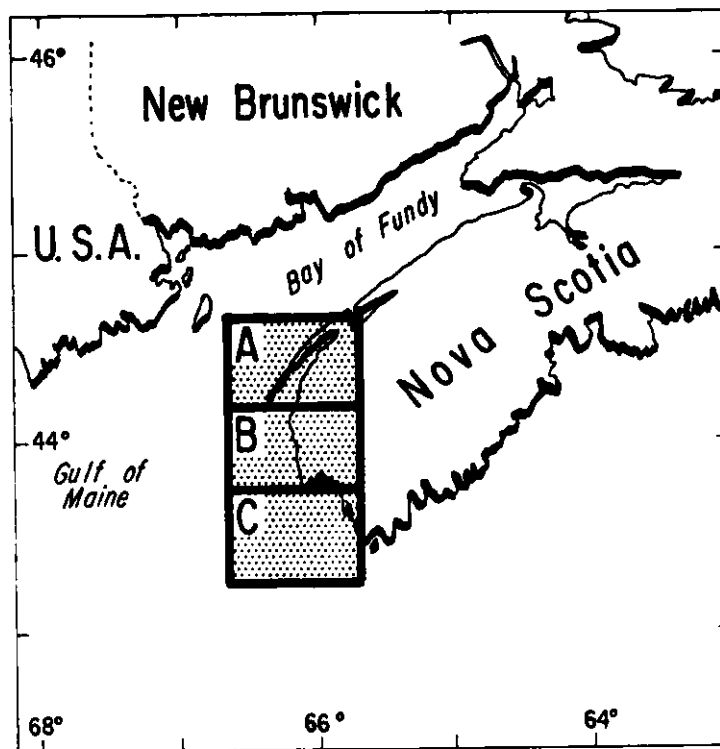


Fig. 3. The area covered by the Canadian purse seine fishery for herring in Div. 4X.

The main features of the 1972 season were the occurrence of 2-year-old herring (1970 year-class) in considerable numbers in Area A (along Digby Neck) where they were caught in the purse seine fishery, and the presence of large concentrations of 3-year-old fish (1969 year-class) in Area C. The average catch rate in Area A was about 20 metric tons/boat night, i.e. almost the same as that for 1971 for the same area (Res.Doc. 72/11). However, 1972 catches in this area contained higher proportions of 2-year-old fish. Preliminary age-composition data indicate a relatively high abundance of 2-year-old fish in the area. There is, therefore, some indication that the 1970 year-class is reasonably large for the Nova Scotia stock, as it may also be for the Georges Bank (Div. 5Z and Stat. Area 6) and Gulf of Maine (Div. 5Y) stocks.

Of more immediate importance is the 1969 year-class, which seems to be of reasonable size in the Nova Scotia stock whereas it was relatively small in both the Gulf of Maine and Georges Bank stocks. USSR data presented at this meeting gave the distribution of young herring in the offshore areas from Middle Bank in Div. 4W to south and west of Cape Cod in Stat. Area 6. On the Nova

Scotia shelf, to the south and east of Area C, there was a wide distribution of juvenile herring in the period January to April 1972. Of three length-frequency samples, two gave a range of 14-22 cm with means of 17.3 and 17.8 cm. The third gave a range of 12-17 cm with a mean of 14.1 cm. Since these samples were taken before the growing period the larger fish in the samples are of a size that would indicate they belong to the 1969 year-class.

Table 12 gives length frequencies of catches in Area C for July and August 1972 when the largest catches were made, and a large proportion of the Canadian catches were 3-year-old herring. Catch-per-effort data are available for this area in 1972 from log-book records of individual vessels, many of which can be identified as having fished in the same area in 1971. The 1972 catch-per-boat-night (m tons) was 67.1 m tons compared with a figure of 31.5 tons per boat night for the same area in 1971 (Res.Doc. 72/11). Bearing in mind that the 1972 catch consisted mostly of 3-year-olds of 1969 year-class whereas the bulk of the 1971 catch was 4-year-old fish and older, the 1969 year-class would appear to be quite abundant. Indeed the 1972 catch-per-effort in this area was nearly as high as the peak level of 64.7 tons per boat night recorded in Area B in 1966. This year-class also occurred in high larval concentrations inside the Bay of Fundy in late 1969, some months after the spawning period (Res.Doc. 71/32).

Table 12. Length frequency distribution (per mille) of herring in the Canadian fishery in Div. 4Xa, 1972.

		Length (cm)																
		<18	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Area C (see Fig. 3)	July	-	16	77	226	319	192	75	11	21	22	11	8	11	3	2	4	2
	Aug	1	5	19	142	277	316	201	26	7	5	1	1	-	-	-	-	-

The fishing mortality rate to which the 1969 year-class was subjected to in 1972 is not yet known. The number of Canadian vessels fishing in the area has declined in recent years, and there was no appreciable increase in the number in 1972, although accurate data are not yet available. However, a large non-Canadian fleet of midwater trawlers and purse seiners, together with factory ships, was reported in Area C in late July and early August of 1972 about 20 miles from shore. Reports to date indicate that only 3,000 tons were taken in the area, but non-member countries (known to have vessels in the area) have not yet submitted data.

Although a virtual population analysis has not yet been done for this stock, preliminary estimates indicate that about 200 million fish of the 1969 year-class were removed in 1972 (includes only recorded catches). This number is about the same as that estimated to have been removed from the 1966 year-class as 3-year-old fish in 1969. However, while the 1966 year-class was heavily exploited also as 2-year-olds in 1968 (500 million fish), relatively few of the 1969 year-class were caught in 1971, for reasons which are not understood. Total removals from the 1969 year-class at ages 1, 2 and 3 are thought to be considerably less than those from the 1966 year-class over the same ages.

Although the relative size of the 1969 year-class and the degree of escapement to the 1973 fishery cannot be quantified with certainty, there is sufficient evidence to indicate that prospects are reasonable and no reason to suggest that the allowable catch be decreased for 1973. Furthermore, the 1969 year-class was abundant enough on the grounds to divert some Canadian effort from the pre-spawning adult fishery, so that effort on the 1972 adult stock may have been lower, thus resulting in more adults surviving at the end of 1972 than would normally be the case, and there are at least reasonable prospects for the 1970 year-class as well. It must be pointed out that exploitation of juvenile fish in the area was too high in 1972, and, while the biological situation makes this difficult to avoid since adult and juvenile year-classes are found in the same general fishing area, attempts to overcome this problem must be made if the fullest potential of the stock is to be realized.

e) Prediction of Year-class and Quota Levels

The Working Group wishes to make some observations on the US proposal that quota levels for the herring stocks for 1974 be decided at the 1973 Annual Meeting and not at a Special Meeting of the Commission in January 1974 (Comm.Doc. 73/2).

Advice to the Commission on catch levels is greatly dependent on estimates of future recruitment, which for the 1973 quota year were derived mainly from the results of the 1972 juvenile fisheries as indicating the size of the 1970 year-class. No information on the 1973 juvenile fisheries will be available at the 1973 Annual Meeting; nor will there be sufficient information on the adult fisheries to confirm estimates of 1973 recruitment of the 1970 year-class made at this meeting.

Juvenile surveys are expected eventually to make a contribution to prediction, but it is not likely that reliable estimates will be available in 1973. The results from larval surveys are expected to throw light on stock identification, relative adult stock abundance and dispersion of larvae from the spawning grounds, but their importance for predicting future year-class abundance is being investigated. The importance of developing predictive capabilities by extending the scope of surveys for larvae and juvenile stages will be discussed below. However, it must be mentioned that assessment will be difficult at Annual Meetings until these surveys are producing reliable results, and even then it may be necessary to make assumptions as to the size of incoming year-classes as a basis for assessment, e.g. that the year-class size is the average for the last five years.

It is suggested, therefore, that the possibility of modifying agreements reached at Annual Meeting by the incorporation of the results of Mid-term Meetings of the Herring Working Group be explored. Alternatively, modifications in administrative procedures could be considered which might solve the problem that would be caused by the adoption of the US proposal.

4. ICNAF Herring Research Requirements

a) Tagging Experiment

US scientists reported on the availability of tag detection machines. However, it was felt that the question of estimation of year-class size in the early stages of the life history to assess recruitment prospects is of much higher priority at this time, and no tagging program is recommended for the present. The importance of tagging experiments is realized and the subject will be kept under review.

b) Larval Surveys

It was agreed that continuation of the ICNAF Herring Larval Survey Program is desirable. The value of these surveys lies in the contribution they can make to estimation of adult stock size, to stock identification by following larval dispersion, and to understanding the factors influencing larval survival which will affect year-class size. The methods used in the 1971 and 1972 surveys should be reviewed in order to explore the possibility of developing prediction capabilities for future year-class strength.

c) Surveys for Juvenile Herring

The results of juvenile surveys by USSR research vessels in the offshore areas in early 1972 and the tentative confirmation of good year-classes indicate that coordinated juvenile surveys are valuable. Initial plans were made for a winter survey in the period from the last week in February to the third week in March 1973. Countries expected to participate are Fed. Rep. Germany, Poland and USSR. The area from the Nova Scotia shelf to Long Island was chosen and tentatively subdivided into areas each of which would be covered by a research vessel from a member country. It was recognized, and is stressed here, that surveys of inshore areas should be carried out over the same period, and Canada is requested to make a special effort to provide survey-vessel facilities for this purpose.

It was considered that the development of a juvenile survey program was of the greatest importance in providing information on future stock prospects.

d) Sampling and Statistics

The assessment responsibilities of ICNAF scientists and the need to provide regular, up-to-date and increasingly-precise advice for management demands an increasingly effective and comprehensive system of statistics and sampling. The present situation for herring is poor, both as to quantity and quality and as to timeliness of presentation, and improvement in the reliability of advice now depends on improvement in the provision of basic catch statistics and adequate sampling.

Attempts will be made during 1973 to standardize reporting formats, but these will not be effective unless a special effort is made by all member countries to improve the present standards of collection and reporting.

e) Otolith Exchange Program

An ageing workshop proposed for early January 1973 at Hamburg did not materialize. Instead, the USA and Canada held a meeting at St. Andrews, Canada, for standardizing methods and conventions in using otoliths for ageing purposes. A document reporting the results of this meeting was presented to the Herring Working Group (Res.Doc. 73/2).

SUPPLEMENT 1. REPORT OF *ad hoc* MEETING OF HERRING WORKING GROUP,
17 JANUARY 1973

The Joint Meeting of Panels 4 and 5 requested the Working Group to review the assessment for the Nova Scotia stock (Div. 4Wb and 4Xa) with particular reference to the size of incoming year-classes.

The Working Group concluded that the 1969 year-class in Div. 4Wb - 4Xa appeared to be larger than those immediately preceding it, possibly as large as the 1966 year-class, although a more precise estimate is not possible at this time. It was also agreed that the evidence to support this statement is at least as good as that supporting the assumption that the 1970 year-class in Div. 5Z - 6 was as good as the 1966 year-class of that stock, although some representatives pointed out that the evidence for the Nova Scotia stock is more qualitative than quantitative.

Assuming that the 1969 year-class in Div. 4Wb - 4Xa is as good as the 1966 year-class, an increase in the allowable catch to 90,000 tons for 1973 would not cause a decline in stock size during 1973, and would likely result in an increase compared with that existing at the beginning of 1972. Also, an increase in catch to 90,000 tons would not necessarily lead to an increase in F.

Assuming that the 1969 year-class is one-half the size of the 1966 year-class, the stock size in 1973 would probably be maintained even with an allowable catch of 90,000 tons.

SUPPLEMENT 2. REPORT OF *ad hoc* MEETING OF HERRING GROUP,
20-22 JANUARY 1973

The instructions to the Working Group from the *ad hoc* Committee on Herring Quotas and their Allocation were related to three specific problems: (1) to indicate a stock size at which recruitment could be expected to be at optimum levels; (2) to indicate what the mean MSY would be at the optimum stock size; and (3) to relate stock size (age 4 and older) at the start of 1974 to catches and assumed recruitment in 1973 and 1974.

1. Stock size

- a) For the Div. 5Y stock the size is estimated at 100,000-120,000 tons. It was pointed out that preliminary larval survey data indicated that the Div. 5Z and Stat. Area 6 stock was of the order of 10 times that of the Div. 5Y stock, but this is only a very preliminary estimate, and a range of 100,000-120,000 tons was agreed as the best estimate.
- b) For the stock in Div. 5Z and Stat. Area 6 the optimum size is estimated at 500,000 tons. This is based on the average stock size in the early 1960's which was known to give good recruitment and the stock size in 1970 which produced the relatively good 1970 year-class. Between these two periods stock size increased markedly as the two very large 1960 and 1961 year-classes made their maximum contribution to the stock. Other estimates lower than 500,000 tons and also higher were given, based on different lines of argument; the figure of 500,000 tons was the consensus of the Group.

2. MSY of optimum stock size

- a) For Div. 5Y stock the best estimate of MSY is 50,000-60,000 tons.
- b) For Div. 5Z and Stat. Area 6 stock, the best estimate is 250,000 tons. This question was dealt with in the 1972 Annual Meeting Report of the Herring Working Group (*Redbook* 1972, Part I, page 56).

3. Catch and recruitment, and their effect on the 1975 stock size

The information relating to this question is given for each of the two stocks in the following Tables. In addition, for the Georges Bank stock the difference in stock size (in % and by weight in 1,000-ton units) is given for different catch levels in 1973.

For the Div. 5Y stock assumptions were made as to the effects of the juvenile fisheries. For both stocks, it was assumed that the 1973 catch will include 3-year-old fish.

It must be pointed out that, while some information is available as to the size of the 1970 year-class, none is available that allows estimates for the 1971 year-class size. The calculations are based entirely on the assumption concerning the latter year-class. It is unlikely that further information will be available by the time of the 1973 Annual Meeting at which time advice on the 1974 catch levels will be expected from the Herring Working Group. The information given here is essentially that which will be used in May 1973.

Table 1. Div. 5Y stock: prediction of 1975 stock size at different assumed levels of 1973 and 1974 recruitment and of 1973 and 1974 catch ('000 tons).

HIGHER LEVEL RECRUITMENT IN 1973 ¹								
Catch in 1973	F in 1973	Recruitment in 1974 as % of 1966 year-class ²						
		F	50%		100%		125%	
			Catch	Stock ³	Catch	Stock	Catch	Stock
17.5	.25	.25	16	61	19	78	22	86
		.30	19	59	23	74	27	81
		.45	25	50	33	62	37	68
20.0	.30	.25	15	59	18	77	21	83
		.30	18	57	22	72	25	79
		.45	25	49	32	60	36	67
27.5	.45	.25	14	49	18	64	19	72
		.30	16	46	21	61	23	67
		.45	21	41	28	52	31	58
LOWER LEVEL OF RECRUITMENT ⁴								
15.0	.25	.25	15	59	17	71	21	80
		.30	18	53	21	68	25	75
		.45	24	45	31	57	35	64
18.0	.30	.25	13	54	18	69	19	77
		.30	17	51	21	66	23	73
		.45	24	45	30	56	33	63
24.5	.45	.25	12	46	17	61	18	68
		.30	15	42	20	57	22	64
		.45	20	37	26	48	29	54

¹ Based on 1972 juvenile catch, $\frac{1}{2}$ of 1968 juvenile catch, and using the best estimate of recent mortality (F) as juveniles.

² Since not as good an estimate of 1966 year-class strength was available to use procedure as was done for 1970, the value of 1966 year-class in Table 8 in Report of Herring Working Group (Redbook 1972, Part I, page 50) was used.

³ Optimum stock assumed to be 100,000-120,000 tons.

⁴ Based on 1972 juvenile catch, $\frac{1}{2}$ of 1968 juvenile catch, and F as juveniles 1.33 times best recent estimate.

Table 2. Div. 5Z - Stat. Area 6 stock: prediction of 1975 stock size at different assumed levels of 1973 and 1974 recruitment and of 1973 and 1974 catch.

1973 Catch (tons)	Recruitment in 1973 as % of 1966 year-class	Recruitment in 1974 as % of 1966 year-class								
		50%			100%			125%		
		F	Catch	Stock	F	Catch	Stock	F	Catch	Stock
100,000	75	.33	105	240	.28	120	341	.26	130	393
		.49	130	203	.42	153	297	.40	167	344
		.65	158	176	.56	190	262	.53	207	304
	100	.35	113	274	.30	130	376	.29	139	429
		.52	154	232	.45	179	326	.43	191	374
		.69	187	197	.60	219	282	.57	235	327
	125	.36	132	315	.31	149	415	.30	159	466
		.53	180	267	.47	205	361	.44	218	407
		.71	218	223	.62	251	308	.59	267	352
115,000	75	.32	90	229	.27	110	330	.26	118	381
		.47	121	194	.41	145	288	.38	158	336
		.63	147	168	.54	180	254	.51	197	298
	100	.34	107	265	.29	125	366	.28	134	416
		.51	147	226	.44	172	318	.41	184	366
		.68	178	191	.58	210	277	.55	226	321
	125	.35	127	305	.30	145	407	.29	154	457
		.53	174	256	.46	200	351	.44	212	397
		.70	212	216	.61	244	302	.58	260	347
135,000	75	.31	79	215	.26	97	316	.25	106	367
		.47	110	184	.39	135	278	.38	147	325
		.62	135	159	.52	168	246	.50	184	290
	100	.33	100	354	.29	117	354	.27	126	405
		.50	136	216	.43	161	308	.40	174	355
		.66	167	184	.57	199	270	.54	215	314
	125	.34	119	291	.30	137	393	.28	146	443
		.51	165	245	.44	191	339	.42	203	386
		.68	200	208	.59	233	294	.56	249	338
150,000	75	.31	75	207	.26	93	308	.25	106	367
		.47	103	172	.39	128	271	.38	147	325
		.62	128	155	.52	159	241	.50	184	290
	100	.33	95	244	.29	111	345	.27	121	396
		.50	129	208	.43	154	302	.40	167	348
		.66	160	178	.57	191	265	.54	207	309
	125	.34	114	280	.30	132	382	.28	141	433
		.51	158	237	.44	184	330	.42	196	378
		.69	192	203	.60	224	288	.57	240	332

Table 3. Div. 5Z - Stat. Area 6 stock: difference in stock size (in % and by weight in 1,000-ton units) for different catch levels in 1973.

