

INTERNATIONAL COMMISSION FOR



THE NORTHWEST ATLANTIC FISHERIES

REDBOOK 1967 PART I.

STANDING COMMITTEE ON RESEARCH AND STATISTICS

PROCEEDINGS

FROM THE

1967

ANNUAL MEETING

Note

REDBOOK 1967 appears in 4 books. The first book contains Part I, Proceedings of the Standing Committee on Research and Statistics. The second book contains Part II, Reports on Researches in the ICNAF Area in 1966. The third book contains Part III, Selected Papers from the 1967 Annual Meeting. The fourth book contains Part IV, Selected Papers from a Special Meeting of the Environmental Subcommittee, May 1967.

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Issued from the Headquarters of the Commission

Dartmouth, N.S., Canada

1967

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PART I. REPORT OF STANDING COMMITTEE ON RESEARCH AND STATISTICS

Chairman: W. Templeman; Rapporteur: B.E. Skud

The Standing Committee on Research and Statistics (R&S) met in Boston, Massachusetts in the United States, from Monday, 29 May to Friday, 2 June 1967 in the week preceding the 17th Annual Meeting of the Commission. The Assessment and Statistics and Sampling Subcommittees met during the previous week from Thursday, 25 May to Saturday, 27 May. The major items considered at these meetings are summarized below:

Following are the agenda items and a summary of the major items dealt with at the meetings:

1. Assessments (Chairman: B.B. Parrish)

- (a) Review of latest statistics of catch and effort
- (b) Trends in total catch and effort
- (c) Revision of assessments (cod in Subarea 2, Div. 3K, 3L and 4T, haddock in Subareas 4 and 5, silver hake in Subarea 5) (Rec. 1 and 2, 1966)
- (d) Consideration of Report of ICNAF Working Group on Joint Bio-Economic Assessment of effects of conservation actions (Rec. 9, 1966)
- (e) Review of additional data on West Greenland cod (Rec. 3, 1966)
- (f) Review of Reports of ICES/ICNAF Joint Working Party on North Atlantic Salmon, including consideration of Canadian proposal to prohibit fishing for Atlantic salmon on the high seas in the Convention Area by any method
- (g) FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains
- (h) Review of R&S data submissions for assessments (Rec. 11, 1966)
- (i) Future work
- (j) Other matters
  - (1) FAO Review of Fishery Resources for IWP
  - (2) Seal fisheries
  - (3) Species interaction

2. Sampling and Statistics (Chairman: F.D. McCracken)

- (a) Sampling
  - (1) Review of Sampling Yearbook Vol. 9 and 10, 1964 and 1965
  - (2) Transfer to data processing cards and first analyses of age/length data for 1961, 1962 and 1963

2. Statistics and Sampling (cont'd)

- (b) Consideration of recommendations of Joint ICES/ICNAF Sampling Meeting, Rome, 1-2 October 1965
  - (1) Reporting length dimensions in Total Length in Subarea 1
  - (2) Adoption of Total Length for species in Subareas 2, 3, 4 and 5
  - (3) Adoption of length measurements for all species to the length interval BELOW
  - (4) Grouping of length data with particular reference to 5-cm groupings for cod in (a) whole ICNAF Area, (b) Subarea 1 alone
- (c) Review of ICNAF List of Vessels for 1965
  - (1) Vessel data
  - (2) Summary of fishing effort, 1965 (ICNAF Stat. Form 3)
- (d) Statistical reporting
  - (1) Report on statistical activities by the Secretariat
  - (2) Review of revised ICNAF Stat. Form 4 (discards and industrial fish turned into fish meal at sea)
  - (3) Review of Statistical Bulletin 15 for 1965
  - (4) Conversion factors
  - (5) Common and scientific names of ICNAF species
- (e) Consideration of the report of the ICES Statistical Committee, October 1966
- (f) Consideration of the report of the 5th meeting of Continuing Working Party on North Atlantic Statistics, Aberdeen, 10-15 April 1967
- (g) Consideration of proposals for extension of ICNAF statistics collection southward
- (h) Consideration of collection and publication of detailed statistical data on catch and effort for North Atlantic salmon and harp and hood seals (based on requirements of ICES/ICNAF Joint Working Party on North Atlantic Salmon and of Panel A, and Scientific Advisers respectively)
- (i) Other matters
  - (1) Definition of hakes
  - (2) Definition of fishing effort

3. Gear and Selectivity (Chairman: A.W.May)

- (a) Review of the report of the ICES Comparative Fishing Committee, October 1966
- (b) Tabular summaries of selectivity data (Rec. 23, 1963; Rec. 31, 1965)
- (c) Selectivity of different codend materials (Redbook 1966, Pt.I, p.63)

3. Gear and Selectivity (cont'd)

- (d) Length, weight and girth data (Recommendation 31, 1966)
- (e) Meshing of redfish (Rec. 32, 1966)
- (f) Catch size and selectivity (Redbook 1966, Pt.I, p.63)
- (g) Developments in gear and fishing methods
  - (1) Review of form for collection of trawl material and mesh size sampling data including grouping of average mesh sizes for reporting
  - (2) Publication of 1964 and 1965 data on trawl material and mesh size sampling in Redbook 1966, Part III (Rec. 33, 1966)
  - (3) Trawl material and mesh size sampling data, 1966
- (h) Mesh measurement
  - (1) Report of ICNAF Working Group on Mesh Measuring, London, November 1966, and adoption of standard gauge for enforcement
  - (2) Mesh equivalents for different gauges and trawl materials with 130 mm mesh of manila measured with ICNAF gauge as regulation in Subarea 1
- (i) Topside chafing gear
  - (1) Approved topside chafers including specifications for large-mesh (Polish-type) chafer
  - (2) Review of further experiments with Polish and other chafers (Rec. 17(i), 1966)
  - (3) Elimination of topside chafer (Rec. 17(ii), 1966)
- (j) Other matters
  - (1) Identification of synthetic twine material

4. Environmental (Chairman: A. Lee)

- (a) Report on NORWESTLANT Surveys (ICNAF Sp. Pub..No.7)
- (b) Consideration of the USA/USSR proposed plan for an ICNAF Georges Bank-Gulf of Maine environmental survey (Rec. 35, 1966)
- (c) Environmental aspects of the national research reports
- (d) Report on activities of IOC, SCOR and ACMRR, including consideration of Dr Kort's proposal of 15 December 1966 for cooperative study of the North Atlantic dynamics and hydrology (IOC Resolution IV-14)
- (e) Consideration of UN Resolution on Resources of the Sea adopted by UN, 6 December 1966