Recruitment as % of 1966 year-class in		Catch in 1973 ('000 tons)	Catch in 1973 ('000 tons)			
1973	1974		100	115	135	150
125	125	100 115 135 150	3 5 8 10 3 5 25 11 2 29 19 8			
125	100	100 115 135 150	3 6 9 10 4 6 22 12 3 31 21 9			
125	50	100 115 135 150	4 9 13 11 4 8 22 11 3 30 19 8			
100	125	100 115 135 150	2 5 7 7 3 5 17 10 2 24 17 7			
100	100	100 115 135 150	3 6 8 7 3 5 18 11 2 25 18 7			
100	50	100 115 135 150	3 7 12 6 5 9 16 10 4 24 18 8			
75	125	100 115 135 150	6 13 18 8 7 12 19 11 4 26 18 7			
75	100	100 115 135 150	6 13 19 9 7 13 19 10 5 26 17 7			
75	50	100 115 135 150	7 18 26 9 10 17 19 10 7 31 22 12			
Effect of different levels of catch in 1973 on stock size in 1975, using $F = 0.4$			Percentage Change in 1,000-ton units			

INTERNATIONAL COMMISSION FOR



THE NORTHWEST ATLANTIC FISHERIES

Serial No. 2934
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Proceedings No. 2

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of First Plenary Sessions

Tuesday, 16 January, 1000 hrs
Wednesday, 17 January, 1500 hrs
Thursday, 18 January, 1430 hrs
Friday, 19 January, 1435 hrs
Monday, 22 January, 0930 hrs
Tuesday, 23 January, 1435 hrs
Wednesday, 24 January, 0905 hrs
Thursday, 25 January, 0915 hrs
Friday, 26 January, 0915 hrs

- Item 1. Opening. The opening Plenary Session of the Special Commission Meeting was called to order by the Chairman, Mr K. Løkkegaard (Denmark). He welcomed delegates from 14 of the 16 Member Governments, and Observers from the European Economic Community (EEC), the International Council for the Exploration of the Sea (ICES), and the Food and Agriculture Organization of the United Nations (FAO) (Appendix I).

The Chairman led in a silent tribute to Captain T. de Almeida, Portuguese Commissioner from 1952 to 1971 and Chairman of the Commission from 1955 to 1957, who died on 24 October 1972.

The Chairman introduced Mr F. E. Popper, Assistant Director-General (Fisheries), FAO, who addressed the participants (Appendix II). The Chairman thanked Mr Popper on behalf of the Commission and its participants for his kind words of encouragement and asked that he present the Commission's compliments and appreciation to the Director General of FAO for again providing excellent meeting arrangements and accommodation.

The Chairman drew attention to the requirements of the 1972 Annual Meeting to consider the establishment of catches and their national allocation for 1973 for the Nova Scotia, Gulf of Maine and Georges Bank herring stocks at an extraordinary meeting of the Commission - the second in the Commission's history - to be held early in 1973. He further noted that the Member Governments had agreed to a US proposal to have the extraordinary meeting consider measures to reduce total fishing effort in the Convention Area and drew attention to the Memorandum by US Commissioners on the regulation of fishing effort which had been presented for discussion to the Meeting as Commissioner's Document 73/3.

- Item 2. Agenda. The Agenda was approved without change (Appendix III).

- Item 3. Rapporteur. The Executive Secretary was appointed Rapporteur.

- Item 5 and 6. Review of Present Herring Conservation Measures. 6. Further Conservation Requirements for Herring. These Items were referred to Joint Panels 4 and 5.

- Item 7. Consideration of Measures to Reduce Total Fishing Effort in the Convention Area. This Item was referred to STACREM. The Plenary agreed that the USA should prepare a specific proposal for regulation of fishing effort in Subarea 5 and Statistical Area 6 for consideration by STACREM.

- Item 4. Report of STACRES. The Chairman then invited Dr A. S. Bogdanov (USSR), the Chairman of STACRES, to present a summary of the Report of STACRES. The summary highlighted the results of consideration by the Assessments Subcommittee, under the chairmanship of Mr D. J. Garrod (UK), of (1) the problem of regulation of mixed fisheries as raised by the US memorandum on the regulation of fishing effort in Subarea 5 and Statistical Area 6 (Comm.Doc. 73/3) and the related Canadian questions (Comm.Doc. 73/4), and (2) the status of other resources (except herring) in the Convention Area. Also highlighted was the work of the Herring Working Group, under the chairmanship of Mr T. D. Iles (Canada), which reviewed the state of the herring stocks in the Convention

Area and presented answers to questions relating to possible conservation measures for herring in 1973 asked in the Commission's Resolution of Herring Research Program (1972 Special Meeting Proc. 4, Appendix VI).

The Chairman of the Commission thanked the Chairman of STACRES, the Assessments Subcommittee and the Herring Working Group and their members for their hard work and valuable advice.

The Plenary recessed at 1115 hrs.

From Wednesday, 17 January through Friday, 26 January, the Plenary reconvened for short periods on eight occasions to hear reports on the progress of deliberations of STACREM on effort limitation and of the Joint Panels 4 and 5 and the *ad hoc* Committee on Herring Quotas and their Allocations.

The Final Plenary Sessions were convened at 1125 and 1430 hrs, Friday, 26 January (1973 Special Commission Meeting Proceedings No. 6).

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Appendix I

SPECIAL COMMISSION MEETING - JANUARY 1973

List of Participants

Chairman: Mr K. Løkkegaard, Ministry of Fisheries, Copenhagen, Denmark

CANADA

Commissioners:

Dr A.W.H. Needler, Huntsman Marine Laboratory, St. Andrews, N.B.
Mr K. Henriksen, H.B. Nickerson & Sons Ltd., P.O. Box 130, North Sydney, N.S.

Advisers:

Mr J.E. Creeper, Environment Canada, Fisheries Service, Maritimes Region, P.O. Box 550, Halifax, N.S.
Dr R.G. Halliday, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B.
Mr T.D. Iles, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B.
Mr D.A. MacLean, Environment Canada, Fisheries Service, P.O. Box 550, Halifax, N.S.
Mr D.A. MacLean, Jr, Black's Harbour, N.B.
Dr F.D. McCracken, Atlantic Coast Fisheries Research Board Directors Committee, P.O. Box 159, Halifax, N.S.
Mr M. Matthews, Wilson's Beach, Campobello, N.B.
Mr D.S. Miller, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B.
Mr R.M. Pattullo, Sealife Fisheries Ltd., R.R. #1, P.O. Box 5, Lower East Pubnico, N.S.
Mr A.T. Pinhorn, Fisheries Research Board of Canada, Biological Station, St. John's, Newfoundland
Dr M.P. Shepard, Environment Canada, Fisheries Service, Resource Management Branch, Fontaine Bldg., Ottawa, Ontario, K1A 0H3
Mr W.A. Titus, Westport, Digby County, N.S.
Mr E.B. Young, Environment Canada, International Fisheries Service, Sir Charles Tupper Bldg., Ottawa, Ontario, K1A 0H3

DENMARK

Commissioners:

Mr K. Løkkegaard, Ministry of Fisheries, Copenhagen
Mr E. Nolsøe, Minister of Fisheries of the Faroe Islands, Torshavn, Faroe Islands

Advisers:

Mr J. Djurhuus, Government of the Faroe Islands, Torshavn, Faroe Islands
Mr Sv.Aa. Horsted, Grønlands Fiskeriundersøgelser, Jaegersborg Allé 1B, DK-2920 Charlottenlund
Mr T. Johansen, Via XX Settembre 1, Rome, Italy

FRANCE

Commissioners:

Mr R.C. Thibaudau, Secrétariat général de la Marine Marchande, 3 Place Fontenoy, Paris 7e
Mr R. Letacconnoux, Institut des Pêches Maritimes, B.P. 1049, Nantes F.44037

Advisers:

Mr A. Dezeustre, French Ship Owners' Union, 59 rue des Mathurins, Paris 8
Mr A. Parres, French Ship Owners' Union, 59 rue des Mathurins, Paris 8
Mme G. Rossignol, Secrétariat général de la Marine marchande, 3 Place de Fontenoy, Paris 7e

FEDERAL REPUBLIC OF GERMANY

Commissioners:

Dr D. Booss, Bundesministerium für Ernährung, Landwirtschaft und Forsten, 53 Bonn
Dr J. Messtorff, Bundesforschungsanstalt für Fischerei, Institut für Seefischerei, Bremerhaven
Dr A. Schumacher, Institut für Seefischerei, Palmallee 9, 2 Hamburg 50

Advisers:

Dr J. Genschow, Association of German Trawler Owners, Preussenstr. 3, Bremerhaven
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ICELAND

Commissioners:

Mr J.L. Arnalds, Ministry of Fisheries, P.O. Box 678, Reykjavik
Dr J. Jonsson, Marine Research Institute, Reykjavik

JAPAN

Commissioners:

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Mr S. Nishida, Economic Affairs Bureau, Ministry of Foreign Affairs, Tokyo

Advisers:

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Mr F. Imanaga, Nippon Suisan Kaisha Ltd. Stuff, 6-2 Otemachi, 2-Chome, Tokyo
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Dr F. Nagasaki, Far Seas Fisheries Research Laboratory, Japanese Fisheries Agency, Kasumigaseki, Tokyo

NORWAY

Commissioners:

Mr K. Raasok, Ministry of Fisheries, Oslo
Mr A. Aasbø, Directorate of Fisheries, Bergen

Adviser:

Mr Ø. Ulltang, Institute of Marine Research, Bergen

POLAND

Commissioners:

Dr R. Pietraszek, Ministry of Shipping, Warsaw
Mr M. Fila, Ministry of Shipping, Warsaw
Mr W. Kalinowski, International Cooperation Department, Fisheries Central Board, Odrowaza 1, Szczecin

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Dr B. Draganik, Morski Institut Rybacki, al Zjednoczenia 1, Gdynia
Dr J. Popiel, Morski Institut Rybacki, al Zjednoczenia 1, Gdynia
Mr A. Wistocki, Urzad Rady Ministrow, al Ajaz Dowskie 1/3, Warsaw

PORTUGAL

Commissioners:

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ROMANIA

Commissioner:

Mr O.R. Ernest, Ministry of Agriculture, Food and Water Management, Bucharest

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Mr L. Popescu, Ministry of Agriculture, Food and Water Management, Bucharest

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Commissioner:

Mr V. Bermejo, Dirección General de Pesca Marítima, Ruiz de Alarcón 1, Madrid

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Commissioners:

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Dr A. Noskov, Atlantic Research Institute of Marine Fisheries and Oceanography (AtlantNIRO), 5 Dmitry
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Commissioners:

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Advisers:

Mr C.J. Dandy, Great Westminster House, London S.W.1

Mr D.J. Garrod, Fisheries Laboratory, Ministry of Agriculture, Fisheries and Food, Lowestoft, Suffolk

Mr C.P. Hudson, 36 Herriby Road, Hershe, East Yorkshire

Mr B.B. Parrish, Marine Laboratory, P.O. Box 101, Torry, Aberdeen, AB98DB, Scotland

Mr J.G. Pope, Fisheries Laboratory, Ministry of Agriculture, Fisheries and Food, Lowestoft, Suffolk

UNITED STATES OF AMERICA

Commissioners:

Mr W.M. Terry, International Affairs, National Oceanic and Atmospheric Administration, Department of
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Mr R.W. Green, P.O. Box 528, Rockland, Maine

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Commander J.B. Lynn, Maritime Laws and Treaties Branch, United States Coast Guard, Washington, D.C.

Ambassador D.L. McKernan, Coordinator of Ocean Affairs, Department of State, Washington, D.C., 20520

Mr E.J. MacLeod, Kennebec Fish Corporation, Gloucester, Mass., 01930

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Mr R.E. Reed, Maine Sardine Council, Augusta, Maine
Mr C.B. Stinson, Stinson Canning Company, Prospect Harbor, Maine, 04669
Mr W.L. Sullivan, Jr, Assistant Coordinator of Ocean Affairs for Marine Science Affairs, Department of State, Washington, D.C., 20520

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Mr Sv.Aa. Horsted, Grønlands Fiskeriundersøgelse, Jaegersborg Allé 1B, 2920 Charlottenlund, Denmark

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Mr A.A. VanLancker, Ambasciata Belgio presso lo Stato Italiano, Via A. Gramsci 9, 00197, Rome, Italy

SECRETARIAT

Mr L.R. Day, Executive Secretary
Mr V.M. Hodder, Assistant Executive Secretary
Mrs V.C. Kerr, Secretary
Mrs E.R. Cornford, Clerk-Stenographer

SECRETARIAT ASSISTANCE

Miss S. Campbell, FAO, Rome, Italy
Miss M. Piaser, FAO, Rome, Italy

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Appendix II

SPECIAL COMMISSION MEETING - JANUARY 1973

Address by Mr F.E. Popper, Assistant Director-General (Fisheries), FAO,
to ICNAF Special Commission Meeting - Rome, 16 January 1973

"Mr Chairman, Gentlemen,

"It is with considerable pleasure that I welcome you for the second time to a Special Meeting of the Commission here in FAO Headquarters. Your meeting here last year was one of the most significant ever to be held by an international fisheries Commission. You reached agreement - though it is true with some difficulty and argument - on the limit on the total catch taken in some of the major fisheries in the ICNAF region, and also agreed on how this total catch would be divided between member countries. This considerable success was followed at the regular session of the Commission by similar agreements concerning many of the other important stocks of fish in the region. These agreements represented very considerable progress in the rational management of fish stocks, and have been watched with pleasure and appreciation by those of us who believe that the best use of the fishery resources of the ocean can be ensured if there is close co-operation between all nations with interests in those resources.

"However, these agreements by themselves do not guarantee the perfect management of the resources, and certain shortcomings of the current quota systems are the main reason for your session here today. They are set out in detail in papers before you and have also been examined by your Research and Statistics Committee, so I will not mention them in detail now. However, I should emphasize that the problems are not confined to the ICNAF region. Indeed, the problems of the rational management of a complex fishery operating on a wide range of different species occur even more forcefully in the tropical and sub-tropical regions of the world in which FAO is particularly closely concerned. Equally, the problems of excess fishing capacity, of highly mobile fleets, and of ensuring that the regulations agreed upon are not only obeyed, but seen by all participants to be obeyed, are of vital interest to FAO in relation to our responsibilities in many parts of the world. I and my staff will therefore be following your deliberations with great interest. I hope your session will prove another example of the ways in which close collaboration between our two organizations has been of mutual benefit. In this connection I note with pleasure that among the background documents mentioned in your annotated agenda, in addition to the Report of the Joint Bio-economics Working Group, in which FAO and ICNAF collaborated, is included a background document submitted by FAO staff to your Commission Meeting in 1970.

"We in FAO, in turn, hope to benefit from the results of your deliberations when we come to hold our Technical Conference on Fishery Management and Development in Vancouver, Canada, next month - where, incidentally, I hope to see several of those in this room today. That Conference will, among other things, study, on a regional basis, the state of resources, of their exploitation, the management mechanism and requirements and perspectives for fishery development. One section will be devoted to the experience in the North Atlantic and out of the discussions as a whole we hope that there will emerge a better understanding of management problems world-wide as well as some guidance towards their solution. I am looking forward to your contribution to that - both as individuals and as a group.

"In conclusion, Mr Chairman, may I wish you all a pleasant stay in Rome, for however long it may prove necessary, and a successful conclusion to your discussion."

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Appendix III

SPECIAL COMMISSION MEETING - JANUARY 1973

Agenda

1. Opening
2. Adoption of Agenda
3. Election of Rapporteur
4. Report from mid-term meetings of the Herring Working Group (Chairman: D. Iles), Assessments Subcommittee (Chairman: D.J. Garrod), and STACRES (Chairman: A.S. Bogdanov)
5. Review of present herring conservation measures
6. Further conservation requirements for herring
7. Consideration of measures to reduce total fishing effort in the Convention Area
8. Other business
9. Adjournment

INTERNATIONAL COMMISSION FOR



THE NORTHWEST ATLANTIC FISHERIES

Serial No. 2935
(B.e. 73)

Proceedings No. 3

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of Joint Meetings of Panels 4 and 5

Tuesday, 16 January, 1500 hrs
Wednesday, 17 January, 0900 hrs
Thursday, 18 January, 0915 hrs
Thursday, 25 January, 1715 hrs and 2255 hrs
Friday, 26 January, 1105 hrs

1. The Executive Secretary of the Commission opened the Joint Meeting of Panels 4 and 5 which was convened at the request of the Plenary (1973 Sp. Comm. Mtg. Proc. No. 2) to give detailed consideration to Plenary Agenda Item 4 "Report from Mid-Term Meeting of the Herring Working Group" (1973 Sp. Comm. Mtg. Proc. No. 1, App. II), to Plenary Item 5 "Review of Present Herring Conservation Measures" and Plenary Item 6 "Further Conservation Requirements for Herring". Dr A.W.H. Needler (Canada) was elected Chairman. The Executive Secretary was appointed Rapporteur. Delegates from Canada, Denmark, France, Fed. Rep. Germany, Iceland, Japan, Norway, Poland, Portugal, Spain, USSR, UK, and USA were present, with Observers from the European Economic Community (EEC), the Food and Agriculture Organization of the United Nations (FAO), and the Council for the Exploration of the Sea (ICES).
2. The Report of the Mid-Term Meeting of the Herring Working Group (1973 Sp. Comm. Mtg. Proc. No. 1, App. II) was presented by the Chairman, Mr T.D. Iles (Canada). Mr Iles reported that the total herring catch in the ICNAF Area, including Statistical Area 6, declined from 729,000 metric tons in 1971 to about 475,000 metric tons in 1972, about one-half of the peak catch in 1968. The 1972 herring catch quotas resulted in a decline of about 34% at the beginning of 1973 in the Georges Bank spawning stocks (240,000 to 158,000 tons), and in the Gulf of Maine spawning stocks (70,000 to 50,000 tons). Regarding the allowable catch for 1973 for the Georges Bank stock, the Herring Working Group noted that, if the 1970 year-class is as good as the 1966 year-class, the 1973 catch, equivalent to the MSY, would be 135,000 tons. This would give a stock increase to the level at the beginning of 1972 (240,000 tons). However, if the 1970 year-class is only 75% as good as the 1966 year-class, the 1973 catch would be 115,000 tons. This would result in a stock level 85% of the stock size at the beginning of 1972 (204,000 tons). To regain the 1972 stock level of 240,000 tons would require a 1973 catch of only 83,000 tons. Regarding the allowable catch for 1973 for the Gulf of Maine stock, the 1973 catch, equivalent to MSY, would be 27,500 tons for the higher level of recruitment and 24,500 for the lower level of recruitment. Regarding the Nova Scotia Bank stock, it was judged to be in good condition in 1972 with good recruitment expected from both the 1969 and 1970 year-classes in 1973. No change from the 1972 catch quota level of 65,000 tons was suggested. A strong plea was made for more support for research programs, especially the juvenile and larval surveys, to help develop a predictive capability.
3. At the suggestion of the Chairman, the Joint Panels agreed to proceed as follows: first, to consider the total allowable catches (TAC's) for 1973 for each of the Georges Bank, Gulf of Maine and Nova Scotia Bank herring stocks; second, discuss the US suggestion (Comm.Doc. 73/2) and its implications that the 1974 herring catch quotas be set at the 1973 Annual Meeting of the Commission; third, determine the national allocation of total allowable catches for 1973 in the fisheries for each of the three herring stocks.
4. Proposed Total Allowable Catches (TAC's) for Herring. Of the TAC's recommended by STACRES for the Georges Bank stock, Canada preferred 135,000 tons. USSR, Fed. Rep. Germany, Poland and Japan could agree to retaining the 1972 TAC of 150,000 tons. However, USA pointed out that there had been a decrease of 34% in stock size to the end of 1972, that paragraph 5 of the 1972 herring proposals required that the Commission set the herring catch in 1973 at a level which will neither further reduce spawning stocks nor reduce productivity by lowering the yield per recruit and that it would be dangerous to accept that the 1970 year-class would be as large as the 1966 year-class. Therefore, USA preferred a TAC of 115,000 tons or even 83,000 tons which would increase the stock to the level at the beginning of 1972. For the Gulf of Maine stock, USSR, supported by Japan, preferred to retain the 1972 catch limit of 30,000 tons. However, USA suggested that, to prevent a further decline in the stock size and to get back to the stock size at the beginning of 1972, a TAC of about 20,000 tons would be required. This TAC was agreed to generally, subject

to looking at TAC's for all three stocks, and their allocations. For the Nova Scotia Bank stock, USSR suggested retaining the 1972 catch limit of 65,000 tons. Canada, on the basis of information, other than that brought out by the Herring Working Group, to the effect that the Nova Scotia Bank stock was in a very healthy state compared to the state of the Georges Bank and Gulf of Maine stocks and that the 1969 and 1970 year-classes should provide strong recruitment to the 1973 fisheries, suggested an increase in TAC to 90,000 tons. Following a suggestion that this additional information be assessed, the Herring Working Group reconvened and reported on the 1970 and 1969 year-class strengths as they would affect the Div. 4XW stock size using the same approach as in the Georges Bank and Gulf of Maine year-class level comparisons (1973 Sp. Comm. Mtg. Proc. No. 1, App. II, Suppl. No. 1). The report pointed out that, if the 1969 year-class in the Nova Scotia Bank stock was one-half the strength of the strong 1966 year-class, a TAC of 90,000 tons would maintain stock size in 1973. This, with the additional evidence of strong recruitment from the 1970 year-class, resulted in tentative agreement to a TAC of 90,000 tons from the Nova Scotia Bank stock, subject to looking at TAC's and their allocations for all three stocks. Returning to consideration of the TAC for the Georges Bank stock, Canada and USA supported a TAC of 135,000 tons which according to their interpretation of the Herring Working Group Report would not decrease the stock size as required in paragraph 5 of the 1972 herring quota proposal. Poland, USSR, Fed. Rep. Germany and Japan supported a TAC of 150,000 to 175,000 tons justified on the basis of evidence from the Herring Working Group Report of good recruitment in 1973 from a strong 1970 year-class. With disagreement resulting in deadlock, the Joint Panels agreed to set up an *ad hoc* Committee on Herring Quotas and their Allocation with representation from USSR, Poland, Fed. Rep. Germany, Japan, USA and Canada to give detailed consideration to possible TAC's and their allocation for all three stocks and report back to the Joint Panels 4 and 5.

5. Scheduling Consideration of Herring Conservation Measures. USA presented a proposal (Comm.Doc. 73/2) to consider the possibility of setting the 1974 herring catch quotas at the 1973 Annual Meeting and thus eliminate the need for a second Commission meeting each year. The Joint Panels noted that, if the data were available for the scientific assessments by the time of the 1973 Annual Meeting, there would be no difficulty in setting the 1974 quotas and having them become effective under the normal procedure from 1 January 1974. if, however, the data were not available, it was recognized that some mechanism should be agreed by which the Commission could take decisions in principle at the 1973 Annual Meeting and insert the 1974 quota figures when the data became available later in 1973. USA contended that paragraph 5 of the 1972 herring proposals already solved the 1973 herring proposal situation and that only a technical decision was necessary about the 1973 herring quota figures to be inserted and the proposals would become effective immediately. Others contended that such a provision could not be binding and would prejudice future decisions and the power to object and that the 1973 herring proposals must go through the normal 6-month waiting period before they become effective. After considerable discussion, the Joint Panels agreed that the 1974 herring quotas should be set in 1973 but that there should be no commitment at this time to any particular plan of procedure for setting 1974 quotas. Further consideration would be given to possible procedures at the 1973 Annual Meeting.

6. The Joint Panels 4 and 5 recessed on 18 January, to await the Report of the *ad hoc* Committee on Herring Quotas and their Allocation.

7. The Joint Panels 4 and 5 reconvened at 1715 hrs, Thursday, 25 January, under the chairmanship of Dr A.W.H. Needler (Canada) to consider a recommendation from STACREM (1973 Sp. Comm. Mtg. Proc. No. 4) that Panels 4 and 5 should, as an interim measure, consider the establishment of TAC's and national catch quotas for 1973 for mackerel, pollock (including catches in Div. 4X of Subarea 4), redfish and other flounders (excluding yellowtail) in Subarea 5 and Statistical Area 6. Members of Panels 4 and 5 agreed that it was correct to proceed with the Panel 4 and Panel 5 items in the meeting of Joint Panels 4 and 5.

8. TAC's for Mackerel, Pollock, Redfish and Flounders Other than Yellowtail. Subject to agreement on their national allocation, Joint Panels 4 and 5 unanimously accepted TAC's proposed by a special meeting of the Assessments Subcommittee (1973 Sp. Comm. Mtg. Proc. No. 4, App. IV) of 50,000 tons for pollock in Subarea 5 and Div. 4X of Subarea 4, 30,000 tons for redfish in Subarea 5 and Statistical Area 6, 25,000 tons for flounders other than yellowtail in Subarea 5 and Statistical Area 6. Because of the lack of adequate data, the Assessments Subcommittee was unable to agree on a 1973 level of mackerel catch that could be related to a level of exploitation that might form the objective of the Commission. This led the Joint Panels to agree to a pre-emptive TAC for mackerel of 450,000 tons from Subarea 5 and Statistical Area 6 in an attempt to slow down the exploitation of a rapidly developing fishery. Countries fishing mackerel agreed that further data, which would allow assessment of the present state of the resource and of the level of fishing to achieve the MSY of mackerel, would be made available at the 1973 Annual Meeting. It was further agreed that a similar resolution to that adopted in 1972 (1972 Mtg. Proc. 16, App. I) was necessary to ensure the application of these TAC's and their national allocation to the fisheries in Statistical Area 6 and in the territorial waters of the coastal states.

9. National Allocation of TAC's for Mackerel, Redfish, Pollock and Flounders Other than Yellowtail. The Joint Panels discussed the applicability of the Canadian formula of 40% each for historic performance over the past three years and 10 years, 10% for coastal states and 10% for new entrants and non-members for

national allocation of the TAC's agreed for mackerel, pollock, redfish and flounders other than yellowtail. However, most members of the Joint Panels could not agree to the use of this formula. A USSR suggestion to prorate the TAC for each of the four species against their 1971 catches allowing a percentage for the coastal states and also for new entrants and non-members where the stocks were in good condition was acceptable without precedent, and resulted in the following proposed national allocations:

a) 450,000 tons TAC for mackerel in Subarea 5 and Statistical Area 6

Bulgaria	33,000 tons
Canada	22,500
Germany, Fed. Rep.	3,500
Japan	1,500
Poland	130,000
Romania	5,300
USSR	148,000
USA	26,200
New Entrants and Non-Members	80,000

These allocations were proposed on the basis of a 10% coastal state preference shared by Canada and USA and the remainder of the TAC (405,000 tons) prorated against the 1971 catches which totaled 348,744 tons.

Following a request from Romania, the Joint Panels agreed to increase the Romanian allocation to 20,000 tons by taking 14,700 tons from the New Entrants and Non-Members allocation. Japan's request to have her allocation of 1,500 tons included with the New Entrants and Non-Members allocation was agreed.

b) 30,000 tons TAC for redfish in Subarea 5

Canada	350 tons
Poland	100
USSR	4,500
USA	24,950
New Entrants and Non-Members	100

These allocations were calculated by prorating the TAC (30,000 tons) against the 1971 catches which totaled 20,034 tons. USA agreed to give 400 tons to increase the New Entrants and Non-Members allocation which is symbolic.

c) 50,000 tons TAC for pollock in Subarea 5 and Div. 4X of Subarea 4

Canada	21,760 tons
Germany, Fed. Rep.	1,125
Spain	450
USSR	2,970
USA	11,275

These allocations were calculated by prorating the TAC (50,000 tons) against the 1971 catches which totaled 24,035 tons.

d) 25,000 tons TAC for flounders other than yellowtail in Subarea 5 and Statistical Area 6

Canada	100 tons
Romania	500
USSR	2,600
USA	21,700
New Entrants and Non-Members	100

These allocations were calculated by prorating the TAC (25,000 tons) against the 1971 catches which totaled about 27,500 tons with some preference for the coastal state. The allocation to New Entrants and Non-Members is symbolic.

10. Following these proposals, Panels 4 and 5 agreed to recommend

that the Commission transmit to the Depositary Government for joint action by the Contracting Governments, proposal (4) for international quota regulation of the fishery for flounders other than yellowtail from the Southern New England stocks found in Subarea 5 and waters to the west and south (Appendix IV); proposal (5) for international quota regulation of the fishery for mackerel from the Southern New England stock found in Subarea 5 and waters to the west and south

(Appendix V); proposal (6) for international quota regulation of the fishery for pollock in Subarea 5 and Div. 4X of Subarea 4 (Appendix VI); and proposal (7) for international quota regulation of the fishery for redfish in Subarea 5 (Appendix VII).

11. The Joint Meeting of Panels 4 and 5 recessed at 2330 hrs, Thursday, 25 January.

12. The Joint Meeting of Panels 4 and 5 reconvened at 1105 hrs, Friday, 26 January, under the chairmanship of Dr A.W.H. Needler (Canada) with all Member Countries of Panels 4 and 5 represented, except Italy. The Joint Meeting considered three proposals from the Report of Meetings of the *ad hoc* Committee on Herring Quotas and their Allocation (1973 Sp. Comm. Mtg. Proc. No. 5) for conservation in the fisheries on stocks of herring in Subareas 4 and 5, and a resolution relating to 1973 proposals for the conservation of herring, flounder, mackerel, pollock and redfish stocks in Subareas 4 and 5. On the advice of Depositary Government, the Joint Meeting agreed that votes on the Panel 4 and Panel 5 proposals would be taken in the Joint Meeting of Panels 4 and 5.

13. Panels 4 and 5 agreed to recommend¹

that the Commission transmit to the Depositary Government for joint action by the Contracting Governments, proposal (1) for international quota regulation of the fishery for herring from the Georges Bank stock (Appendix I); proposal (2) for international quota regulation of the fishery for herring in Division 5Y of Subarea 5 (Appendix II); proposal (3) for international quota regulation of the fishery for herring in Division 4X and part of Division 4W of Subarea 4 (Appendix III);

and agreed to recommend to the Commission the resolution relating to the 1973 proposals for the conservation of herring, flounder, mackerel, pollock and redfish stocks in Subareas 4 and 5 (Appendix VIII).

14. Participants in the meetings of Joint Panels 4 and 5 congratulated Dr Needler on his excellent efforts as Chairman.

15. The Joint Panels 4 and 5 adjourned at 1120 hrs, Friday, 26 January.

¹ Proposals (1) and (2) were accepted unanimously. Proposal (3) had 7 Member Countries vote Yes, 2 abstentions (France and Portugal), and 1 absent.

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Proceedings No. 3
Appendix I

SPECIAL COMMISSION MEETING - JANUARY 1973

(1) Proposal for International Quota Regulation of the Fishery for Herring from the Georges Bank Stock

Panel 5 recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of herring, *Clupea harengus* L., by persons under their jurisdiction fishing on the Georges Bank stock found in Division 5Z of Subarea 5 and in the adjacent waters to the west and south so that the aggregate catch of herring by vessels taking herring from this stock shall not exceed 150,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of herring taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	5,050	metric tons
Federal Republic of Germany	31,600	" tons
Japan	1,200	" tons
Poland	49,400	" tons
Romania	1,300	" tons
USSR	48,200	" tons
USA	5,250	" tons
Others	8,000	" tons
- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date in which its vessels have ceased a specialized fishery for herring. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for herring, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of herring in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of herring, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of herring from the Georges Bank stock by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take herring, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the Commission establish (a) the level of catch for 1974 which will result in the restoration of the adult stock to at least 225,000 metric tons by the end of 1974, it being understood that in any event the level of catch for 1974 will not be increased above that for 1973 unless the adult stock size at the end of 1973 has reached a level which will provide the maximum sustainable yield by the end of 1974, and (b) the allocation of that catch for 1974, both of which will be substituted for the catch and the allocation thereof in paragraphs 1 and 2 above, respectively.
- "6. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks. Nothing in this proposal shall prejudice the future possibility of the Contracting Governments entering into mutual arrangements for the management of the allocations of herring catches or re-allocating the allocations of herring catches given in paragraph 2 above by such agreements as they may enter into, all such arrangements and re-allocations to be reported to all other Contracting Governments through the Executive Secretary.
- "7. This proposal shall become effective only at such times as the herring quota proposals adopted 26 January 1973 by Panels 4 and 5 for Division 4X and part of Division 4W of Subarea 4 and Division 5Y of Subarea 5 become effective."

SPECIAL COMMISSION MEETING - JANUARY 1973(2) Proposal for International Quota Regulation of the Fishery for Herring in Division 5Y of Subarea 5

Panel 5 recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of herring, *Clupea harengus* L., by persons under their jurisdiction fishing on the stock found in Division 5Y of Subarea 5 so that the aggregate catch of herring by vessels taking herring from this stock shall not exceed 25,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of herring taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	4,000	metric tons
Federal Republic of Germany	1,000	" tons
USA	19,750	" tons
Others	250	" tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for herring. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for herring, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of herring in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of herring, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of herring in Division 5Y of Subarea 5 by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take herring, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the Commission establish (a) the level of catch for 1974 which will result in the restoration of the adult stock to at least 60,000 metric tons by the end of 1974, it being understood that in any event the level of catch for 1974 will not be increased above that for 1973 unless the adult stock size at the end of 1973 has reached a level which will provide the maximum sustainable yield by the end of 1974, and (b) the allocation of that catch for 1974, both of which will be substituted for the catch and the allocation thereof in paragraphs 1 and 2 above, respectively.
- "6. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks. Nothing in this proposal shall prejudice the future possibility of the Contracting Governments entering into mutual arrangements for the management of the allocations of herring catches or re-allocating the allocations of herring catches given in paragraph 2 above by such agreements as they may enter into, all such arrangements and re-allocations to be reported to all other Contracting Governments through the Executive Secretary.
- "7. This proposal shall become effective only at such times as the herring quota proposals adopted 26 January 1973 by Panels 4 and 5 for Division 4X and part of Division 4W of Subarea 4 and Division 5Z of Subarea 5 become effective."

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Appendix III

SPECIAL COMMISSION MEETING - JANUARY 1973

(3) Proposal for International Quota Regulation of the Fishery for Herring in Division 4X and Part of Division 4W of Subarea 4

Panel 4 recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of herring, *Clupea harengus* L., by persons under their jurisdiction fishing in that portion of Division 4W south of 44°52'N latitude and in Division 4X of Subarea 4 so that the aggregate catch of herring by vessels taking such herring shall not exceed 90,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of herring taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	57,000 metric tons
Japan	1,350 " tons
USSR	31,050 " tons
Others	600 " tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for herring. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for herring, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of herring in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of herring, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of herring in the area mentioned in paragraph 1 by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take herring, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks. Nothing in this proposal shall prejudice the future possibility of the Contracting Governments entering into mutual arrangements for the management of the allocations of herring catches or re-allocating the allocations of herring catches given in paragraph 2 above by such agreements as they may enter into, all such arrangements and re-allocations to be reported to all other Contracting Governments through the Executive Secretary.
- "6. This proposal shall become effective only at such times as the herring quota proposals adopted 26 January 1973 by Panel 5 for Divisions 5Y and 5Z of Subarea 5 become effective."