4. Environmental (cont'd)

- (f) Reports on meetings on oceanographic instrumentation (Redbook 1966, Pt.I, p.69)
  - (1) Meeting of Institute of Electronic Engineers (UK), Southampton, September 1966
  - (2) Joint Meeting of Hydrography and Plankton Committee of ICES, Copenhagen, October 1966
- (g) FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains (Rec. 7 and 8, 1966)
- (h) Review of ICNAF Environmental Symposium, 1964 (ICNAF Sp. Pub. No.6)
- (i) Environmental changes (atmospheric and oceanic) in relation to fisheries
- (j) Other matters

5. Herring and Other Pelagic Fish (Chairman: S.A.Studenetsky)

(a) Herring

- (1) Review of pertinent documents including report of ICES Herring Committee 1966
- (2) Review of fisheries and research
- (3) Sampling results from Georges Bank area
- (4) Georges Bank catch/effort data, 1966
- (5) Year-class changes on Georges Bank (Rec. 20, 1966)
- (6) Year-class changes in coastal waters (Redbook 1966, Pt.I, p.79)
- (7) Other matters

(i) Herring otolith exchange

- (b) Swordfish and tuna catch and research
- (c) Porbeagle and other shark fisheries
- (d) Mackerel fisheries
- (e) Other matters

- (1) FAO Meeting on Fish Behaviour in Relation to Fishing Techniques and Tactics, Bergen, 19-27 October 1967
- (2) ICES Symposium on the Biology of Early Stages and Recruitment Mechanisms of Herring, October 1968 (ICNAF Circular Letter 66/21 dated 29 November 1966)
- (3) FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains, 1968
- (4) Atlantic Tuna Commission

6. Ageing Techniques (Chairman: E. Bratberg)
  - (a) Report on cod otolith photograph exchange program (Redbook 1966, Pt.I, para.1, p.83)
  - (b) Report on redfish otolith photograph exchange (Rec.36, 1966)
  - (c) Report on silver hake otolith photograph exchange (Redbook 1966, Pt.I, para.3, p.83)
  - (d) Further additions to inventory of validation studies (Rec. 37, 1966)
  - (e) Reports of further validation studies (Rec. 38, 1966)
  - (f) Distribution of type otoliths from validation studies (Rec. 39, 1966)
  - (g) Report on herring otolith exchange by Canada, Poland and USA (Rec. 20, 1966)
  - (h) Other matters
  
7. Steering and Publications (Chairman: W. Templeman)
  - (a) Timetable and arrangements for R&S meetings
  - (b) Relationship of R&S to Panel A (Seals) and its Scientific Advisers
  - (c) Relationship of R&S to ICES/ICNAF Joint Working Party on North Atlantic Salmon
  - (d) Publication of Report of ICES/ICNAF Joint Working Party on North Atlantic Salmon
  - (e) Inventory of holdings of Commission publications
  - (f) Review of ICNAF publications 1966/67
    - (1) Research Bulletins 3 and 4
    - (2) Annual Proceedings Vol.16
    - (3) Redbook 1966, Pts. I, II and III
    - (4) Sampling Yearbook Vol.10, 1965
    - (5) Statistical Bulletins 14 and 15, 1964 and 1965
    - (6) Special Publication No.6 (Environmental Symposium)
    - (7) Revision of ICNAF Handbook
    - (8) FAO/ICES/ICNAF Joint Index of North Atlantic publications
  - (g) Printing of national research reports in Annual Proceedings
  - (h) Chairmen for 1967/68
  - (i) Other matters
    - (1) Printing of new ICNAF map
    - (2) Indexing to aid libraries (Carrothers' note)
    - (3) Addition of Romania to Subcommittee
    - (4) Consideration of Research Documents for Redbook or other publication
  
8. Mid-year meetings
  
9. Coordination and cooperation with other organizations

10. Election of officers for the ensuing year
11. Arrangements for the 1968 meetings
12. Other matters

Note re special session of the Environmental Subcommittee

In accordance with Recommendation 19 on page 23 of Redbook 1966, Part I, Mr A. Lee, Chairman of the Environmental Subcommittee, has taken steps "...to obtain from the appropriate experts (a) further information about the environmental factors that may have affected the growth of cod in Subarea 2; (b) a synthesis of hydrographic and meteorological fluctuations in the ICNAF Area in recent years." He has been offered 3 research papers on environmental factors and growth of cod in Subarea 2 and about 10 papers on hydrography and meteorology in the ICNAF Area. In order to allow time for presentation and full consideration of these contributions, the whole of Tuesday, 30 May 1967, except for a short meeting of R&S at 9:00 a.m., has been given over to Mr Lee and the Environmental Subcommittee. It is expected that all meeting participants will wish to attend this special session.

1. ASSESSMENTS (APP.I)

(a) Nominal Catches and Fishing Activity in the ICNAF Area

R&S compiled the landings data (nominal catches) for 1966 and the landings-per-unit effort and estimated total fishing activity for 1965. The principal changes from previous years are noted below:

Subarea 1

The nominal catches for 1966 include the data for non-member countries. The total nominal catches of cod and redfish were similar to that in 1965 - about three-quarters of the highest yield in 1962.

During the period 1962-1964 the decrease in nominal catch was associated with increasing fishing effort and decreasing catch-per-unit activity. Although in 1965 and 1966 the nominal catch remained steady, with a slight improvement in catch-per-unit activity in 1965, for all fisheries combined, the estimates of catch-per-unit effort for the German fishery continued to decrease in both 1965 and 1966.

There was a small decrease in total fishing activity in 1965 but an increase in large stern trawlers.



### Subarea 2

The total nominal catches of all species excluding herring and shellfish in 1966 showed a decline from the previous year, but they still remained the second highest in the history of fishing in this area. As in previous years, cod made up the greater part of the landings. Redfish landings declined substantially.

The estimates of fishing activity indicate that the high landings in 1965 followed a further sharp increase in fishing effort.

### Subarea 3

Subarea 3 catches of all species from this subarea in 1966 were approximately the same as in 1965. Cod catches remained steady at about half a million tons, and haddock landings, though low, were also steady. Redfish landings declined somewhat, thereby reversing the upward trend which began in 1963.

The estimates of total fishing activity were higher in 1965, continuing the upward trend.

### Subarea 4

Subarea 4 catches of groundfish in 1966 decreased by about 20,000 tons from the 1965 level, but were still close to the high levels reached in 1963-1965. For the main species fished, the following changes were noted:

Haddock landings decreased sharply from 1965 but were still above the long-term average. Redfish landings increased by 55 percent, continuing the upward trend begun in 1963. The improvement was primarily the result of increased abundance combined with increased effort in the Gulf of St. Lawrence. Flounder landings continued to increase as they have done almost every year since 1957. Catches of silver hake decreased to one-fifth of the 1965 level. This continued the decline begun in 1963 and appears to be the result of poor recruitment in recent years and changes in the distribution of fish due to decreased water temperatures. Herring landings increased by almost 30 percent, mainly as a result of increased purse seine effort by Canadian vessels. Landings have more than doubled since the 1957-1963 period, but the increase does not appear to be related to changes in stock abundance.

The estimated fishing activity in the groundfish fisheries in the subarea in 1965 continued at the same high level reached in 1963.

### Subarea 5

Landings of groundfish in 1966 dropped to more than 60% of the 1965 level, but herring landings were more than double. The most striking decrease

in groundfish landings was for silver hake, which dropped to only half the 1965 level. Haddock landings were nearly 20% lower than in 1965, but they were still much higher than the average for the years before 1965. The catch-per-day of groundfish by US medium trawlers only dropped by about 10 percent, so the change in landings was evidently the result of a reduction in effort.

### General Conclusions

In summary, the most recent data indicate that the total fishing activity in the groundfish fisheries in the ICNAF Area in 1965 continued the increasing trend of recent years.

## (b) Revision of Past Assessments in the Light of Latest Information

### (i) West Greenland Cod

Recent information confirms the conclusions of last year's assessments that long-term gains would result in the cod fisheries of Subarea 1 from an increase in mesh size up to 150 mm. Such a measure would not only increase the total catches, but also lead to a substantial reduction in the proportions of the catch discarded or utilized for industrial purposes. Further, an increase in mesh size up to 150 mm would produce additional benefits aboard freezer trawlers by reduction in the costs of fish handling, processing, etc. Such potential benefits should, where possible, be taken into account in the evaluation of the results of mesh assessments.

Information presented from the German trawl fishery suggests that the effective mesh size in the West Greenland trawl fishery may be smaller than the 100 mm (manila) used in the earlier assessments. This indicates that the long-term gains from an effective mesh size of 130 mm, as agreed by the Commission, would be greater than those estimated in last year's assessment.

### (ii) Subarea 2 - Cod

The results of further assessments of the Subarea 2 cod fishery confirmed the conclusions in last year's report that no loss, and possibly a gain in long-term catch and a larger gain in catch-per-unit effort, would result from a reduction in total fishing intensity of up to 30%.

It was noted that the annual variations in catch-per-unit effort in this fishery are relatively high, owing to the variability of environmental factors in this area, which affect both the distribution and availability of cod and the efficiency of fishing operations. Such factors were probably responsible for a higher catch-per-unit effort of the trawl fisheries in 1965 than in 1964 and 1966.

(iii) Northern Gulf of St. Lawrence - Cod

Data on this fishery suggest that, in the period 1962-66, the size and age compositions of the stock have decreased and the estimated total mortality rate has increased in comparison with the period up to 1961. At the same time, the total fishing intensity increased. Although detailed assessments are necessary, the information suggests that long-term gains in average catch would result from increases in mesh size possibly to as much as 6 inches (150 mm).

(iv) Div.4T and 4V (Spring) - Cod

New data on this cod stock indicated that the following changes have taken place since the increase in fishing intensity in this fishery in the early 1950's: the catch-per-unit effort has decreased; the older age-groups are much less abundant; the younger age-groups in the exploited stock have increased in abundance; and in recent years growth has declined. Despite the various changes, the total yield since 1960 has remained fairly stable.

The Committee expressed the need for extending the earlier mesh assessments in the light of these new data and stressed the importance of continued detailed studies of density dependent changes in the exploited fish populations with special reference to growth, recruitment and concurrent environmental changes. R&S accordingly

recommends (1)

*that the results of such studies should be reported to future meetings of R&S.*

(v) Subarea 5 - Haddock

The review of catch statistics for Subarea 5 has shown that catches of haddock fell in 1966 from the exceptionally high level of 1965, but they still remained much higher than the long-term average. Earlier assessments had indicated that substantial increases in fishing effort, such as those which have occurred during the past two years, could not be expected to give an increase in the long-term average catch of this fishery. The Committee, therefore, gave detailed consideration to the probable implications to the fishery of the very high catches of 155,000 tons in 1965 and 126,000 tons in 1966.

Whereas the US fishing effort has remained steady since 1962, there has been a very rapid increase in USSR fishing effort, although this effort decreased in 1966. Haddock fishing by other countries, principally Canada, has also increased steadily and represents 20% of the total. There is some difficulty in comparing the US and

USSR haddock age data in that the US data are from commercial landings and that of the USSR from research and scouting vessels. The USSR agreed to increase its sampling of haddock with special reference to the sampling of the commercial catches.

The Committee concluded that:

- (1) The large increase in the Subarea 5 haddock catch in 1965 and 1966 can be accounted for by an increase in fishing effort to approximately twice its previous level together with increased recruitment to the fishery by the unusually strong 1963 and 1962 year-classes.
- (2) If this high level of fishing effort is maintained, the yield from any year-class will be slightly lower than if the increase in effort had not taken place, and the contribution of any one year-class to the catches will be taken in fewer years. The total cost of obtaining this catch would, of course, be much higher than at the lower level of effort.
- (3) The intensive fishing in 1965 and 1966 has decreased the potential yield from the 1962 and 1963 year-classes, and will increase the year-to-year variation in catches in the 1967-1970 period.
- (4) The recruitment of a series of weak year-classes since 1963 is likely to result in below-average effort and catches in the years 1967-70.

(vi) Subarea 5 - Yellowtail Flounder

Data on the yellowtail flounder fishery in Subarea 5 showed that the total landings, fishing effort, and catch-per-unit effort in this fishery have increased since the mid 1950's. Also total mortality estimates were larger in 1960-64 than they were in the mid 1940's. The instantaneous natural mortality rate is estimated to lie between 0.1 and 0.2. Although no new assessments of the effect of mesh changes have been made in the light of these more recent data, the observed changes do not conflict with the results of the earlier assessment and the Committee concluded that no revision is necessary at the present time.

(vii) ICNAF Area in General

R&S wishes to draw the Commission's attention to the fact that with more large, highly mobile vessels fishing in the ICNAF Area, there are likely to be large temporary increases in fishing intensity on a fish stock subject to large variations in year-class abundance.

(c) Bio-Economic Assessments

The Report of the Working Group on Joint Biological and Economic Assessment of Conservation Actions appointed at the 1966 Commission Meeting was reviewed. R&S endorsed the Working Group's main conclusions concerning the state of the exploited cod and haddock stocks in the ICNAF Area and in Region I of the NEAFC Area, that with a reduction in the amount of fishing on them, the same or a somewhat higher average annual catch could be achieved. R&S strongly endorsed the Working Group's view that continued growth in fishing power is expected and that this greatly increases the urgency for steps to introduce effective control measures in these North Atlantic fisheries.