SPECIAL COMMISSION MEETING - JANUARY 1973(4) Proposal for International Quota Regulation of the Fishery for Flounders (except Yellowtail) from the Southern New England Stocks

Panel 5, having in mind the STACREM Report, recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of flounders¹ by persons under their jurisdiction fishing in the Southern New England stock found in Subarea 5 and in the adjacent waters to the west and south so that the aggregate catch of flounders by vessels taking flounders from this stock shall not exceed 25,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of flounders taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	100 metric tons
Romania	500 " tons
USSR	2,600 " tons
USA	21,700 " tons
Others	100 " tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for flounders. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for flounders, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of flounders in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of flounders, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of flounders from the Southern New England stock by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take flounders, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks."

¹ Includes American plaice, *Hippoglossoides platessoides* (Fab.);
summer flounder, *Paralichthys dentatus* (L.);
winter flounder, *Pseudopleuronectes americanus* (Walb.);
witch, *Glyptocephalus cynoglossus* (L.).

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Appendix V

SPECIAL COMMISSION MEETING - JANUARY 1973

(5) Proposal for International Quota Regulation of the Fishery for Mackerel from the Southern New England Stock

Panel 5, having in mind the STACREM Report, recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of mackerel, *Scomber scombrus* L., by persons under their jurisdiction fishing in the Southern New England stock found in Subarea 5 and in the adjacent waters to the west and south so that the aggregate catch of mackerel by vessels taking mackerel from this stock shall not exceed 450,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of mackerel taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Bulgaria	33,000	metric tons
Canada	22,500	" tons
Federal Republic of Germany	3,500	" tons
Poland	130,000	" tons
Romania	20,000	" tons
USSR	148,000	" tons
USA	26,200	" tons
Others	66,800	" tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for mackerel. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for mackerel, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of mackerel in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of mackerel, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of mackerel from the Southern New England stock by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take mackerel, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks."

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Appendix VI

SPECIAL COMMISSION MEETING - JANUARY 1973

(6) Proposal for International Quota Regulation of the Fishery for Pollock in Subarea 5 and Division 4X of Subarea 4

Panels 4 and 5, having in mind the STACREM Report, recommend that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of pollock, *Pollachius virens* (L.), by persons under their jurisdiction fishing in Subarea 5 and Division 4X of Subarea 4 so that the aggregate catch of pollock by vessels taking pollock from this stock shall not exceed 50,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of pollock taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	21,760	metric tons
Federal Republic of Germany	1,125	" tons
Spain	450	" tons
USSR	2,970	" tons
USA	11,275	" tons
Others	12,420	" tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for pollock. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for pollock, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of pollock in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of pollock, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of pollock in Subarea 5 and Division 4X of Subarea 4 by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take mackerel, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks."

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Appendix VII

SPECIAL COMMISSION MEETING - JANUARY 1973

(7) Proposal for International Quota Regulation of the Fishery for Redfish in Subarea 5

Panel 5, having in mind the STACREM Report, recommends that the Commission transmit to the Depositary Government the following proposal for joint action by the Contracting Governments:

- "1. That the Contracting Governments take appropriate action to regulate the catch of redfish, *Sebastes marinus* (L.), by persons under their jurisdiction fishing in Subarea 5 so that the aggregate catch of redfish by vessels taking redfish from this stock shall not exceed 30,000 metric tons in 1973.
- "2. That Competent Authorities from each Contracting Government listed below shall limit in 1973 the catch of redfish taken by persons under their jurisdiction to the amount listed from the above-mentioned stock:

Canada	350	metric tons
Poland	100	" tons
USSR	4,500	" tons
USA	24,550	" tons
Others	500	" tons

- "3. That each Contracting Government mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of the date on which its vessels have ceased a specialized fishery for redfish. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary if its vessels engage in a specialized fishery for redfish, together if possible with an estimate of the projected catch. Each Contracting Government not mentioned by name in paragraph 2 above shall promptly notify the Executive Secretary of specialized or incidental catches of redfish in increments of 100 tons. The Executive Secretary shall promptly inform all other Contracting Governments of such notifications. The Executive Secretary shall notify each Contracting Government of the date on which accumulated catch and estimated catch of redfish, the quantity estimated to be taken before closure could be introduced, and the likely incidental catch for the remainder of the year equal 100 percent of the allowable catch designated as for "Others" in paragraph 2 above. Within 10 days of receipt of such notification from the Executive Secretary, each Contracting Government not mentioned by name in paragraph 2 above shall prohibit the catching of redfish in Subarea 5 by persons under its jurisdiction, except for small incidental catches.
- "4. That the Contracting Governments take appropriate action to ensure that all vessels under their jurisdiction which take redfish, record their catches on a daily basis according to position, amount, date, type of gear, amount of effort, i.e., number of sets (or hooks) x time gear on the bottom (otter trawl) or fishing (midwater trawl, lines, other gear), discards and disposition of catch.
- "5. That the allocations in paragraph 2 above are without prejudice to future allocations of catches for this or other stocks."

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Proceedings No. 3
Appendix VIII

SPECIAL COMMISSION MEETING - JANUARY 1973

Resolution Relating to 1973 Proposals for the Conservation of Herring,
Flounders (except Yellowtail), Mackerel, Pollock and Redfish Stocks in Subareas 4 and 5

Panels 4 and 5 recommend the following draft resolution for adoption by the Commission:

The Commission

Noting Article VI, paragraph 1; Article VIII, paragraph 2(a); Article IX, Article XII and Article XIII of the Convention, 1949,

Having Considered measures for the conservation of the stocks of herring, flounders¹, mackerel, pollock and redfish found in Subareas 4 and 5 of the Convention Area and having adopted seven proposals for the conservation of these stocks,

Being Aware that some stocks of herring, flounders, mackerel, pollock and redfish found in Subarea 5 extend westward and southward into an area designated by the Commission as Statistical Area 6 and are exploited there,

Considering that some stocks are exploited within territorial waters and the measures which have been taken for their conservation by coastal states,

Noting that non-members of the Commission participate in the exploitation of the stocks of herring, flounders, mackerel, pollock and redfish in the Convention Area and Statistical Area 6,

Holding the View that measures for the conservation of the stocks shall be applied also to Statistical Area 6 and to the territorial waters of the coastal states, where part of the stocks are found,

Being Aware of the time period before the proposals referred to above may enter into effect pursuant to the provisions of Article VIII of the Convention as amended, the desirability of taking appropriate steps for the implementation of measures for the conservation of herring, flounders, mackerel, pollock and redfish prior to the effective date of the proposals referred to above and the desirability of reducing the time period before these proposals take effect,

1. Invites the attention of all Contracting Governments to the above matters,
2. Urges the coastal states to ensure that appropriate conservation measures are undertaken within territorial waters to protect the stocks and limit the catch,
3. Requests all Contracting Governments fishing for herring, flounders, mackerel, pollock and redfish to anticipate the coming into effect of the above-mentioned proposals later in 1973 and to institute appropriate measures as soon as possible to ensure the effectiveness of the proposals when they become effective under the terms of the Convention,
4. Further Requests all Contracting Governments fishing the stocks of herring, flounders, mackerel, pollock and redfish found in Subarea 5 and Statistical Area 6 to ensure the effectiveness of the Commission's proposals for those stocks, either by further international agreements or on a national basis,
5. Calls On the Contracting Governments to invite the attention of non-members of the Commission fishing for herring, flounders, mackerel, pollock and redfish in the above-mentioned areas to these matters, and
6. Urgently Requests all Contracting Governments to notify promptly, if possible before 15 April 1973, the Depositary Government of their acceptance of the above-mentioned proposals and their willingness to be bound by them at an earlier date than provided under the normal procedure.

¹ Includes American plaice, *Hippoglossoides platessoides* (Fab.);
summer flounder, *Paralichthys dentatus* (L.);
winter flounder, *Pseudopleuronectes americanus* (Walb.);
witch, *Glyptocephalus cynoglossus* (L.).



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(B.p.73)

Proceedings No. 4

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of Meetings of Standing Committee on Regulatory Measures (STACREM)

Wednesday, 17 January, 1515 hrs
Thursday, 18 January, 1445 hrs
Monday, 22 January, 0945 hrs
Wednesday, 24 January, 0915 hrs
Thursday, 25 January, 0930 hrs

1. The Standing Committee on Regulatory Measures (STACREM) met during the Special Commission Meeting held at FAO, Rome, 16-26 January 1973, at the request of the Plenary (1973 Sp. Comm. Mtg. Proc. 2). Mr J. Graham (UK) was elected Chairman of the STACREM. The Executive Secretary acted as Rapporteur. Representatives were present from all Member Countries, except Bulgaria and Italy. Observers were present from the European Economic Community (EEC), Food and Agriculture Organization of the United Nations (FAO), and International Council for the Exploration of the Sea (ICES).

2. Under Plenary Agenda Item 7, "Consideration of Measures to Reduce Total Fishing Effort in the Convention Area", the STACREM considered the technical questions raised in the US proposal for effort regulation in Subarea 5 and Statistical Area 6 (Comm.Doc. 73/3). A general summary of the results of studies carried out by the Assessments Subcommittee of STACRES, in response to the US proposal on effort regulation (Comm.Doc. 73/3) and the Canadian questions relating to it (Comm.Doc. 73/4), was presented by the Subcommittee Chairman (Comm.Doc. 73/5). Details of the US proposal were elaborated in the further paper submitted by the USA (Appendix I) in the light of the Assessments Subcommittee report which was endorsed by the STACRES (1973 Sp. Comm. Mtg. Proc. 1).

3. In the oral presentation of their proposal, the US delegation made the following points. The most recent assessment of the status of fisheries indicated that the total yield in 1971 was at or above the maximum sustainable yield (MSY), and the total effort was significantly beyond the MSY point. The assessment also indicated that there were no large finfish resources not now under exploitation. It appeared, therefore, that the total finfish resource was being overfished, with marked declines in the biomass. The effect of catch quotas already introduced was to reduce the effort on regulated stocks which had been diverted to other stocks in the area. It was, therefore, necessary to reduce the overall effort to a level which the biomass could support. This could be done by regulating effort or catch or both. Because of the existence of mixed fisheries a total limit must be less than the sum of the limits for the individual species and should be fixed so as to reduce fishing mortality by 25% below the 1971 level. Owing to the absence of complete information about some stocks, it was difficult to know what the limit should be in terms of catch, whereas the effort reduction needed could be estimated with some certitude. Moreover, a restriction on effort would guarantee that fishing mortality was, in fact, reduced, whereas the effect of catch quotas on mortality was problematical, being heavily dependent on fluctuations in recruitment. USA accepted that overall effort limitation would not dispense with the need for other regulations (and were not proposing this) and considered that it might improve the effectiveness of some, e.g. mesh regulations. With regard to enforcement, the US delegation considered that an overall effort limitation expressed in terms of "days on ground" could be much more effectively enforced than a catch limitation which depended on the statistical controls of member states, and would thus reassure fishermen disposed to doubt whether regulations were enforced on others. With a view to allocating the total effort allowed among Member Countries, USA proposed a system of standardization under which coefficients would be established to relate the effort of each class of vessel to that of a US side trawler 0-50 tons (taken as standard). In the original US memorandum (Comm.Doc. 73/3), a single coefficient was applied to vessels of all countries of the same class but in the second US paper (Appendix I) separate coefficients were calculated for vessels of each class in each country. Countries which had already reduced their effort in the area should not be subject to further reductions. Finally, USA felt strongly that a measure of effort limitation was urgently necessary and that the Commission would be failing in its duty if it did not take immediate action.

4. US concern about the present situation was shared, and there was no opposition in principle to effort regulation. While there was some support for the US view that effort regulation had definite advantages, biological or economic, it was also felt that the details of the proposal needed more study

and it was pointed out that the problem of standard units of effort would be examined in May 1973 by an ICES Working Group to which ICNAF had been invited to send representation; and it was felt that it would be necessary, in any case, to see the effect of the catch quotas agreed for 1973 before proceeding to a direct limitation of effort.

In the course of discussion of the detailed proposals in the US memorandum (Comm.Doc. 73/3), the following points were made:

- (a) Effort limitation would not overcome the by-catch problem any better than catch limitation; and while effort limitation could take account of fluctuations in stocks, changes in patterns of fishing could seriously distort its effect on fishing mortality. Moreover, there were not enough effort data over a period of years to provide an adequate historical basis and it would be unfair to allocate effort quotas between countries by reference to a single year.
- (b) If an effort limitation were introduced, it should apply to the whole Convention Area since otherwise, diversion of effort would create problems elsewhere.
- (c) There were some stocks, e.g. squid, saury, etc. in Subarea 5 and Statistical Area 6, which were not generally fished and were capable of further exploitation in which by-catches of regulated species would be quite insignificant.
- (d) With regard to enforcement, the existence of an overall effort limitation would not dispense with the need to enforce the species catch quotas, and the impressions formed by individual fishermen did not enable them to judge how effectively restrictions were being enforced.
- (e) An effort limit might prevent some countries from achieving their catch quotas.
- (f) The proposals on standardization presented many difficulties which required further study.
- (g) It was questionable whether effort restrictions could be fixed with any greater confidence than further catch quotas.

5. The detailed doubts of the Portuguese delegate regarding the proposed scheme of effort regulation are recorded at Appendix II. The general view of the Committee delegates was that more detailed study of effort regulation was necessary and the Committee adopted a list of questions on which it felt that it would be helpful to have further technical advice from STACRES (Appendix III).

6. In the meantime, the general feeling of the Committee was that the adoption of catch quotas for additional species, possibly supplemented by an overall catch quota, offered the best immediate prospect of achieving, at least in part, the objectives of the US proposal. The Assessments Subcommittee was accordingly asked to provide their best estimates of the figures needed for this purpose (Appendix IV).

After considering these figures, the Committee recommended that the appropriate Panels should, as an interim measure, consider the establishment of TAC's and national catch quotas for 1973 for stocks of mackerel, pollock (including catches in Div. 4X of Subarea 4), redfish and other flounders in Subarea 5 and Statistical Area 6. These arrangements would be subject to review at the 1973 Annual Meeting in the light of revised assessments based on the fuller information which could by then be available.

7. In order to enable the Commission to be in a position to take definitive action at the 1973 Annual Meeting, the US delegation offered to provide facilities at the Northeast Fisheries Center, National Marine Fisheries Service, Woods Hole, Massachusetts, for a special meeting of experts to consider the questions listed in Appendix III, and related matters concerning the establishment of effort limitation schemes. Representatives at this meeting would include not only scientists, but economists and other experts to cover the various aspects of the problem.

8. The Committee expressed its appreciation of the US invitation. As delegates were not in a position to commit their Governments to definite arrangements, it was agreed that the date of the meeting, which it was suggested should take place at the end of March, should be fixed at the initiative of USA in consultation with Governments.

9. In conclusion, the Committee wished to place on record its appreciation of the great assistance it had received from members of the Assessments Subcommittee.

SPECIAL COMMISSION MEETING - JANUARY 1973Comments by the USA on the Proposalto Regulate Fishing Effort in Subarea 5 and Statistical Area 6Summary

In summary, the specifics of the US proposal are:

1. *That the reduction of fishing intensity required to obtain the maximum sustainable yield (MSY) is 25% below 1971.*
2. *USA proposes that the total allowable effort be expressed in terms of days on ground.*
3. *Taking into account the different principles of allocation discussed in this paper, the allowable fishing effort by countries for calendar year 1974 in terms of standardized US small otter trawler days on ground or its equivalent (see Table 2) is as follows:*

<i>Federal Republic of Germany (FRG)</i>	<i>10,160</i>
<i>Japan</i>	<i>7,716</i>
<i>Poland</i>	<i>45,829</i>
<i>Romania</i>	<i>2,750</i>
<i>Spain</i>	<i>3,250</i>
<i>USSR</i>	<i>80,868</i>
<i>Bulgaria</i>	<i>9,386</i>
<i>German Democratic Republic (GDR)</i>	<i>20,122</i>

4. *Furthermore, given the urgency of this situation, USA proposes that the total effort expended by each country listed in paragraph 3 in the period 1 September to 31 December 1973 be one third of the figures listed in paragraph 3 above.*
5. *USA proposes that the existing regime of ICNAF conservation measures be maintained (individual species quotas, minimum mesh size regulation, closed areas, minimum fish sizes).*
6. *USA proposes that, should new entrants or non-members not mentioned in paragraph 3 above become a significant factor in the fishery, then adjustments should be made in the allocated effort similar to that which has been done with the catch quotas.*
7. *Fisheries developed specifically for invertebrates with gear not capable of capturing finfish are to be excluded from the total effort regulations proposed herein.*

USA conducts extensive research into the status of fisheries and works closely with STACRES to provide advice to ICNAF on the state of the fisheries. USA has a vital interest in the stocks of fish off its coast specifically, but also is concerned with developments elsewhere. US scientists and the ICNAF Assessments Subcommittee have advised over the last few years that the magnitude of fishing intensity in general in the ICNAF Area has been rapidly approaching the point where further increases will not provide significant increases in catch in the long run; indeed, they have pointed out that some stocks have been rather severely overfished. The studies have shown that the situation in Subarea 5 and Statistical Area 6 is particularly serious. The variety of species makes assessment difficult and, in the past, the corrective actions have come too late, i.e., a severe reduction in catch is involved, with the possible exception of cod. All of the major finfish resources were heavily exploited by the beginning of 1971. The coastal fisheries have suffered a significant drop in catch of 46% over the last 10 years. Most of the resources of direct interest to coastal fishermen have suffered rather severe declines as indicated in the Assessments Subcommittee Report.