The Committee stressed the continued importance of the Commission's mesh regulations controlling the size at which fish enter the fishery. The fishing mortality rate in most of the cod and haddock stocks is such that even with larger mesh sizes, decreases in fishing intensity would not result in a decrease in the long-term yield. Consideration was given to the biological data required to provide a system of catch quotas for the cod and haddock fisheries in the North Atlantic. Comprehensive data on the abundance of pre-recruit age-groups are needed to permit the adjustment of quotas following changes in stock abundance due to year-class fluctuations. A review of the data currently being collected in national research programs indicated that these data are available for one or more years prior to the age of recruitment for the haddock stocks and for some of the important cod stocks in the ICNAF Area, although it was recognized that in the event of a catch quota system being introduced in this area, increased research effort would have to be devoted to the estimation of pre-recruit year-class strength.

(d) West Greenland Salmon

The ICES/ICNAF Joint Working Party on North Atlantic Salmon was unable to meet at this year's ICNAF meeting, and consideration of the West Greenland salmon problem was undertaken by the Assessments Subcommittee. For this purpose, an *ad hoc* working group was appointed, which was chaired by Mr K.R.Allen, the current chairman of the Joint Working Party.

(i) ICES/ICNAF Joint Working Party

The reports of the First and Second Meetings of the Joint Working Party were reviewed and accepted. R&S accordingly

recommends (2)

*that ICNAF should approve the reports and make the necessary arrangements for their publication in consultation with ICES. The Committee considers that the ICES Cooperative Research Report series is the most suitable for their publication.*

The R&S Committee emphasized the need for continuing collaboration between ICES and ICNAF on salmon problems and pointed out that the Joint Working Party provides the means for this collaboration and accordingly

recommends (3)

*that meetings of the Working Party should be held at regular intervals and that, in view of the resignation of the present chairman, special arrangements should be made for a meeting in the near future to be convened by the ICNAF ex officio member. This meeting should, among other matters, consider the pertinent salmon documents and reports of the 1967 ICNAF meeting in Boston. Further, that the ICNAF Secretariat should circulate these documents and the Report of the Assessments Subcommittee to all members of the Working Party.*

(ii) Catch and Effort Statistics

Statistics of salmon catches at West Greenland show that in 1966 the salmon catch at West Greenland increased to over 1,300 tons from about 900 tons in 1965 and was only slightly less than the 1964 level. Data on fishing effort show an increase in Canada and Scotland since 1960, but a decrease in Ireland. No drastic changes in effort were noted, but all areas show signs of a rising trend over the last 5 or 6 years. While it welcomed the improvement in the provision of salmon fishery statistics, R&S

recommends (4)

*that all countries concerned should be urged to continue their efforts to obtain further improvement in statistical reporting for Atlantic salmon. In particular, more comprehensive data on fishing effort and on the breakdown of catches between grilse and salmon are needed.*

(iii) Tagging Data

Recaptures at West Greenland of Salmon tagged as Smolts in Home Waters

Canadian returns in 1966 from the West Greenland fishery of salmon tagged as smolts in 1965 were much higher than in 1964-65. The data from the British Isles show a similar change, although the numbers of recaptures were small. The rise in Greenland catches in 1966 is not sufficient to account for the rise in the recovery rate of Canadian tags and although more efficient tag reporting in Greenland may have contributed to the effect, it seems probable that a larger proportion of Canadian fish moved into the exploited stocks at West Greenland in 1966 than in 1964 and 1965.

Tagging at West Greenland

From the 223 salmon tagged at Greenland in 1965, one long-distance recapture was taken on the south coast of Newfoundland in June 1966. In the 1966 tagging experiments in Greenland, 728 salmon were tagged. There were 27 local recaptures, all but 2 being taken in the Godthaab district where they were tagged. These two were taken in the Fiskenaesset area, 50 miles south of the tagging site. One long-distance recapture was obtained in the River Tweed, Scotland, in March 1967.

(iv) Growth Rate in the Sea

New length and weight data provided an additional estimate of the increase in weight of salmon between the time of their presence in the West Greenland fishing area and their capture in the Canadian fishery. This increase is about 40% which is generally similar to the 1966 estimate. Therefore, no revision is required of the Working Party's estimate of 70% as the critical exploitation rate in home waters of fish which have been to West Greenland, above which the effect of the West Greenland fishery would result in a decrease in the total salmon catch.

(v) High Seas Fishing for Salmon

The Committee noted the Canadian proposal for the prohibition of salmon fishing on the high seas in the ICNAF Area. The available data on high seas fishing showed that in 1965 and 1966 two vessels, one from Norway and one from the Faroes, fished for salmon on the high seas in the ICNAF Convention Area.

Canadian data showed that at night the salmon were caught very close to the surface in the open sea. Only a small amount of information exists on the oceanic distribution of salmon and especially on their migration routes and areas of major aggregation, but from the present data it appears possible that at certain times of the year salmon may be congregated in fishable concentrations in certain oceanic areas.

With regard to the effect of high seas fishing on salmon yields, the Committee concluded that such fishing in the vicinity of West Greenland would have the same effect as that of taking the same weight of fish in the coastal Greenland fishery. Similarly, high seas catches near Canada would tend to have the same effect as catches in Canadian inshore waters.

High seas fisheries in other areas further from any coast could take fish on their way to Greenland or during their return, or fish which were remaining far from land, and would not visit the Greenland or

other coast before returning to their home waters. The effect of such a fishery on home water stocks and catches would depend not only on its magnitude, but also on which of these classes of fish it was taking and, of course, upon their countries of origin.

(e) FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains

Interest was expressed in this symposium, which is to be held in Denmark in July 1968. It was agreed that much of the subject matter was of direct relevance to the Committee, especially those aspects concerned with density dependent changes in growth, recruitment and mortality.

(f) Seal Fisheries in the ICNAF Area

Although no detailed consideration was given to problems concerning the seal fisheries in the ICNAF Area, an introductory review of the harp seal fishery and biology was given by Dr Sergeant. Documents presented to the special meeting of Panel A (Copenhagen, October 1966) were made available for study by an appointed group of the Committee.

(g) Data Submissions for Assessments

At last year's meeting, a review was made of statistics and sampling data intended for publication in the Commission's journals. This revealed substantial gaps in the data submitted. The Committee again stresses the importance in assessment work of routine information on nominal catches, fishing effort, discards, length and age compositions of commercial catches, and effective mesh sizes in use and, therefore, wishes to draw the attention of ICNAF scientists to the recommendation passed last year (Redbook 1966, Pt.I, Rec.11) concerning the provision of these data. In particular, the Committee stresses the importance of data being supplied for new fisheries developed by countries on the major ICNAF species.

(h) Interaction between Species

In consideration of the recent changes in the Subarea 5 haddock fishery and stock, attention was drawn to the possible interaction between haddock and silver hake as a factor determining the variations in haddock year-class strength. Silver hake are known to be predators of small haddock, but the available information provided no evidence that this type of interaction was the principal cause of the changes in the haddock stock. It was agreed, however, that research should continue on the problem of species interaction in relation to the exploited stocks of the ICNAF Area.



## 2. STATISTICS AND SAMPLING (APP.II)

### (a) Joint ICES/ICNAF Sampling Meeting, Recommendations

The recommendations on methods of measuring and recording fish length were discussed and the decisions reached are listed in the full report of the Subcommittee.

### (b) ICNAF List of Vessels for 1965

This ICNAF vessel list was reviewed and in the light of the Continuing Working Party recommendations, R&S

recommends (5)

*that the listing of fishing vessels be examined carefully by workers in all countries: to determine which items are useful, and to suggest corrections and possible changes in definitions of various parameters.*

It was agreed that the fishing effort summary in the Vessel List is useful and that it should continue to be compiled and published.

### (c) Report of ICES Statistical Committee

The Chairman of the Statistical Committee of ICES reviewed its activities and reported that ICES is still exploring the preparation of a vessel list. ICES will include nominal catches of main species from the ICNAF Area in their Bulletin Statistique. The close cooperation between the Secretariats of ICNAF and ICES was commended.

### (d) Report of the 5th Meeting of the CWP

The report of the Fifth Session of the Continuing Working Party on Fishery Statistics in the North Atlantic Area, held at Aberdeen, 10-14 April 1967, was discussed.

A complete listing of the recommendations is included in the Subcommittee's report. Items of interest to the Commission are:

#### (1) Inclusion in ICNAF Statistical Bulletin of ICES landings

The CWP recommended the inclusion of ICES totals in ICNAF Table 3 for species of common interest. R&S agreed to the proposal. It was noted that ICES is including ICNAF totals in its publications. Consideration should be given eventually to eliminating FAO's Bulletin of Fishery Statistics "Catches in the North Atlantic".

(ii) Notes for STANA Form 1W and Definition of Effort

R&S in agreement with CWP

recommends (6)

*that countries should be urged to make sure that their national statistics collection systems would produce data required to report on STANA forms all the following three effort details:*

- (a) *either no. of hours or 1000 hooks fished (line 1)  
or no. of hauls, drags or sets made (line 2)*
- (b) *no. of days fished (line 3)*
- (c) *no. of days on grounds (line 4).*

*The items (a), (b) and (c) are not alternatives.*

R&S further

recommends (7)

*that proposed changes in the notes for completion of form STANA 1W, Section 4, as drafted by the Secretary of the CWP and presented in Res.Doc.67/101, be made as follows:*

*In giving data on fishing effort, lines (1), (3) and (4) should all be completed. If data to complete (1) cannot be obtained, line (2) should be completed.*

(iii) Representation on the CWP

At its fifth session, the CWP considered its terms of reference; the continuing need for such a group; its name; and possible changes in representation of the CWP. The Committee supported the conclusions reached by the CWP to rename the group the Coordinating Working Party on Fishery Statistics in the North Atlantic. The Committee agreed that one country from North America should be included in national representation of the CWP. For immediate action, it was agreed that the Federal Republic of Germany should be replaced by Denmark. After the 1968 meeting of the CWP it is expected that the US will replace Canada.

R&S agreed with the CWP in its proposal to meet each year and

recommends (8)

*that ICNAF continue to be represented at future meetings of the CWP.*

(e) Proposed Extension of ICNAF Statistics Collection Southward

In 1966, R&S recognized the need to extend its catch/effort statistics collection southward to the Cape Hatteras region. A working party considered this matter and R&S noted the CWP report and

recommends (9)

*that ICNAF collect and publish data from a proposed Statistical Area 6 and that this area be designated as that part of the Western North Atlantic bounded by a line beginning at a point on the coast of Rhode Island in 71°40' west longitude; thence due south to 39°00' north latitude; thence due east to 42°00' west longitude; thence due south to 35°00' north latitude; thence due west to the coast of North America; thence northwards along the east coast of Hatteras Island, past Oregon Inlet along the coasts of North Carolina, Virginia, Maryland, Delaware, New Jersey, New York, Connecticut, and to the point on Rhode Island at 71°40' west longitude. Further, that the divisions of Statistical Area 6 be established as recommended by CWP, except for the line separating Div. 6B and 6C, which should run along 37°00' north latitude from 70°00' west longitude to 76°00' west longitude; thence due south to shore. And, that the Secretariat should provide a specific description for each division, using any advice necessary.*

(f) Statistical Subdivision of 5Z

The USA proposed a division of 5Z along the 70°00' west longitude line. This division is based on natural division of stocks. The USSR pointed out that there was no actual separation of the fishing banks at this point and it would be very difficult to comply with this proposal. R&S

recommends (10)

*that Division 5Z be divided at 70°00' west longitude into an eastern subdivision 5Ze, and a western subdivision 5Zw and that where possible countries should submit statistics separately for 5Ze and 5Zw.*

3. GEAR AND SELECTIVITY (APP.III)

(a) Selectivity of Different Codend Materials

New data confirmed earlier findings that selection factors for polypropylene codends were closer to those for manila than to the polyamide-polyester group. Intermediate selection factors were reported for polyethylene. The Committee concluded that further research on the relation of polyethylene selectivity to that of other materials would be desirable. The USSR indicated that double Kapron (polyamide) gave mesh

equivalents of 97 mm and single Kapron 92 mm compared to 114 mm double manila. USSR agreed to document this information next year.

The Committee noted the similarity of selection factors between 1965 German experiments with a side trawler and 1966 experiments with a larger stern trawler, indicating that characteristics of the towing vessel have no appreciable effect on selectivity.

(b) Mesh Measurement

(i) Adoption of Standard Gauge for Enforcement

The report of the ICNAF Working Group on Mesh Problems was reviewed. Accounts of experiments in mesh measuring using gauges in which pressure was applied by hand, spring and weight, were presented by the USA and UK. Both series of experiments revealed no significant differences in average mesh sizes between these varieties of gauges used carefully by experienced operators. In both experiments it was noted that the use of a wedge-shaped gauge with attached weight increased the time required for measurement.

The Committee noted that there was considerable range in the size of individual meshes in a codend, and that therefore there was some variation even in the mean size from 50 meshes. The standard error of this mean has been estimated as being from 0.3 to 0.7 mm, depending on the mesh size, material and method of manufacture. The corresponding standard errors for the mean of 20 meshes are 0.5 to 1.0 mm. The number of meshes that should be measured in each codend will depend on what degree of variation is acceptable to the Commission.