Because of these serious and alarming trends, USA believes that the overall fishing intensity needs to be regulated to maintain good yields, particularly in Subarea 5 and Statistical Area 6. USA proposes that the total fishing effort be regulated to achieve this. US reasons for choosing this means of regulation have been outlined and a reasonably specific method for framing the regulations has been proposed (Comm.Doc. 73/3).

The Assessments Subcommittee of STACRES has now studied the problem and evaluated most of the items relating to the US proposal (1973 Sp. Comm. Mtg. Proc. 1, App. I). USA would like now to review a more

detailed proposal which has been prepared along the lines of its original proposal (Comm.Doc. 73/3) taking into account the Assessments Subcommittee's advice.

- I. The US memorandum states that fishing effort be reduced to the level which corresponds to that required to provide the total maximum sustainable yield of finfish (Comm.Doc. 73/3, Section I, Paragraph I)

The objective of the Commission has long been to regulate fisheries in order to maximize the long-term yield. The Assessments Subcommittee of STACRES has concluded that the 1971 catch was at or beyond the MSY and the 1971 effort was significantly beyond the MSY level. It has also concluded that there are no large finfish resources now under exploitation. Therefore, there would be no missed opportunities for expansion with some overall effort limit. USA fully agrees with the merit of the individual species quotas which the Commission has set in the past. However, the Assessments Subcommittee has concluded that, because of the by-catch problem, this approach would tend to generate over-exploitation, and this can only be prevented by total catch or effort regulation.

In choosing the type of regulation, both biological and practical matters must be considered. A total catch quota is set to regulate the effective fishing intensity. Therefore, to achieve the correct level of fishing intensity, the quotas must be adjusted for changes in recruitment and growth which lead to changes in the stock abundance. The annual adjustments to quotas needed to maintain fishing intensity at the right level would require a very large amount of assessment work; much greater than we now put forward in ICNAF. This would mean not only many more manhours of assessment work but also much additional statistical and biological data. On the other hand, fixing the fishing intensity directly means that catches can be allowed to vary according to changes in abundance. While vessel controls will not eliminate entirely the need for quotas, and we are not suggesting that the effort regulation USA has proposed be substituted for the existing quotas, the regulation of effort will decrease the need for frequent adjustment in quotas. In either case, later adjustments may have to be made because of changing objectives, or because the initial status was not correctly assessed.

Another factor to be taken into account is the relative status of fisheries. The Assessments Subcommittee concluded that most of the finfish stocks are now overfished, i.e., the 1971 point of catch and effort is above and to the right of the MSY point on the total yield curve. The 1972 effort is even greater. If the effort were left at this level, the catch per unit of effort (CPE) and, hence, total catch would drop until stabilized at a new level, lower than MSY. Although this is a long-term phenomenon, in the interim, as now when we are considering regulation, the CPE will fall.

The quota must be set at the point on the yield curve corresponding to that catch of the current year's yield-effort curve. Yet we do not know the 1972 status nor can we predict the effect of fishing in the time period before the total quota comes into effect. The events in the interim period make no difference to the correctness of the effort level judged as of 1971, but could have a significant effect on the correctness of the quota set as of 1971.

The Assessments Subcommittee concluded that the mixed fisheries problem can only be dealt with by some overall limitation of fishing intensity. It also indicated that the by-catch problem itself was not solved by using a total catch or total effort regulation. Although we cannot eliminate the problem, we could alleviate it by preventing further increases in effort. Total effort limitation seems to take care of the situation best, in that it does prevent increases in effort. Quota regulations, even a total quota, do not accomplish this in a predictable way. As mentioned above, variations in stock abundance will cause changes in fishing intensity, unless they are adequately measured and the quota adjusted. Thus, the opportunity exists for increased effort, particularly when stocks decrease in abundance. The Commission can probably not observe, assess and take action quickly enough to prevent such increased effort.

The economic advantages of controlling effort that have been made obvious by earlier studies in ICNAF should be emphasized. The importance of effective enforcement to an effective management scheme should also be emphasized. A management program which includes many quotas and many changes will be very difficult to enforce.

Not only must a management program be administratively feasible in order to regulate effectively, but adherence must be self-evident to the participating fishermen. Because they are mixed fisheries, one cannot infer what species are caught from observations of vessel occurrence.

However, observations on the occurrence and time in the area of vessels would provide the opportunity for fishermen to see for themselves the effects of effort regulation. Also, Governments can mount observation programs to monitor adequately the number, type and activity of the fleet components. This would also, in addition, provide for much improved fishery statistics.

II. The US memorandum states that the allowable amount of effort as recommended by STACRES should be expressed as a percentage reduction of 1971 effort because that is the last year for which complete statistics are available (Comm.Doc. 73/3, Section 1, Paragraph II)

STACRES has accepted the Assessments Subcommittee's advice of a 20-30% cutback to achieve MSY. USA proposes that a value of 25% be used. The STACRES Report also stated that effective effort in 1972 had increased in excess of 10% from that in 1971. The US estimate of increase was 25%, based on US vessel overflight observations and calculations. Although this increase accentuates the problem by increasing the extent to which the stocks are being overfished, it does not have to be considered as the effort reduction can be calculated from 1971 reported effort levels.

III. Problems of standardizing effort (Comm.Doc. 73/3, Section 1, Paragraph III)

The Assessments Subcommittee has reported that, of the units of effort most regularly reported, "days fished" adequately relates effort to fishing intensity for management purposes and that "days on ground" is a feasible unit to use to regulate fishing effort. USA proposes, therefore, that the actual regulation of fishing effort be accomplished on the basis of "days on ground".

There are many problems involved in standardizing effort; USA welcomes further research and refinement of the measures of relative catchability. However desirable this is, the time for action is now. The Assessments Subcommittee has stated that a reduction in effort in the neighbourhood of 30% is required for proper management of the stocks. Therefore, the question is whether standardization is adequate for assuring a reduction in fishing mortality in 1973. The ratios between catch rates of various vessel classes within each country, based on 1971 reported statistics, are pertinent to this question. As computed from the 1971 ICNAF Statistical Bulletin tables, these ratios reflect differences in fishing patterns among such vessels, as well as different fishing power. The Federal Republic of Germany and Japan apparently fished with the same pattern for all their vessel classes. Polish side trawlers concentrated on herring to a greater extent than on mackerel, while the reverse was true for the stern trawlers. There was less indication of this tendency for the USSR vessels. In addition, the larger USSR vessels concentrated to a greater extent on hake. Changes in these patterns would affect the relative catchabilities to some degree, depending on relative availabilities of the different species. Changes in patterns would not appear, however, to be of major significance in the effectiveness of effort reduction. Of greater concern is possible future improvement in efficiency, particularly in the way a country deploys effort, relative to the "days fished" and "days on ground" as reported to ICNAF. It is unlikely that efficiency will decrease. Thus, using present values errs, if anything, in the direction of not achieving the desired effort reduction and, accordingly, effort should probably be reduced more than that recommended by the Assessments Subcommittee.

The only place in the computations where between-country coefficients are used is in the determination of the percentage reductions which will be applied to individual countries to achieve a 25% overall reduction. This depends, of course, on the proportion of effort eliminated relative to that being reduced. The greater the amount eliminated, the greater will be the percentage reduction on the remaining countries. Since most of the effort eliminated was US effort, it is appropriate to discuss these consequences. The Assessments Subcommittee discussions pointed out that the relative abundance of groundfish and pelagic stocks would influence their relative catchabilities based on standard US gear. If the pelagic stocks were in greater abundance than the groundfish stocks, the proportion of US effort would be underestimated relative to the distant-water fleets and thus, the percent reduction of the countries affected would be less, and might be too low to achieve a 25% overall reduction of effort.

A significant fishery for invertebrates exists at the present time and may develop further in the future. The US proposal is not intended to limit effort on such species so long as the gear used does not catch significant quantities of finfish as a by-catch. Thus, the US proposal excludes specific fisheries now in existence for lobster, shrimp, scallops, and other shellfish, except squid.

The current small fishery for squid takes significant quantities of finfish as a by-catch. The effort directed to squid has been included in the allocations. Should future development of this fishery include gear that does not take a by-catch of finfish, the USA would expect the Commission to exempt the fishery from the total effort regulation. Separate quotas and effort regulation would have to be developed for these various independent fisheries depending on needs.

IV & V. Factors in allocation of effort among nations (Comm.Doc. 73/3, Section 1, Paragraphs IV and V)

In determining the allocation of total effort among participants, some of the same factors considered in applying quota management programs should be taken into account. Traditional fishing patterns, as reflected by average effort levels over a period of selected years and expressed in terms of standard fishing units, should provide a partial and useful basis for the allocation of effort levels. However, other factors, such as recent increases in effort, coastal state interests, developing fisheries, immobile vessels, and recent entrants, must be considered. Under the present circumstances of fully utilized fisheries, new entrants would not be given significant consideration.

Coastal fishing interests should be given high priority. Many coastal fisheries are relatively immobile and cannot be shifted to other areas. Similarly, coastal states are often concerned with developing new potentials; effort control must recognize this need and must be flexibly applied to permit such expansion.

Even a quick look at the data shows clearly that the coastal states have not increased their catch and effort since 1961. In fact, they have decreased it, and thus have already made a contribution to effort control. They should not be expected to make a further contribution now, since they have not created the problem.

Moreover, it must be recognized that the relatively immobile fleets of small coastal vessels are unique in contrast with the remaining vessels in the area, that is, the distant-water vessels. These coastal vessels have been designed almost exclusively to supply specialized markets with a continuous year-round supply of fresh fish. This they cannot do if they are shifted to other areas. Nor can they make longer trips to other fishing grounds: even when they are physically capable of venturing further offshore, they cannot operate effectively amidst the fleets of large vessels found there.

As in catch quota allocation, it appears appropriate to divide part of the effort quota among participating countries in proportion to their average level of participation over an agreed period of time. However, it seems only equitable to relate the amount of effort an individual participating country is asked to reduce, in part, to the extent by which that country has increased its level of effort over the years when the total effort was excessive. On the other hand, the allocation scheme must recognize that countries, which have not increased their fishing effort or which may have reduced their effort in response to changes in fish stocks or biomass, have already made a contribution toward effort control and should not be expected to accept further reductions.

Certain other special factors need consideration similar to that given to the allocation of catch quotas. USA recognizes that these might include provision for the special needs of recent entrants with relatively small fleets to the fishery.

Basing such an allocation on historical fishing, as was done with the catch quotas, is, as the Assessments Subcommittee has stated, difficult because of changes in relative catch rates within time periods. This was tried in several different ways and although the trends remain the same, the actual country values fluctuated depending on the time periods for which relative catchabilities were calculated. Nevertheless, in all trials, Japan, Poland, USSR, Bulgaria and the German Democratic Republic showed increases since 1968 when effort was at about the right level. Because Canada and USA are coastal fishing nations, their effort was not reduced.

In order to avoid very small reductions, and the impairment of very small fisheries, countries with less than 2,500 days, or about 1% of the total, were not given reductions in effort. This rule applied to Romania and Spain.

Because of these difficulties, the procedure recommended by the Assessments Subcommittee to use 1971 relative catchabilities as determined from statistics reported to ICNAF to determine 1971 standard effort, was adopted. The number of standard days to be reduced was 25% of this total. This reduction was apportioned to those countries not exempted by the criteria given above on the basis of the standardized effort applied by each country in 1971. This resulted in a 30.7% reduction for each of the countries in the allocation to achieve the overall 25% reduction (Table 1).

A procedure for each country to use in allocating its total allowable effort among various vessel categories was presented by the Assessments Subcommittee. Tables have been prepared for each country. The conversion coefficients for "days on ground" to "days fished" are also listed.

Standardized "days fished" were computed using the relative catchabilities given in Table 7 of the Assessments Subcommittee Report. These were obtained by making monthly comparisons of catch rates of all vessel types with the US OTSI 0-50-ton class. These relative catch rates were then averaged over months to obtain an annual average.

The raw annual "days fished" for each gear type for each country were then multiplied by the annual average coefficients and added to obtain the total annual standardized "days fished" (Table 2). Serious problems arise in using the country-vessel type conversions for "days fished" to "days on ground". The first is that the last year for which such ratios were submitted to ICNAF was 1969 and changes may have occurred since then for some countries. The second is that such data are only available for Romania, Spain, Poland and USSR. The third is that there are differences among vessel classes in the "days fished" "days on ground" conversion coefficients for Poland. The latter fact leaves unresolved the precise determination of allowable "days on ground" to achieve the desired reduction in "days fished".

The Commission is faced with three possible solutions to this problem:

- (1) The Commission can decide at this meeting the best single coefficient for each country for conversion of "days fished" to "days on ground". It is assumed that further studies will be undertaken to improve the accuracy of this coefficient.
- (2) The Commission can set up a Working Party to study the matter further and to derive new country coefficients and to report to the 1973 Annual Meeting of the Commission. These new coefficients could then be applied to the regulations effective 1 September 1973.
- (3) The Commission can derive a scheme which would allow each country to utilize different "days on ground" to "days fished" conversion coefficients. This would require that the actual "days on ground" in column 15 of Table 13 of the Assessments Subcommittee Report would be reconverted to standard "days fished". The total of these reconverted "days fished" must not exceed the total given at the bottom of columns 6 or 7. If they do, a reapportion of days among different vessel categories must be done such that the reconverted "days fished" are less than, or equal to, the original allocated "days fished".

VI. Present regulatory measures (Comm.Doc. 73/3, Section 1, Paragraph VI)

(See Paragraph 5 of the Summary)

VII. That the reduced level of fishing effort is to be implemented on an urgent basis (Comm.Doc. 73/3, Section 1, Paragraph VII)

The Assessments Subcommittee Report estimated that the level of fishing intensity associated with the MSY of finfish in Subarea 5 and Statistical Area 6 is 70-80% of the 1971 level. The Subcommittee also concluded that, on the basis of US overflight data, the increase in fishing effort from 1971 to 1972 was considerably in excess of 10%. The compositions of distant-water fleets have changed in recent years, with the ratio of large stern trawlers to medium side trawlers increasing from 0.7 in 1971 to 1.02 in 1972 (the former estimated to be 3.5 times as effective as the latter). Improved technology in addition to larger boats also tends to multiply the fishing intensity. This indicates that more fishing effort existed in 1972 than was necessary to harvest the available surplus resource.

In view of the existence of one major unregulated species (mackerel) and of other less substantial, unregulated stocks (including squid), one can only assume that all available effort will be directed by the distant-water fleets towards these resources. The by-catch of regulated species taken by effort specifically directed towards mackerel has been shown by the Assessments Subcommittee to be substantial.

Therefore, any delay in administering a reduction in fishing intensity will only serve to reduce stock levels further, and to increase the period of recovery of stocks to levels supporting the maximum sustainable yields. While the proposal sets out the annual allowable standard effort beginning 1 January 1974, the urgency of the current situation requires that effort reductions begin as soon as possible.

USA proposes that the standard "days fished" (expressed in terms of "days on ground") expended by each country from 1 September 1973 to 31 December 1973 not exceed one-third of the annual allowable effort as given in Table 2.

VIII. Annual review (Comm.Doc. 73/3, Section 1, Paragraph VIII)

The initial effort regulation should not only provide for the level at which effort should be set, but also for review and adjustments as necessary at each Annual Meeting.

As experience with the effort control system is gained, there will be a need to have the Assessments Subcommittee and STACRES review and adjust such critical factors in the equation as fishing power coefficients for various classes of vessels and for the different countries, as well as the relationship between "days on ground" and "days fished". In short, the effort regulation system must be considered to be a dynamic one over the years and adapt to changes in circumstances and experience.

IX. Administration of effort regulations (Comm.Doc. 73/3, Section 1, Paragraph IX)

Administration of effort regulations will be relatively simple. If a vessel is observed in Subarea 5 and Statistical Area 6, and if it is not listed as one to which vessel days which were allotted by its government from its allocation remain to be utilized, it is in violation. If it is listed, it is O.K. No boardings. No questions. No worrying about what it is doing.

Under an optimum system of enforcement of effort regulations, each country will plan well ahead of time for the optimum utilization of the "days on ground" allocated to it. It will determine how many such days will be apportioned to each vessel class and, to ensure utilization of its full share, it will allocate these shares to individual vessels. Allocating lists can then be provided to the ICAF Secretariat, which in turn can provide collected lists to enforcement officers. A listed vessel would

then report by radio when it enters and leaves Subarea 5 and Statistical Area 6, and utilization of the days allocated to that vessel can be quickly verified. An enforcement officer can quickly check on the status of a vessel. If it is observed in the area, and it has not checked in, or is not listed, or has already checked out, it is in violation. If it is listed, and has checked in, everything is fine. However, it is envisaged that a simplified method of enforcement can be utilized under which a vessel will simply report its entry into and exit from the area. Of course, plans will change during the course of the year, and countries will have the possibility of modifying their lists, as situations change.

It has been stated that vessels will use up some of their allocated time in non-productive activities, such as not being able to fish because of weather, of breakdown, or of the need to transit from one ground to another, and so on. This is true, but these non-fishing periods have been taken into account, on the average, in formulating $X \text{ "days on ground"} = Y \text{ "days fished"}$. Thus, what the vessel is doing is immaterial in terms of enforcement. The only question is whether it should be in the area when observed there. The inspector would only have to record the names of the vessels he sees in the area. Later, in his office, he can check his observations against the listing, or whether the vessel had reported itself in the area.