(ii) Mesh Equivalents for different gauges and trawl materials with 130 mm manila mesh in Subarea 1

The Committee noted that a single mesh gauge has not yet been prescribed and that data presented at this meeting for a variety of gauges gave similar results. It therefore concluded that mesh size equivalents for different gauges were of doubtful necessity. R&S agreed that equivalents for different trawl materials should conform as closely as possible to those in Region 1 of NEAFC and accordingly

recommends (ii)

*that mesh equivalents for different trawl materials with 130 mm mesh be the same as those in Region 1 of NEAFC, namely 110 mm for seine nets, 120 mm for such part of any trawl net as is made of cotton, hemp, polyamide fibers or polyester fibers, and 130 mm for such part of any trawl net as is made of any other material.*

(c) Topside Chafing Gear

(i) Specifications of Large-Mesh (Polish-Type) Chafer

R&S examined the specifications of the Polish-type chafer and the results of recent investigations by the Federal Republic of Germany and USSR using large-meshed chafers of approximately the same length and width as the codends and

recommends (12)

*that the specifications of the Polish-type chafer be amended to permit the length of the chafer to be the same as the length of the codend.*

(ii) Review of further experiments with Polish-type chafers

Reports of further experiments with the Polish-type chafer were presented and discussed. These experiments, together with 3 studies presented to the ICES Comparative Fishing Committee and recent unpublished Norwegian results, show that the Polish-type chafer has no appreciable effect on selectivity. The Committee agreed that further studies with chafers of the Polish-type having twine size greater than that of the codend would be valuable, in that this modification could increase the strengthening function of the chafer.

(iii) Elimination of Topside Chafers

The Committee was informed that UK experiments on means of eliminating topside chafers were in progress. As this topic is of major importance to the Commission, R&S

recommends (13)

*that experiments on means of eliminating the need to use topside chafers be continued.*

4. ENVIRONMENTAL (APP.IV)

(a) Report on the NORWESTLANT Surveys

Mr Lee announced that most of the material from the NORWESTLANT Surveys was virtually ready for publication and that Mr Corlett of the Lowestoft Laboratory would be the editor of Part 4: Biological Data. Denmark, Germany, Iceland and Norway were to report to the Chairman on the strength of the 1963 year-class so the information could be included in the NORWESTLANT Report. Dr Laevastu described progress with the use of the

NORWESTLANT material for oceanographic forecasting purposes. The Executive Secretary estimated that the cost of publication of Parts 1-4 would be \$10,000.

(b) Publication of ICNAF Environmental Symposium 1964

The Secretariat was congratulated on the publication and distribution of the ICNAF Environmental Symposium volume.

(c) Environmental Aspects of the National Research Reports

Substantially more environmental material was included in this year's reports and indicates an increasing effort in marine science in the ICNAF Area.

(d) Environmental Changes in the ICNAF Area

Twelve research documents were presented in response to last year's request for information about environmental factors that may have affected the growth of cod and for a synthesis of hydrographic and meteorological fluctuations in the ICNAF Area.

The work of the U.S. Fleet Numerical Weather Facility was noted and Mr Flittner described the use of such forecasting in relation to albacore tuna availability in the eastern Pacific.

(e) USA-USSR Proposal for an ICNAF Georges Bank Survey

A revised plan for the Georges Bank Survey was presented, involving 200-250 stations to be occupied every 14 days throughout the year by a total of 4 vessels. It was agreed that the analysis of samples should concentrate initially on the numbers of fish eggs and larvae because of the value of this information for recruitment studies. R&S endorsed the proposal for the US-USSR to carry out joint discussions on plankton sampling trials over the next year.

(f) Dr Kort's Proposal for a Cooperative Study of the Dynamics of the North Atlantic

R&S was of the opinion that the fisheries laboratories of ICNAF members could not spare research vessels to participate in Dr Kort's project. It was also thought that fisheries research vessels were best employed in shelf areas and in fisheries surveys such as that proposed for Georges Bank rather than participate in oceanographic surveys in the deep ocean. R&S accordingly

recommends (14)

*that the Executive Secretary should send these views on Dr Kort's proposal to the FAO Advisory Committee on Marine Resources Research (ACMRR) and to the Scientific Committee on Oceanic Research (SCOR).*

## 5. HERRING AND OTHER PELAGIC SPECIES (APP.V)

### (a) Status of Herring Fisheries and Research

Herring landings in the ICNAF Area increased from 263,000 metric tons in 1965 to 410,000 tons in 1966. The catches and effort of Canada, Poland and the USSR showed substantial gains, but the US catch declined. The 1960 and 1961 year-classes dominated the samples obtained from the fisheries for adult herring of Subarea 5. The 1963 and 1964 year-classes dominated the fisheries for immature herring in Subareas 4 and 5.

The USSR continued their studies of herring egg deposition and presented estimates of the abundance of the spawning population of herring on Georges Bank.

The US continued racial studies on herring, using a variety of biochemical, serological and morphological methods. Blood typing indicated that the herring from Nova Scotia, Georges Bank and Eastern Gulf of Maine were separate sub-populations. Meristic studies showed that herring from coastal Maine-Nova Scotia comprise one complex which is significantly different from the Georges Bank-Cape Cod complex of herring.

### (b) ICES Herring Symposium

The ICES Symposium in 1968 on the Biology of Early Stages and Recruitment Mechanisms of Herring was called to the attention of the Subcommittee.

### (c) Other Pelagic Species

The catches and research on swordfish, tuna, skipjack, marlin, mackerel and sharks were reported by those member countries having active fisheries for these species.

## 6. AGEING TECHNIQUES (APP.VI)

### (a) Cod Otolith Photograph Exchange Program

The Committee expressed its appreciation of Mr Blacker's services in the cod otolith photograph exchange program and planned to review his summary of the exchange at next year's meeting.

(b) Redfish Otolith Photograph Exchange Program

The Committee noted that burning of redfish otoliths may improve age reading for this species. Although scientists agree that redfish is a slowly growing fish, the need for further studies was expressed and R&S

recommends (15)

*that in order to discuss recent progress in the problems of age determination and related biological problems of the redfish stocks of the North Atlantic, a working group of redfish experts be convened and that ICES should be invited to participate.*

(c) Age Validation Studies

R&S encouraged further age validation studies and

recommends (16)

*that experts having made validation studies circulate among member countries photographs of selected otoliths to demonstrate their findings.*

7. PUBLICATIONS

(a) FAO/UNESCO/ICES/ICNAF/IBP Symposium on Marine Food Chains

R&S

recommends (17)

*that ICNAF provide \$8,000 in the fiscal year 1968/69 to support the general costs of documentation and publication of the papers presented at the Symposium which will be held in Aarhus, Jutland, Denmark, from 23-26 July 1968 inclusive.*

(b) ICNAF Map

R&S

recommends (18)

*that the Secretariat make arrangements to have the coloured ICNAF map redrawn and printed.*



(c) Inventory of ICNAF Publications

R&S

recommends (19)

*that the Secretariat develop a scheme for reducing the numbers of early issues reported on the inventory of holdings of Commission publications.*

8. REVIEWS DURING RESEARCH AND STATISTICS COMMITTEE PLENARY SESSIONS

(a) USSR Papers on Redfish

Dr Ridgway reviewed three USSR papers on redfish which were authored by Dr Ju. P. Altukhov and his colleagues. In Res.Doc.67/47, the authors described an antigen complex which was found in mature females but was absent in males and immature females. This difference provides a means of estimating the rate of sexual maturation in female redfish. The taxonomic relation of *Sebastes marinus* and *S. mentella* was the subject of Res.Doc.67/48. A higher level of thermostability of isolated muscles was discovered in *S. mentella* and as this is a species specific character, it offers additional evidence of the taxonomic differences in these species. In Res.Doc.67/52, agar gel electrophoresis was used to study the protein patterns of blood serum. Significant differences were found between *S. marinus* and *S. mentella*, and these differences were assumed to be genetically controlled. Giant redfish showed no biochemical identity with either species, and the authors concluded that the giants were hybrids. The three documents supported the hypothesis that the "*marinus*-type" giant redfish in Greenland and from west of Iceland were sterile hybrids. Following the review, there was a discussion of this and other possible explanations of this occurrence.

(b) FAO Paper on World Fishery Resources

Mr Gulland discussed the FAO Indicative World Plan (IWP) paper (Res.Doc. 67/82). The IWP is concerned with the potential world food production in 1975 and 1985. Fishery resources are included in this study, and a survey of the living resources in the Northwest Atlantic is contemplated. The document prepared by Mr Gulland represents a draft outline of this survey and includes a description of fish stocks and fisheries in the ICNAF Area. The statistics and assessments of a few major species were reviewed, and the information available for estimating potential production was summarized by subarea. Based on information which for some species was rather limited, and including data on numbers of eggs and larvae, Mr Gulland listed the potential catch for 15 species in the ICNAF Area.

In the discussion that followed, suggestions and additions were offered by the Committee, especially with reference to species which are unexploited

or not fully exploited. Contacts with scientists and laboratories were recommended for additional information on topography, hydrography, and primary and secondary production. R&S expressed its interest in the survey and asked that Mr Gulland provide a progress report at next year's meeting.

## 9. MID-YEAR MEETINGS

### (a) CWP on Fishery Statistics in the North Atlantic Area

R&S

recommends (20)

*that the Secretariat and the Chairman of the Subcommittee on Statistics and Sampling be represented at the mid-year meeting of CWP.*

### (b) Assessments Subcommittee

R&S noted the proposed establishment by the Commission of a new Standing Committee on Regulatory Measures to further studies on possible limitation of catch or effort in the Convention Area. If the Committee is established, R&S suggests

- (1) that the Chairman of the Assessments Subcommittee be invited to attend, at Commission expense, meetings of the new Standing Committee which will define the precise terms of reference for work by R&S;
- (2) that, if the new Standing Committee requests information from R&S, a mid-year meeting of the Assessment Subcommittee be convened if the Chairman of R&S and the Chairman of the Assessment Subcommittee consider it necessary, the expenses of the Chairman of the Assessment Subcommittee again to be met by the Commission;
- (3) that, prior to any mid-year meeting of the Assessment Subcommittee, as for (2) above, the Chairman of the Assessment Subcommittee correspond with members regarding preliminary assessments related to the new Standing Committee's activities.

## 10. COORDINATION AND COOPERATION WITH OTHER ORGANIZATIONS

It was agreed that Dr H.A.Cole would serve as the ICNAF observer to ICES and that Mr A.J.Lee would serve in this capacity to SCOR and IOC.

11. ELECTION OF OFFICERS FOR ENSUING YEAR

The following officers were elected to R&S and its subcommittees:

Standing Committee on Research & Statistics - Mr Sv.Aa.Horsted

Subcommittees:

Assessment	- Mr B.B.Parrish
Gear and Selectivity	- Dr A.W.May
Ageing	- Dr J. Messtorff
Statistics and Sampling	- Dr F.D.McCracken
Herring and Other Pelagic Fish	- Dr S.A.Studenetsky
Environmental	- Dr H.W.Graham

Steering and Publications

France, Italy, Portugal, Spain	- Dr R. Monteiro
Iceland, Norway, Romania, USSR	- Dr J. Jónsson
Denmark, Germany, Poland, UK	- Dr H.A.Cole
Canada	- Dr W. Templeman
USA	- Dr H.W.Graham

12. ARRANGEMENTS FOR THE 1968 MEETING OF R&S

It was agreed that the Assessments Subcommittee would begin its meeting on the Thursday before the First R&S Plenary on Monday and that the Subcommittee on Statistics and Sampling would meet on the Saturday before the R&S meeting.

If the ICES/ICNAF Joint Working Party on North Atlantic Salmon decides on a meeting, it should be held on Tuesday and Wednesday prior to the First R&S Plenary.

13. OTHER MATTERS

The Chairman congratulated Mr Horsted on his election to the Chairmanship of R&S and thanked the Subcommittee Chairmen, the Secretariat and staff, the Observers and the R&S Rapporteur for their assistance. Mr Horsted expressed his gratitude for the appointment as Chairman of R&S. He acknowledged the fine efforts of Dr Templeman during the past three years and was supported in this action by the Committee. Mr Parrish called attention to Dr Hart's planned retirement, acknowledged his contribution to R&S, and the Committee expressed its appreciation to Dr Hart. Dr Messtorff thanked the Committee for his election as Chairman of the Ageing Subcommittee.

APPENDIX I - REPORT OF THE SUBCOMMITTEE ON ASSESSMENTS

Chairman: B.B.Parrish; Rapporteur: D.J.Garrod

The Subcommittee met on 25 and 26 May 1967 and at intervals during the week of the Research and Statistics Committee meeting.

1. Review of Latest Statistics of Landings (Nominal Catches) and Fishing Activity in the ICNAF Area

The series of data on landings (nominal catches), landings-per-unit fishing effort and total "fishing activity" summarized in recent years (Redbook 1966, Pt.I, App.I) was extended to include the landings data for 1966 and of the landings-per-unit activity and estimated total "fishing activity" for 1965. These are presented in Tables 1-5 and Fig. 1 and 2 of this report. As pointed out last year, the "fishing activity" estimates provide only a general index of the amount of fishing in the Convention Area, as a guide to the direction in which it is changing; they do not necessarily represent the best estimates of effective fishing effort for use in detailed assessment work.

The principal changes in yields in 1966 and for catch-per-unit effort and fishing activity in 1965 for each subarea were as follows:

Subarea 1

The nominal catches for 1966 include the data for non-member countries and are shown in Table 1. The total nominal catches of cod and redfish from the subarea in 1966 were about the same as in 1965. This was about three-quarters of the highest yield, which was obtained in 1962.