Such a system, it has been said, would not improve the acceptance by fishermen that other nations were actually enforcing the rules. Credibility is a problem, because there is virtually no fisherman anywhere in the world who does not believe that he is subject to more rigorous enforcement than the other fishermen who are fishing alongside him. Fishermen of country A assume this to be true of countries B and C, while fishermen of country C assume this of countries A and B. It is universal. The system USA has proposed overcomes this through the ease with which checks can be made. True, an individual fisherman sees only a small part of what is going on, but fishermen have a very good communications system amongst themselves. More importantly, however, the fishermen will know how easy it will be for their own officials to verify compliance by others.

Moreover, fishermen can get the picture from what they observe even if they do not have all the details. Fishermen first saw in 1972 the increase in effort which was discussed in the two US memoranda. And fishermen will certainly be able to observe a decrease in effort of the order STACRES is referring to, and when they do, maybe they will say that ICNAF is useful instead of a failure.

Table 1. Calculation for reduction in fishing effort in US OTSI 2 standardized days fished.

	Column 1	Column 2	Column 3 ¹
Country	Days fished 1971	Percent distribution of effort based on total (Can, USA, Rom, Sp)	1973 decrease
Canada	7,414	-	-
Germany, Fed.Rep.	11,285	6.09	3,470
Japan	8,567	4.62	2,632
Poland	45,974	24.81	14,135
Romania	1,980	-	-
Spain	2,375	-	-
USSR	89,003	48.04	27,370
USA	30,860	-	-
Bulgaria	9,684	5.23	2,980
Germany, Dem.Rep.	20,754	11.20	6,381
Total	227,896	99.99	56,968
	x 0.25		
Reduction	56,974		
Total (less Can, Rom, Sp, and USA)	185,267		

¹ Reduction x Column 2

Table 2. Calculations for 1973 allowable effort by country.

Column numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Vessel category	Relative performance ratio		Actual 1971 days fished	Standardized days fished		Ratio: days on ground to days fished	Raw days on ground	Standardized days on ground		Reduction in standardized days fished		1973 Standardized days fished		1973 Standardized days on ground	
	to US OTSI 2	to USSR OTSI 4		to US OTSI 2	to USSR OTSI 4			to US OTSI 2	to USSR OTSI 4	to US OTSI 2	to USSR OTSI 4	to US OTSI 2	to USSR OTSI 4	to US OTSI 2	to USSR OTSI 4
USSR															
OTSI 4	1.32	1.00	11489	15165	11489	1.3	14936	19714	14936						
OTSI 5	1.91	1.45	6590	12587	9556	1.3	8567	16363	12423						
OTST 5	1.91 ²	1.45	360	688	522	1.3 ¹	468	894	679						
OTST 7	7.26	5.50	7767	56388	42718	1.3	10097	73304	55533						
PS 4	3.93	2.98	197	744	587	1.7	335	1316	998						
PS 5	6.63	5.02	513	3401	2575	1.5	770	5102	3862						
Total			26916	89003	67447		35173	116693	88431	27370	20706	61633	46741		
POLAND															
		to POL OTSI 5			to POL OTSI 5				to POL OTSI 5		to POL OTSI 5		to POL OTSI 5		to POL OTSI 5
OTSI 5	1.57	1.00	5852	9188	5852	1.6	9363	14700	9363						
OTST 6	6.92	4.41	1873	12961	8260	1.4 ³	2622	18144	11563						
OTST 7	8.29	5.28	2874	23825	15175	1.4	4024	33359	21247						
Total			10599	45974	29287		16009	66203	42173	14135	8991	31839	20296		
GERMANY (DR)															
		to GDR OTSI 5			to GDR OTSI 5				to GDR OTSI 5		to GDR OTSI 5		to GDR OTSI 5		to GDR OTSI 5
OTSI 5	1.72 ⁴	1.00	Not known	Not known	Not known	1.4 ⁴	Not known	Not known	Not known						
OTST 6	7.82 ⁴	4.55 ⁴				1.3 ⁴									
OTST 7	7.31 ⁴	4.25 ⁴				1.4 ⁴									
Total				20754 ⁵	12066					6381	3704	14373	8362		
BULGARIA															
		to BUL OTST 7			to BUL OTST 7				to BUL OTST 7		to BUL OTST 7		to BUL OTST 7		to BUL OTST 7
OTST 7	7.68	1.00	1261	9684	1261	1.4	1765	13555	1765	2980	387	6704	874		
GERMANY (FR)															
		to FRG OTST 6			to FRG OTST 6				to FRG OTST 6		to FRG OTST 6		to FRG OTST 6		to FRG OTST 6
OTST 6	8.72	1.00	490	4273	490	1.3 ⁶	637	5555	637						
OTST 7	8.82	1.01	795	7012	803	1.3 ⁶	1034	9116	1044						
Total			1285	11285	1293		1671	14671	1681	3470	397	7815	896		
JAPAN (Cols 3, 5, 7, 11, 13 expressed in hours fished)															
		to JAP OTST 6			to JAP OTST 6				to JAP OTST 6		to JAP OTST 6		to JAP OTST 6		to JAP OTST 6
OTST 6	0.13	0.50	2520	328	1260	1.3 ⁶	3276	426	1638						
OTST 7	0.42	1.00	19617	8239	19617	1.3 ⁶	25502	10711	25502						
Total			22137	8567	20877		28778	11137	27140	2632	6409	5935	14468		

¹ Used average of all USSR values

² Used USSR OTSI 5 value

³ Used Poland OTST 7 value

⁴ Used average over all countries in distant-water fleets for gear class

⁵ Obtained by dividing catch by 1971 USA OTSI 2 total catch/day (5.15 MT)

⁶ Average for vessel class over all countries

Table 2. (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Vessel category	Relative performance ratio		Actual 1971 days fished	Standardized days fished		Ratio: days on ground to days fished		Raw days on ground	Standardized days on ground		Reduction in standardized days fished to US	1973 Standardized days fished to US	1973 Standardized days on ground to US		
	to US OTSI 2	to SPA PT 4		to US OTSI 2	to SPA PT 4			to US OTSI 2	to SPA PT 4		to US OTSI 2		to US OTSI 2		
SPAIN															
PT 4	3.16	1.00	499	1577	499	1.3	649	2050	649	No reduction below minimum number of days fished					
OT 6	1.68	0.49	475	798	233	1.3 ⁷	618	1037	303						
Total			974	2375	732		1267	3087	952						
ROMANIA															
	to ROM OTST 7			to ROM OTST 7				to ROM OTST 7							
OTST 7	4.52	1.00	438	1980	438	1.1	482	2178	482	No reduction below minimum number of days fished					
USA															
OTSI 2	1.0		6439	6439	No reduction coastal state										
OTSI 3	1.12		12827	14366											
OTSI 4	1.44		2777	3999											
Other gear	-		-	6056 ⁸											
Total			-	30860											
CANADA															
OTSI 4	1.09		353	390	No reduction coastal state										
OTST 5	1.83		454	952											
Other gear	-		-	6072 ⁸											
Total			-	7414											

⁷ Used Spain PT 4 value

⁸ Estimated by dividing catch by total US OTSI Class 2 catch/day (5.15 MT)

Explanation of data in Table 2

The standardized "days fished" (hours fished in the case of Japan) in Table 2 were compiled from the raw days in Table 5 of the 1971 Statistical Bulletin for all countries (otter trawl catches only for USA and Canada), except the German Democratic Republic, and were standardized by using the average monthly relative catchabilities to US 0-50-ton otter trawlers as given in Table 7 in the Assessments Subcommittee Report (1973 Sp. Comm. Mtg. Proc. 1, App. I). Average monthly catchabilities for Japan (all vessels) and Spain (otter trawlers Class 6) which do not appear in Table 7 have now been calculated. The standardized "days fished" for the German Democratic Republic were estimated by dividing the total catch by the total catch per day of US small otter trawlers which was 5.15 tons. The remainder of the Canadian catch (except by scallop dredges and from the large pelagic fisheries) for which, in general, no effort was reported, was treated similarly as was the remainder of the US catch in Table 5 of the Statistical Bulletin, minus that by the fixed gear and from the large pelagics, menhaden, and invertebrate fisheries (including the not-known mixed species category which is primarily invertebrates but includes such miscellaneous inshore fisheries as striped bass, etc.)

Catches which were eliminated for the USA were the same ones omitted from analysis of effort reported in the Assessments Subcommittee Report.

Ratios of "days on ground" to "days fished" were taken from the 1969 (the last year for which they were reported) column in Table 11 of the Assessments Subcommittee Report. Such values were not available for all countries and gears. Where estimates were used, their bases are given in the footnotes to Table 2.

Calculations involved in Table 2

Col 4 = Col 1 x Col 3
5 = Col 2 x Col 3
7 = Col 3 x Col 6
8 = Col 4 x Col 6
9 = Col 5 x Col 6
10 = Total Col 4 x 0.307
11 = Total Col 5 x 0.307
12 = Total Col 4 - Col 10
13 = Total Col 5 - Col 11

2 - vessel tonnage category	0- 50 tons
3 - " " "	51- 150 tons
4 - " " "	151- 500 tons
5 - " " "	501- 900 tons
6 - " " "	901-1800 tons
7 - " " "	over 1800 tons

OTSI = side otter trawler
OTST = stern otter trawler
OT = otter trawler
PT = pair trawler
PS = purse seine

SPECIAL COMMISSION MEETING - JANUARY 1973Statement by the Portuguese Delegate, Captain Cardoso,
Relating to a Scheme of Effort Regulation as Proposed by
the USA (Comm.Doc. 73/3) and Analyzed by the Assessments Subcommittee
of STACRES (1973 Special Commission Meeting Proc. 1, Appendix I)

My delegation must confess, in the first place, that, in all the available literature, we cannot find one conclusion that fishing effort regulation is more viable or preferable to catch limitation and catch quota allocation. Indeed, on page 1 of the Report of the Assessments Subcommittee (hereafter referred to as RAS) (see 1973 Sp. Comm. Mtg. Proc. 1, App. I), it is stated:

"These interactions must be taken into account in making assessments and in setting annual catch quotas. Provided this is done, the best way, from the biological point of view, to manage a multi-species fishery would be to set individual quotas for each stock."

Following that, it is said, however, that the current regime, in which only some catch quotas have been adopted, has several disadvantages. Three of these are mentioned:

- (1) By-catch of regulated species taken in other regulated and unregulated fisheries has not been controlled.
- (2) The danger, especially with highly mobile fleets, that particular stocks can be depleted before appropriate regulations are introduced.
- (3) Difficulties of enforcement, particularly of ensuring not only that the regulations are obeyed, but that they are clearly seen to be obeyed.

Again, we fail to see how effort regulation answers these objections better than catch regulations.

Let us take objection No. 1, the by-catch problem: that effort regulation does not solve the problem is clearly stated on page 18 of RAS: "Since overall effort regulation does not in itself solve the by-catch problem".

In fact, we would say that the only way of solving this problem is to take into account, while determining the MSY's and the consequent allowable catches, all by-catch of regulated and unregulated species, including catches and by-catches of non-member countries.

We cannot agree that it is correct to classify a fishing effort as too intense before one has knowledge of the allowable catches and the trends of their evolution. In fact, it is theoretically possible to have a case in which an abundance of stock "Y" exists which would justify a total allowable effort (TAE) "T". It would be catastrophic if not applied on "Y" but on unregulated species "Z" or else harmful to regulated species "R" due to the by-catches of "R" in a fishery on "Y" alone.

It appears to us, therefore, that one can only solve resources conservation problems if one has knowledge about those resources. If we know the resources it might be good economics to translate stocks into effort and then regulate effort. If not, it is impossible to regulate the effort properly since the effort has to be allocated rationally among the stocks.

Moving on to objection No. 2, we feel sure that any appropriate regulation, even an effort regulation, if applied too late, will allow stocks to be depleted. We also feel that a highly technical controversial effort regulation will have a very high probability of being accepted too late!

As to objection No. 3, we agree with a previous statement that effort regulation does not appear more seeable or credible than a catch limitation. For example, according to the factors presented, 10 gill-netters of the biggest size possible fishing side by side with one US 50-ton side trawler will put in fishing time equal to the one American vessel. I wonder how many US fishermen will see this as credible! Neither would they ever see all the foreign vessels fishing during the whole year.

Besides, we stand by the statement that, in our opinion, all a regulation needs to be is reasonable and enforceable; if it is enforceable, it does not need to be credible, since it can and should be enforced, with obvious results to all involved.

Having shown, we hope, that the three main disadvantages of the current catch limitation regime either do not exist or, if they do, they affect equally if not more strongly, the effort regulation system, we

pass on to page 2 of the RAS. The very last paragraph of that page tells us that "It was pointed out that the standardized effort derived from this study is really an index of fishing intensity appropriate for the period concerned and not necessarily a measure of fishing power". We agree with a small correction: we would say "certainly not" instead of "not necessarily".

It happens that we disagree completely with the method of allocating days of fishing based on a one-point relationship between the characteristics of the vessels and the resulting intensity of fishing.

If a certain large class of ships has just been generally unlucky, for many unspecified reasons, during 1971 and, for that reason, it is allocated a relatively large number of fishing days, it just may happen that instead of reducing fishing effort, we will be expanding it in 1973.

Another disadvantage of fishing power or capacity to be ascertained in this manner and fishing effort to be allocated on this basis, that is to say, from a direct relationship to fishing mortality, is that, if it results in a decrease of mortality, automatically will bring back mortality to the rate that existed at the point that was used for the calculation. Indeed, if the reduction of effort brings about a better abundance of stock, this same effort applied on the more abundant stock will tend to reduce it.

Another fault of the system is that the introduction of such regulation to be effective will definitely change the pattern of fishing of any one country. This will have as a consequence, a change in the fishing mortality generated by the action of that country's fleet and consequently, its position relative to other countries. But since this initial fishing mortality generated by that country determined its relative position, this means that in order to be effective the calculated factors are automatically unfair or incorrect during the year in which they are applied. The RAS refers to the same problem at the bottom of page 14.

Another point is that the fishing power coefficients should be taken off a continuous curve and not from block values. Otherwise, you might increase considerably the fishing power of a fleet by moving the average tonnage from near the lower limit to near the upper limit (which in the 900+ does not even exist) without reducing your allowed fishing time.

On the other hand, and for the same reason, with the present block values, a 499-ton stern trawler will have a coefficient of 1.3, whereas a 501 would probably have 2.0, which does not make sense.

Also, of course, it is well known that tonnage is only one of the determinant factors of fishing power. Horsepower, winch power, fishing equipment and aids may be even more important.

Finally, we would inquire: Are there no trawler-seiners in the area and its fisheries? If one appears, what is its fishing power? Do all the vessels inside a block tonnage group take only fresh fish? Or only frozen fish? Do all stern trawlers in any one group use pelagic trawls? What happens to the fishing power of those that initiate their use in the near future?

One may reply to most of our doubts and questions that, of course, we will revise annually the whole schedule. It is hard to see, however, how one could justify starting from such an obviously erroneous basis by the fact that it would be corrected soon enough.

We are told at the bottom of page 8 of the RAS that the principle of standardization of fishing effort is crucial, but that the choice of a particular national unit is not. We could not agree more that within the calculations made and for the year 1971 the choice of standard vessel is absolutely immaterial.

We would not, however, like this truth to be taken to imply a certain correctness of the method as a basis for extrapolation. For this purpose, it is essential to study the footnote on page 27 of the RAS, which is self-explanatory.

Not only the vessels were compared without making all the different factors, like time and area, constant, but also very significantly it is stated that "They (the vessels performance factors)..... provide a basis for computing total standardized fishing effort.....provided their distributions and pattern of fishing remains the same as in 1971".

How can it remain the same if our purpose is exactly to change it? And even without our joint action are there two adjacent years in which the distributions and pattern of fishing remain equal or very similar?

A further point: How can this calculation be right when we are told that the two main components of the fishery - herring and mackerel - are not really known? In 1971 these two fisheries accounted for about 66% of the total catch in the area (RAS Table 9).

This is confirmed on page 10 of the RAS: ".....the appropriate level of overall fishing effort is critically determined by the state of the herring and particularly because it is presently unregulated,

the mackerel fishery". The Subcommittee has been able to carry out only a very preliminary assessment of the mackerel stock, and estimates of MSY, the associated fishing effort and current status for this stock are tentative (I underline tentative). Can the whole system be based on this attempt?

It is not possible for me from the data given to deduce how the learning factor has been calculated. We are told on page 3 of RAS that there is no change of direction, but rather of degree by about 50%. Overall the possible inaccuracy appears (I underline appears) less if the learning factor is used. Obviously, a change of degree of 50% is rather formidable and cannot be justified only because it leads to fairer curves. We would, therefore, ask further elucidation on the development of the calculation of this factor.

Another calculation I am unable to follow is that of the increase in total effort by about 25% from 1971 to 1972 in this area. For that purpose, it would be necessary to know how many of the total number of days fished and of vessels counted were Canadian or US vessels, how many side trawlers, stern trawlers, other fishing vessels, and how many vessels of non-member countries.

We also point out that the RAS at the bottom of page 11 states that it is still impossible to determine the effective fishing effort in 1972. So probably, the 25% increase will not be substantiated in the end.

On page 7 of the RAS we are told that an overall limit in terms of catch would be a partial solution. Why partial? Is it because questions of enforcement would still remain? Which questions?

We would tend to disagree with the impossibility, stated on page 9 of the RAS, of studying the historic performance of a particular vessel or country category in precise terms. We believe this could and should be done if we are to develop a regulation of fishing effort. It would be necessary for each country to choose typical classes of their vessels and study their results, say, in the last five years.

We do not agree, as it is written on page 15 of the RAS, that every vessel of a distant-water fleet would have to fish 365 days and we cannot see that days on ground is easily observed by the fishermen, as we have already mentioned.

We cannot possibly agree with a constant factor of days fished to days on ground for every type of vessel considered in the calculations. If we look at Tables 11 and 12 of the RAS, we observe that there are many classes of vessels that do not appear in the Tables.

If we would accept an average figure for large vessels, it would seem obvious without any calculations that the figure for small vessels would have to be considerably different and smaller.

As to the calculations for the national allocation of the national total allowable fishing effort, mentioned at the top of page 16 and presented in Table 13 of the RAS, I am afraid that they are not of much use for a distant-water fleet.

It is obvious that a percentage allocation by class of vessels will not do. It is enough to see in Table 13 that it would result in the sacrifice of two classes of vessels in favour of a middle one, without any reason for it. The problem is further complicated by the fact that if we take two ships of the same class, for instance the 900+ stern trawlers, which are, therefore, estimated to have the same fishing power and consequently, the same right to fishing time, we come up against the problem that in order to fill up, say, 70% of her holds, or otherwise it is uneconomical to send her away to fish, the 901-ton vessel will need less time than the 1800-ton vessel.

The whole puzzle for a large fleet of highly diversified vessels would necessitate the use of computers. This is, of course, assuming that we had already solved the problem of vessels which may fish by trawl, by drift net or longline according to what species they may find.

The whole question of an allocation of vessel days on the grounds has, however, far graver implications.

We must in the first place ask ourselves what are these grounds to which entrance would be forbidden unless a national allocation has been granted. These grounds are those where fishing effort on any of the species existent in Subarea 5 and Statistical Area 6 may be exerted. In other words, they are the total of Subarea 5 and Statistical Area 6: an extension of high seas of some 400,000 square miles! A vast body of water which any fishing vessel should have at least the right to navigate, a vast expanse of sea where any new entrant or non-member would indeed fish. Would it not be absolutely illogical that a fishing vessel of any nation with her fishing gear properly stowed would be allowed to pass across the territorial waters of the coastal state, but a fishing vessel of a non-allocated member nation with the same stowed gear would not be able to pass across that expanse of high seas? Would it not be absurd that a fishing vessel for any reason would wish to interrupt her fishing and come back to

Subarea 4, in order not to penalize her own country's rights of fishing, would have to either navigate close to the shores of the USA or else go out past the meridian of 42°W to come back again at the right latitude to Subarea 4?

What would happen to a non-allocated fishing vessel that wished to load bait or be repaired at a coastal harbour in these areas? Through which seas would she be allowed to navigate? What would be the consequences of crossing them going to or returning from the South Atlantic?

And what of a new entrant? How does one qualify as a new entrant? Has a new entrant more or less rights than a non-member? And how do the rights of members and non-members compare?

I fear that the concept of days on the ground cannot reasonably be used to close to fishing vessels vast expanses of high seas, turning these areas into waters, in some ways more exclusive to the coastal state than its own territorial waters.

The political implications of such a move could indeed be prejudicial to the interests of the USA and, therefore, I am confident that they will study this question carefully.

We will, therefore, proceed to other questions which have raised doubts.

We find that in Section 7 on page 17 of the RAS, the problem of reflex actions of a regulation of effort in Subarea 5 and Statistical Area 6 is raised. This was touched upon in the US memorandum (Comm. Doc. 73/3). I am afraid, however, that both solutions suggested there are unworkable, at least, for the moment. To forbid employment of that effort on non-regulated species in the whole of ICNAF Area seems inappropriate and illogical to the rational exploitation of stocks. Not to forbid it, it would raise the problem of by-catches, maybe on a bigger scale than previously to the introduction of the effort regulation.

To regulate the whole effort in all the areas seems an impossible task at least for the time being. We have been pointing out some of our doubts in relation to Subarea 5 and Statistical Area 6: they would be multiplied many times over for the whole area.

There are many stocks for which statistical data are incomplete and allow errors of $\pm 50\%$. In other words, one cannot even be sure if it is 50% in excess or 50% by default. Check please what is said at the top of page 17 of the RAS on the fishing mortality and potential of the mackerel stock in Subarea 5 and Statistical Area 6.

Another problem that has not been clarified is, what is the state of stocks, fishing mortality and effort, in each of the following: territorial waters, outside the Convention Area, and within this Area? We feel these bring in other unknown quantities.

Having stated all my doubts relating to the general principles of the US memorandum, I must now affirm that we in the Portuguese delegation, find ourselves in agreement with much that is written there and share their alarm.

As to the solution urgently proposed, although we feel it may be impracticable for the moment, we consider that it shows the way into useful refinements which should have paramount importance in the future: How to maximize yield at the maximum output of economical effort - should be the true aim of every conservation system.

We sincerely commend the important work already done and recommend that it be continued and that all possible measures be taken to ensure obtaining the necessary statistical background.

But, given the existing problem, what should be done immediately? That is the question. We believe that the USA is right in asking the Commission to start taking measures before they are so obviously necessary that they may not be needed because they are already obsolete.

We are very pleased to note that the USA supports the maintenance of all conservation measures so far adopted. We do feel that they are essential to the welfare of the stocks involved and it is wise to have time to study their effect. Furthermore, as we said previously, without them the limitation of total effort alone would be useless in guaranteeing that welfare. We fear, however, that as elaborated, they would result in different member countries being unable to catch their allocated quotas and encourage, in fact, the activities of new entrants and non-members.

We had great satisfaction in hearing the Polish Delegate state that Poland is willing to study immediately a catch quota system for the mackerel fishery in the area and we hope that the Commission will finally agree on measures to limit the catch of herring. We believe that this new idea of taking conservation measures before all the data is in but the trends are menacing is a novel and important step that the Commission should take immediately and be proud of. This alone should allay most of the fears voiced in the US memorandum.

In spite of the fact that it is stated, on page 11 of the RAS in reply to Question 3, "It is impossible to estimate the effect of maintaining the fishing intensity at the 1972 level in 1973 to 1975 in terms of the potential catches in these years, because data are not yet available to determine the effective fishing effort in 1972 or the recruitment to the stocks in the immediate future.", the Subcommittee explains on page 13 that "So the implication of maintaining the catches of particular species at the 1971 catch level could lead to an undesirable increase in fishing directed toward mackerel (or one or two other minor species) or diversion to other areas. Thus, if an increase in fishing on mackerel is to be avoided, it would be preferable to regulate the amount of fishing in Subarea 5 and Statistical Area 6 or to introduce a catch quota regulation on mackerel." This is even more clearly stated in the summary on page 18 of the RAS "Bearing in mind the history of exploitation of some of the other regulated resources, there is justification for a pre-emptive catch quota regulation of mackerel, pending a better assessment of its potential."

As to the problem of by-catches, we feel that it could be ameliorated by a more exact determination of MSY's taking into account by-catches in other fisheries. Tables 6A and 6B of the RAS already appear to provide good guide lines for that assessment.

Thank you.

Serial No. 2936
(A.a.4)

Proceedings No. 4
Appendix III

SPECIAL COMMISSION MEETING - JANUARY 1973

Questions Posed by STACREM Regarding Details of Effort Regulation

1. What are the conversion factors needed to obtain days on ground from days fished for the various Member Countries? Do countries collect the necessary information to answer this question and, if not, how long will it take to collect the necessary data?
2. Please define exactly the following terms:
 - a) fishing mortality
 - b) fishing intensity
 - c) fishing power
 - d) fishing effortand specify what are the variables that should be discussed for effort control.
3. The Commission is attempting to control the fishing mortality on the resources and fishing mortality is an abstract quantity which cannot be regulated directly. The Commission may be able to control fishing mortality by regulation of fishing intensity or fishing effort. What is the accuracy with which these quantities can be measured and what is the error involved in using them as a predictor of future fishing mortality?
4. If catch quotas are set for several species which imply different percentage reductions in fishing mortality, what problems does this raise in connection with a fixed reduction in fishing effort, especially for countries only interested in some species?
5. What is the probable increase of fishing mortality in other subareas, if a regulation of fishing effort is introduced in Subarea 5 and Statistical Area 6?
6. If you are controlling your vessels at a level of fishing intensity lower than the one you are allowed, how can that be judged by the criterion of days on ground?
7. If both catch and effort quotas are applied to a given stock, what problems are raised in allocating between countries and within a country to ensure that the two quotas are simultaneously met?
8. What are the opportunities for countries to increase in response to effort control the fishing mortality caused by one unit of fishing effort?
9. Given the present status of stocks and fishing effort in Subarea 5 and Statistical Area 6, assuming that non-member activity does not change, that no new entrants and that the coastal state stabilizes the catches in the territorial waters outside the Convention Area at the 1972 level, what will be the situation of the stocks in those areas in the years 1974 and 1975 if appropriate catch quotas for those years for mackerel and flounders (other than yellowtail) are added to the quotas already established and the by-catch problem is taken care of by revising MSY's of the regulated species in the area at June 1972 and 1973?
10. Could STACRES look into the question of further regulating mesh size and minimum size of fish in Subarea 5?

Serial No. 2936
(B.g.7)

Proceedings No. 4
Appendix IV

SPECIAL COMMISSION MEETING - JANUARY 1973

Estimates of Total Allowable Catch (TAC) of Finfish in Subarea 5 and
Statistical Area 6 Prepared by the Assessments Subcommittee
at the Request of STACREM, 24 January 1973

1. The Assessments Subcommittee of STACRES met at the request of STACREM, on 24 January 1973, to estimate the total allowable catches of finfish species in Subarea 5 and Statistical Area 6 in 1973. These are summarized in Table 1.

Table 1. Nominal catches in 1971 and TAC's for 1973 for Subarea 5 and Statistical Area 6 combined.

Species	1971 Catch (000 t)	1971 ¹ (000 t)
Cod	35	45
Haddock	12	6
Silver hake	108	170
Red hake	40	40
Yellowtail flounder	38	31
Herring	326	-
Redfish	20	30
Pollock	25 ²	50 ³
Dogfish	1	50
Other flounders	27	25
Mackerel	349	-
Other finfish	97	-

¹ Total allowable catch to meet Commission objectives for regulated species. The catch given for presently unregulated species is the potential catch in 1973 which would not result in reduction of the stocks named.

² Includes 15,000 tons from Subarea 5 and Statistical Area 6 and 10,000 tons from Div. 4X of Subarea 4.

³ TAC for Subarea 5, Statistical Area 6 and Div. 4X of Subarea 4.

2. Comment

Mackerel. The level of fishing effort that would achieve the MSY of mackerel, and the present state of the resource is not known. The Subcommittee was, therefore, unable to agree on a level of catch of mackerel in 1973 that could be related to a level of exploitation that might form the objective of the Commission. Further information will become available at the 1973 Annual Meeting.

The seasonal distribution of mackerel catches in 1971 is given in Table 2. It shows that 60% of the annual catch was taken by June during that year. The proportion may have increased slightly in 1972 owing to changes in the pattern of fishing in that year.

Pollock. This resource migrates into Div. 4X. Ideally, regulation should cover the whole stock.

Other flounders. Detailed information on individual species in this group is not available. However, they are judged to be subject to the same level of exploitation as yellowtail flounder and the TAC for 1973 is at a level slightly below the catch in 1971 to accord with the regulation agreed for yellowtail flounder.

Other fish. This category includes demersal species and pelagic species (e.g. butterfish, round herring, saury). The present state and potential catches of these resources, particularly pelagic, is not known.

Table 2. Nominal catches¹ of mackerel and accumulated percentages by month in Subarea 5 and Statistical Area 6 in 1971.

Month	Nominal catches (000 tons)			Accumulated percentages		
	SA 5	SA 6	Total	SA 5	SA 6	Total
Jan	0.5	29.9	30.4	+	18	11
Feb	0.3	14.6	14.9	1	27	16
Mar	0.3	36.2	36.5	1	48	29
Apr	13.1	33.8	46.9	13	68	46
May	19.7	12.7	32.4	32	75	58
Jun	9.9	2.1	12.0	41	76	62
Jul	7.1	-	7.1	48	76	65
Aug	7.0	-	7.0	55	76	68
Sep	6.9	-	6.9	61	76	70
Oct	3.7	0.8	4.5	64	77	72
Nov	16.0	3.8	19.8	79	79	79
Dec	23.2	35.5	58.7	100	100	100
Total	107.7	169.4	277.1			
GDR ²	7.1	63.1	69.2			
Others	1.6	0.8	2.4			
Total (Stat. Bull.)	116.4	232.3	348.7			

¹ For Poland, USSR, Romania, Bulgaria, Japan and Federal Republic of Germany.

² German Democratic Republic.

3. Catches of finfish resources in the squid fishery

The fishery directed at squid alone cannot be separated in the international statistics. Squid are recorded in a mixed fishery, a part of which is directed toward other finfish, e.g. butterfish. The catch of finfish associated with squid may, therefore, have been taken in a fishery for another finfish, or as by-catch in the squid fishery.

Accumulation of monthly catches in 1971 (ICNAF Statistical Bulletin, Vol. 21, Table 4) for which 50% or more of the total catch was given as shellfish (assumed to be squid).

Subarea or Statistical Area	Cod	Silver hake	Flounders	Other Groundfish	Herring	Other Pelagics	Other Fish	Shellfish	Total
5	12	82	6	183	12	1,130	571	4,766	6,762
6	-	32	33	317	25	2,270	33	8,800	11,510
Total	12	114	39	500	37	3,400	604	13,566	18,272
%	0.1	0.6	0.2	2.7	0.2	18.7	3.3	74.2	100

A summary of the catch of finfish associated with the squid in this mixed group in 1971 is given above. The Japanese fishery taking squid also catches butterfish as the opportunity arises. The by-catch of finfish in the squid fishery alone cannot be separated but in 1971 the combined fishery caught 11,400 tons of squid, 5,800 tons of butterfish and 4,600 tons of other finfish, mainly hakes, mackerel, skates, redfish and other unregulated species. In 1972 a catch of 17,800 tons of squid was associated with 3,900 tons of butterfish and 3,800 tons of other finfish.

4. The sustainable yield of the total resource

In its Report (1973 Sp. Comm. Mtg. Proc. 1), STACRES concluded that the by-catch problem would tend to generate over-exploitation if the TAC is set as the sum of MSY's of individual resources. The Subcommittee cannot at present advise on a reduction in catch below the summed MSY's of the individual resources that would alleviate this problem in a predictable way. It will vary from year to year with the relative abundance of the resources and the way in which the pattern of fishing responds to that abundance. A considerable amount of further research is necessary to make progress in this aspect of the problem and should include study of alternative ways of reducing the by-catch problem, e.g. by adjustment of the method of fishing for particular species.



Serial No. 2937
(B.g. 27)

Proceedings No. 5

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of Meetings of the *ad hoc* Committee on Herring Quotas and their Allocation

Thursday, 18 January, 1520 hrs
Friday, 18 January, 0930 and 1500 hrs
Saturday, 20 January, 1025 hrs
Tuesday, 23 January, 0900 and 1445 hrs
Wednesday, 24 January, 1500 hrs
Thursday, 25 January, 1430 and 2115 hrs
Friday, 26 January, 0930 hrs

1. The Executive Secretary opened the first meeting of the *ad hoc* Committee which had been set up by the Joint Meetings of Panels 4 and 5 (1973 Sp. Comm. Mtg. Proc. 3) to give detailed consideration to establishing for 1973 the TAC's and their national allocation for the herring stocks in the Georges Bank, Gulf of Maine and Nova Scotia Banks areas. Dr A.W.H. Needler (Canada) was elected Chairman. Representatives from Canada, Fed. Rep. Germany, Japan, Poland, USSR and USA were present.

2. The Chairman pointed out that the Joint Meetings of Panels 4 and 5 (1973 Sp. Comm. Mtg. Proc. 3) had tentatively agreed to TAC's of 90,000 tons for the Nova Scotia Bank stock and 20,000 tons for the Gulf of Maine stock, subject to looking at the TAC's and their national allocation for all three stocks. The Joint Panels could not reach agreement on a TAC for the Georges Bank stock. One group of Member Countries supported a TAC of 150,000 tons while the other group supported a lower TAC of 135,000 tons.

3. TAC's and their National Allocation. Canada reviewed a Canadian proposal regarding quota allocation for the three herring stocks (Comm.Doc. 73/1). The proposal required establishing the TAC, then deducting the estimated catch from inside the 3-mile limit, and allocating the remainder of the TAC nationally, using the 40-40-10-10 formula of the STACREM guidelines. However, USSR, Fed. Rep. Germany, Poland and Japan all favoured a prorating scheme. Canada presented three tables showing the national allocations when the 40-40-10-10 formula and the 1972 unadjusted prorating procedure were used on TAC's of 20,000 tons for the Gulf of Maine stock, 90,000 tons for the Nova Scotia Bank stock and 150,000 tons and 135,000 tons for the Georges Bank stock. Both proposals were unacceptable. A Canadian proposal for the Nova Scotia Bank allocation which subtracted the estimated catch made inside territorial waters from the TAC and allocated the remainder by prorating against the 1971 catch, was dropped when it was pointed out by USSR that, on this basis, Statistical Area 6 catches should be excluded from the TAC. A US proposal for national allocation had minor adjusted allocations in prorating a TAC of 135,000 against 1971 catches for the Georges Bank stock. It also increased the TAC for the Gulf of Maine stock to 25,000 tons from 20,000 tons and gave Canada and USSR allocations from the Nova Scotia Bank stock which were halfway between that given by the 40-40-10-10 formulation and the 1972 prorating procedure, using a TAC of 90,000 tons.

A USSR proposal used the unadjusted 1972 prorating procedure with a TAC of 150,000 tons for the Georges Bank stock, adopted the US proposed allocation for the Gulf of Maine stock, and adjusted Canadian and USSR allocations to meet USSR needs from the Nova Scotia Bank stock. However, still no agreement could be reached on a TAC for 1973 for the Georges Bank stock. The Chairman noted that, according to STACRES, if the 1970 year-class was as large as or 75% of the successful 1966 year-class, using a TAC of 150,000 tons for 1973 could mean that more drastic conservation measures might have to be taken for 1974. The USA presented analyses of data, based on the assumption that the 1970 year-class was equal to or 75% of the 1966 year-class at TAC's for 1973 of 155,000, 149,000 and 132,000 tons. These analyses showed the Georges Bank stock size which could be expected at the beginning of 1975 (end of 1974) and that there was a risk in agreeing to a TAC of even 115,000 tons. Further discussion resulted in the *ad hoc* Committee agreeing that the Herring Working Group should be asked to discuss analysis of existing data and assumptions which would provide stock size estimates for the Georges Bank and Gulf of Maine stocks at the end of 1974, under various assumptions as to the strength of the 1970 and 1971 year-classes. Accordingly, the following terms of reference were drawn up and presented to the Herring Working Group for consideration and report back to the *ad hoc* Committee:

- 1) Calculate the stock size at 1 January 1975 for the various catches in 1974 for the following options:
 - a) Catch in 1973 in range of 100,000-150,000 tons
 - b) Recruitment level in 1973 figured on
 - 1) 1970 year-class = 1.25 of 1966 year-class

- ii) 1970 year-class = 1.00 of 1966 year-class
- iii) 1970 year-class = 0.75 of 1966 year-class
- c) Recruitment level in 1974 figured on
 - i) 1971 year-class = 1.25 of 1966 year-class
 - ii) 1971 year-class = 1.00 of 1966 year-class
 - iii) 1971 year-class = 0.50 of 1966 year-class
- 2) Make calculations for both the Georges Bank and Gulf of Maine stocks.
- 3) What is the stock size which in the long run will provide adequate recruitment for obtaining maximum productivity? What is the yield related thereto?

All countries agreed that TAC's proposed by USA for 1973 for the Georges Bank and Gulf of Maine stocks would be withdrawn pending a report from the Herring Working Group.

4. Herring Size Limit Tolerance. Canada introduced discussion on the implementation of the herring size limit adopted in 1972 and in effect from 1 January 1973 in Subarea 5 and parts of Div. 4X and 4W of Subarea 4 (1972 Sp. Mtg. on Herring, Proc. 4, Appendix IV), particularly the provision regarding size limit tolerances (Comm.Doc. 73/1). Canada explained that, because of the many small Canadian fishing vessels landing at many small ports, it was difficult to implement the requirement that not more than 10% by weight of herring less than 9 inches could be taken by each vessel during a year. Instead, Canada proposed a count of not more than 25% per trip per vessel. Following discussion, Canada agreed to postpone the proposal and to provide comparative data on the size frequency in catches using the two methods for the 1973 Annual Meeting for examination by the Herring Working Group, prior to consideration by the Commission.

5. The *ad hoc* Committee recessed at 1730 hrs, Saturday, 20 January, to await the report of the *ad hoc* Meeting of the Herring Working Group.

6. The *ad hoc* Committee reconvened at 0900 hrs, Tuesday, 23 January, under the chairmanship of Dr A.W.H. Needler (Canada). Representatives were present from Canada, Fed. Rep. Germany, Japan, Poland, Romania, USSR and USA.

7. In continuation of the consideration of possible TAC's and their national allocation (see Section 3 above), the Report of the *ad hoc* Meeting of the Herring Working Group (1973 Sp. Comm. Mtg. Proc. 1, App. II, Suppl. 2) was presented by the Chairman, Mr T.D. Iles (Canada). For the Georges Bank stock, optimum stock size was estimated to be 500,000 tons and MSY 250,000 tons; for the Gulf of Maine stock, 100,000-120,000 tons and 50,000-60,000 tons. Catch and recruitment and their effect on the stock size at the beginning of 1975 were presented in a series of Tables. Canada pointed out that the 1972 Report of the Herring Working Group recommended quotas for 1973 which would not further reduce spawning stocks and would maintain the MSY. To get to the MSY of 250,000 tons for the Georges Bank stock and 50,000-60,000 tons for the Gulf of Maine stock, the catches should be reduced in 1973 to at or below 100,000 tons and below 20,000 tons respectively. This view was endorsed by USA. After considerable discussion and further reference to previous allocation proposals, the Chairman pointed out that the hindrance to establishing TAC's for 1973 for the Georges Bank and Gulf of Maine stocks was the uncertainty about the size of the 1970 year-class, which would be recruiting in 1973, and the resulting wide range of allowable catches. He suggested that, regardless of the quotas agreed to, a commitment should be included in the proposals for 1973 TAC's, as was done for the 1972 proposals, to the effect that, in setting the 1974 TAC's, the Commission would take action to produce substantial restoration of the stocks and that the commitment be honoured. Most Member Countries agreed in principle to the commitment proposal but wanted to have "substantial restoration" quantified. USA suggested that the commitment in the 1973 proposals be stock-size objectives of 300,000 tons in the Georges Bank stock and 62,000 tons in the Gulf of Maine stock at the end of 1974. These were about 3/5 of the optimum size for each stock as reported by the Herring Working Group. After considerable discussion, the *ad hoc* Committee agreed to recommend to the Joint Panels 4 and 5 the setting of objectives which would require rebuilding of the Georges Bank and Gulf of Maine stocks by the end of 1974 (beginning of 1975) to at least 225,000 tons and 60,000 tons, respectively. The *ad hoc* Committee further agreed to recommend the setting of allowable catches in 1973 at 150,000 tons (150,000 tons in 1972) and 25,000 tons (30,000 tons in 1972) respectively, which would be reduced in 1974 if scientific assessments indicated the objectives could not be reached, and, in any event, would not be increased unless the stocks reached a level which would provide their MSY's of 250,000 tons and 110,000 tons respectively by the end of 1974. The *ad hoc* Committee agreed that the TAC for the Nova Scotia Bank stock in 1973 should be 90,000 tons (65,000 tons in 1972) as the stock was in good condition in 1972 with good recruitment expected in 1973 and that no commitment for 1974 was necessary.

8. National Allocation. After considerable discussion and negotiation, a proposal presented by the Chairman for national allocation of the TAC for Georges Bank, Gulf of Maine and Nova Scotia Bank stocks which took into account the special needs presented in previous proposals was presented as follows:

Country	Georges Bank stock	Gulf of Maine stock	Nova Scotia Bank stock	Total
Total TAC's	150,000 tons	25,000 tons	90,000 tons	265,000 tons
Canada	5,050	4,000	57,000	66,050
Germany, Fed. Rep.	31,600	1,000	-	32,600
Japan	1,200	-	1,350	2,550
Poland	49,400	-	-	49,400
Romania	1,300	-	-	1,300
USSR	48,200	-	31,050	79,250
USA	5,250	19,750	-	25,000
Others	8,000	250	600	8,850

By a vote of 5 Yes and 2 No (Fed. Rep. Germany and Romania), the *ad hoc* Committee agreed to recommend the above national allocations for the TAC's for the Georges Bank, Gulf of Maine and Nova Scotia stocks and the commitment proposal for the Georges Bank and Gulf of Maine stocks to the Joint Meeting of Panels 4 and 5 for consideration and approval.

9. The *ad hoc* Committee on Herring Quotas and their Allocation, having completed its work, adjourned at 1105 hrs, Friday, 26 January. The best thanks of the Committee was extended to its Chairman, Dr Needler, for his patience and skill.

INTERNATIONAL COMMISSION FOR



THE NORTHWEST ATLANTIC FISHERIES

Serial No. 2938
(B.v.)

Proceedings No. 6

SPECIAL COMMISSION MEETING - JANUARY 1973

Report of Final Plenary Sessions

Friday, 26 January, 1125 hrs and 1430 hrs

1. The Chairman of the Commission convened a meeting of the Plenary at 1125 hrs, Friday, 26 January. Representatives of all Member Countries, except Bulgaria and Italy, were present.
2. The Report of STACREM (1973 Sp. Comm. Mtg. Proc. 4) was presented by the Chairman of STACREM, Mr J. Graham (UK), for acceptance by the Plenary. Following a short discussion, the Report, with minor editorial changes, was adopted by the Plenary.
3. The Plenary recessed at 1150 hrs.

4. The Chairman of the Commission reconvened the Plenary at 1430 hrs. Representatives of all Member Countries, except Bulgaria and Italy, were present.

5. The Report of Joint Panels 4 and 5 (1973 Sp. Comm. Mtg. Proc. 3) was presented by the Chairman, Dr A.W.H. Needler (Canada), for consideration of seven proposals for international catch quota regulation of herring, flounders, mackerel, pollock and redfish in the southern part of the Convention Area and a resolution relating to these proposals (1973 Sp. Comm. Mtg. Proc. 3, App. I-VIII).

In the discussion of the catch quota proposals and the resolution which followed, the delegate of Iceland reiterated his Government's view that the coastal state had the prime responsibility for the conservation and management of the marine resources and, therefore, he must abstain from voting on the proposals and the resolution. The delegate of Denmark, supported by a number of other delegates, objected, in principle, to a single allocation for both non-members and other Contracting Governments which might become new entrants under a catch quota scheme.

It was pointed out that separate allocations could become a problem if a non-member country should become a member of the Commission in the near future. The Plenary finally agreed

- 1) that a single allocation called "Others" would be acceptable, with the understanding that, in making provision for countries not individually specified, it was not the intention of the Commission that fishing by non-member countries should have the effect of limiting the catches which Member Countries, not individually specified, were permitted to take.
- 2) that the Commission would give further consideration to resolving quota allocation problems at its 1973 Annual Meeting.

The Chairman of the Commission then called for a vote on each of the seven proposals and the resolution. The Plenary agreed that the French and Spanish delegates should be able to vote by proxy. By a vote of 12 yes, 1 no (Romania), 1 abstention (Iceland) and 2 absent (Bulgaria and Italy), the Plenary adopted the proposal (1) for herring quota on the Georges Bank stock (1973 Sp. Comm. Mtg. Proc. 3, App. I). By votes of 13 yes, 1 abstention (Iceland) and 2 absent (Bulgaria and Italy), the Plenary adopted proposal (2) for herring quota in Division 5Y of Subarea 5 (1973 Sp. Comm. Mtg. Proc. 3, App. II), proposal (3) for herring quota in Division 4X and part of Division 4W of Subarea 4 (1973 Sp. Comm. Mtg. Proc. 3, App. III), proposal (4) for flounder (except yellowtail) quota on the Southern New England stock (1973 Sp. Comm. Mtg. Proc. 3, App. IV), proposal (5) for mackerel quota on the Southern New England stock (1973 Sp. Comm. Mtg. Proc. 3, App. V), proposal (6) for pollock quota in Subarea 5 and Division 4X of Subarea 4 (1973 Sp. Comm. Mtg. Proc. 3, App. VI), proposal (7) for redfish quota in Subarea 5 (1973 Sp. Comm. Mtg. Proc. 3, App. VII) and the Resolution relating to the seven 1973 proposals (1973 Sp. Comm. Mtg. Proc. 3, App. VIII).

6. The Chairman of the Commission recognized the Observer from the European Economic Community (EEC) who spoke as follows:

"Mr Chairman,

"Thank you very much for giving me the floor in my capacity as a representative of the European Community.

"You and your Commission know how much EEC is interested in the work of international organizations for fisheries and how much it is aware of the necessity to try to find the most efficient measures for conservation at the international level. In this respect, having looked very broadly at the measures concerning the limitation of fishing effort, we also think like many of the representatives who are present and as has been decided here, that such an important question requires a very careful examination, particularly in the light of the implementation of national quota allocations.

"In view of the introduction of national catch quotas for some species for the year 1973, I would like to refer to the statement made on behalf of the Community in Halifax on 4 June at the 1971 ICNAF Meeting - which I shall not repeat now - but to which I should like to add - the implementation of the common policy on fisheries may lead the Community to work out arrangements for Community management of its member-states quotas.

"Thank you."

The Observer from ICES thanked the Commission on behalf of the Council for the invitation to attend the meeting and drew attention to the active and useful cooperation and collaboration between the ICES and ICNAF scientists. He felt assured that such close working arrangements prove of mutual benefit in the wise use of the North Atlantic fishery resources.

The Observer from FAO said that FAO and its Department of Fisheries in particular were pleased to have the Commission meet again at FAO in Rome. It provided an excellent opportunity to meet old friends and discuss mutual problems in fisheries. FAO was greatly interested in the good work and rapid progress now being made by ICNAF and hoped that others would take note.

7. The Chairman of the Commission announced the conclusion of the business before the Commission's Special Meeting. On his own behalf and that of the Commission, he expressed his sincere thanks to all for their efforts in providing solutions to difficult and delicate tasks. A special thank you was extended to Dr A.W.H. Needler (Canada) as Chairman of Joint Panels 4 and 5 and of the *ad hoc* Committee on Herring Quotas and their Allocation, to Mr J. Graham (UK) as Chairman of STACREM, to Dr A.S. Bogdanov (USSR) and Messrs D.J. Garrod (UK) and T.D. Iles (Canada) for their excellent work in STACRES and its Assessments Subcommittee and Herring Working Group. He expressed the Commission's gratitude to the US delegation for the considerable thought and effort it had put into introducing effort limitation as a possible additional measure to ensure wise use of the stocks of fish in the Northwest Atlantic. He thanked the staff of the Secretariat for its work and FAO for its cooperation, accommodation and hospitality.

8. There being no other business, the Chairman declared the Special Commission Meeting - January 1973 adjourned at 1800 hrs. A press notice covering the proceedings of the Special Commission Meeting is at Appendix I.

SPECIAL COMMISSION MEETING - JANUARY 1973

Press Notice

1. A second extraordinary meeting of the International Commission for the Northwest Atlantic Fisheries (ICNAF) considered the current status of the herring stocks on the Nova Scotia Bank, in the Gulf of Maine, and on Georges Bank and areas to the west and south following the application of national catch quotas on these stocks as conservation measures for the year 1972. The meeting also considered the possibility for limitation of the increasing amount of fishing effort being applied on the commercial fish stocks in the southern part of the Northwest Atlantic area.
2. The Special Meeting was held by courtesy of the Department of Fisheries of the Food and Agriculture Organization of the United Nations in Rome, Italy, from 16 to 26 January 1973, under the chairmanship of Mr K. Løkkegaard (Denmark). Delegates from all Member Countries, except Bulgaria and Italy, were present. The sixteen Member Countries are Bulgaria, Canada, Denmark, France, Federal Republic of Germany, Iceland, Italy, Japan, Norway, Poland, Portugal, Romania, Spain, USSR, UK, and USA. Observers represented the Food and Agriculture Organization, the Commission of the European Economic Community and the International Council for the Exploration of the Sea.
3. The Special Meeting was preceded by meetings of the Commission's Standing Committee on Research and Statistics from 8 to 15 January 1973.
4. After considering the reports of the scientific meetings and other relevant economic and technical information, the Commission agreed to recommend to the Member Countries measures to conserve the herring stocks by limiting the total catch of herring during 1973 from the Georges Bank stock to 150,000 tons (the same amount allowed in 1972), from the Gulf of Maine stock to 25,000 tons (5,000 tons less than for 1972), and from the Nova Scotia Banks stock to 90,000 tons (25,000 tons more than for 1972). The Commission also agreed to recommend to Member Countries catch quota allocations of the 1973 total catch quotas for each Member Country fishing on each of the three stocks of herring.
5. The Commission's Standing Committee on Research and Statistics under the chairmanship of Dr A.S. Bogdanov (USSR) and the Standing Committee on Regulatory Measures under the chairmanship of Mr J. Graham (UK) conducted thorough studies of a US proposal to limit the amount of fishing effort as a further conservation measure for the commercial fish stocks in the southern part of the Northwest Atlantic. Following considerable discussion, the Commission agreed to refer the many scientific, economic and technical problems involved in effort regulation for future detailed study to a meeting of scientific and technical experts to be convened at the National Marine Fisheries Centre, Woods Hole, Massachusetts or at the Commission offices, Dartmouth, Nova Scotia in late March or early April 1973.
6. Further and pending further consideration of effort limitation at its Annual Meeting in June 1973, the Commission agreed, as an interim measure, to recommend for 1973 measures to conserve the currently unregulated fish species by limiting their total catches as follows:

Mackerel from the Gulf of Maine, Georges Bank and to the west and south to 450,000 tons
Pollock from the Gulf of Maine, Georges Bank, and off southwestern Nova Scotia to 50,000 tons
Redfish from the Gulf of Maine and Georges Bank to 30,000 tons
Flounders (except yellowtail) from the Gulf of Maine, Georges Bank and to the west and south to 25,000 tons.

The Commission also agreed to recommend catch quota allocations of these 1973 total catch quotas for each Member Country fishing on the stocks making up these commercial species.
7. The Commission adopted a resolution urging Member Countries whose fleets fish the stocks of species which migrate between Georges Bank and the area to the west and south outside the Commission's jurisdiction (ICNAF Statistical Area 6) and for which catch quotas were recommended for 1973 to institute appropriate measures to regulate their fisheries in Statistical Area 6 to ensure the effectiveness of the Commission's proposals for these stocks either by further international agreements or on a national basis.
8. The Commission urged Member Countries to accept or ratify the Commission's seven conservation proposals for herring, mackerel, pollock, redfish and flounders other than yellowtail as soon as possible

in order to shorten the six-month period normally required for the proposals to come into force for 1973.

9. The 1973 Annual Meeting of the Commission will be held at the World Health Organization Building in Copenhagen, Denmark from 5 to 15 June 1973 under the chairmanship of Mr K. Løkkegaard (Denmark). Meetings of the Commission's Standing Committee on Research and Statistics will meet for a preceding period of a week or more.

27 January 1973

Office of the Secretariat of the Commission
Dartmouth, Nova Scotia