During the period 1962-1964 the decrease in nominal catch was associated with increasing fishing effort and decreasing catch-per-unit activity. Although in 1965 and 1966 the nominal catch remained steady, with a slight improvement in catch-per-unit activity in 1965, for all fisheries combined, the estimates of catch-per-unit effort for the German fishery continued to decrease in both 1965 and 1966. There was a small decrease in the estimated total fishing activity in the subarea in 1965, but it must be noted that there was an increase in the proportion of more powerful stern trawlers in the total fleet in that year.

Subarea 2

The total nominal catches of all species, excluding herring and shellfish, in Subarea 2 for 1966 showed a slight decline from the previous year and is the second highest catch in the history of fishing in the subarea. Nominal

catches of cod were the highest ever recorded. Redfish landings declined substantially from the level of 1964 and 1965.

The estimates of fishing activity in 1965 indicate that the high landings in that year followed a further sharp increase in fishing effort.

### Subarea 3

Subarea 3 landings (nominal catches) data for all species from this sub-area in 1966 were approximately the same as in 1965. Cod catches remained steady at about half a million tons, and haddock landings, though low, were also steady. Redfish landings declined somewhat, thereby reversing the upward trend of 1964-1965 while landings of flounders showed a large increase, continuing the upward trend which began in 1963. Landings of pelagic species were approximately the same as in 1965. Over all, the improvement in flounder landings offset the decrease in redfish, leaving the total landings of all species only slightly down on those of 1965.

The estimated total fishing activity was somewhat higher than in 1965, thereby continuing the recent upward trend.

### Subarea 4

The Subarea 4 landings (nominal catches) data for groundfish in 1966 decreased by about 20,000 tons from the 1965 level, but even so it was still close to the high levels reached in 1963-1965. For the main species fished, the following changes are noted:

- (a) Haddock landings decreased sharply from 1965 but were still above the long-term average. The decline resulted from less dense and stable stocks in Div. 4W.
- (b) Redfish landings increased by some 55 percent, continuing the upward trend begun in 1963. The improvement was primarily the result of increased abundance combined with increased effort in the Gulf of St. Lawrence (Div. 4R, S and T).
- (c) Flounder landings continued to increase as they have done almost every year since 1957.
- (d) Catches of silver hake decreased to one-fifth of the 1965 level. This continued the decline begun in 1963 and appears to be the result of poor recruitment (year-classes 1961-1964 are rated as unsuccessful) and changes in the distribution of fish due to decreased water temperatures (Res.Doc.67/21).
- (e) Herring landings increased by almost 30 percent, mainly as a result of increased purse seine effort by Canadian vessels. Landings have more than doubled since the 1957-1963 period, but the increase does not appear to be related to changes in stock abundance.

The estimated fishing activity in the groundfish fisheries in the subarea in 1965 continued at the same high level reached in 1963.

#### Subarea 5

Nominal catches of groundfish in 1966 dropped substantially from the 1965 level, but herring landings were more than double. The most striking decrease in groundfish landings was for silver hake, which dropped to only half the 1965 level. Haddock landings were also nearly 20% lower than in 1965, but they were still much higher than the average for the years before 1965. The catch-per day of groundfish by US medium trawlers only dropped by about 10 percent, so the change in landings was evidently the result of a reduction in effort from the very high level of 1965, back almost to the level of 1964.

#### General Conclusions

In summary, the most recent fishing activity data indicate that the total fishing activity in the groundfish fisheries in the ICNAF Area in 1965 continued the increasing trend of recent years. However, the decrease in total landings of groundfish in 1966 in both the northern and southern subareas suggests that this trend might not have continued in 1966.

## 2. Revisions of Past Assessments in the Light of Latest Information

### (a) West Greenland Cod

At last year's meeting results were presented of assessments of the effects on the yield of cod of a closure of Store Hellefiske Bank (as proposed to the Commission by the Danish delegation at the 1965 Annual Meeting) and of an increase in mesh size throughout Subarea 1. These showed that long-term gains in average yields should accrue from both of these measures adopted alone or together. The mesh assessments showed that there would be long-term gains in yield for both the regulated (trawl) and unregulated (line) gears for increases in mesh size up to 150 mm. The Commission subsequently decided to increase the mesh size in this subarea to 130 mm (manila), thereby bringing it into conformity with the mesh size regulations for the fisheries in Region 1 of NEAFC.

Further information presented in Res.Doc.67/55 confirms the conclusions of last year's assessments that long-term gains to the trawl and other cod fisheries in Subarea 1 would result from an increase in mesh size to 150 mm. Such a measure would not only increase the total catches, but also lead to a substantial reduction in the proportions of the catch discarded or utilized for industrial purposes.

Information presented for the German trawl fishery in Res.Doc.67/55 suggests that the effective average mesh size in use in the West Greenland trawl fishery in recent years may be rather smaller than that used (100 mm - manila) in the earlier assessments. This indicates that the long-term gains that would follow the introduction and proper enforcement of an effective mesh size of 130 mm, as agreed by the Commission at its last meeting, would be rather greater than those estimated in last year's assessment.

Res.Doc.67/55 also draws attention to the fact that in addition to the increase in yield, an increase in mesh size to 150 mm in the trawl fisheries in this area would produce additional operational benefits aboard freezer trawlers by a reduction in the costs of fish handling, processing, etc. The Subcommittee considers that such potential benefits should, where possible, be taken into account in the evaluation of the results of mesh assessments.

(b) Subarea 2 - Cod

In last year's report, the Subcommittee concluded that, with the recent large increase in cod fishing in Subarea 2 and the northern divisions of Subarea 3, the fishing intensity has probably reached, or may even be beyond, the level giving the maximum sustainable yield per recruit. The results of further assessments of this fishery, as presented in Res.Doc.67/69, confirmed these conclusions and indicated that no loss and perhaps a small gain in average long-term catch and a more substantial gain in catch-per-unit effort would result from a reduction in total fishing intensity of up to 30 percent.

The Subcommittee noted, however, that the annual variations in catch-per-unit effort in this fishery are intrinsically relatively high, owing to the variability of environmental factors in this area, which affect both the distribution and availability of cod and the efficiency of fishing operations. Such factors were probably responsible for a higher catch-per-unit effort of the trawl fisheries in 1965 than in 1964 and 1966.

(c) Northern Gulf of St. Lawrence (Div.4R, S and 3Pn) - Cod

Hitherto, no detailed assessment has been possible on the state of the cod fishery and stock in the northern part of the Gulf of St. Lawrence and off the west and southwest coasts of Newfoundland. In the earlier work of the Fishery Assessment Working Group (Beverton and Hodder; Ann. Proc. 1962), no assessment of this fishery was attempted, although an indication of the effect of increases in mesh size on cod landings in this fishery was obtained from the assessment for the cod fishery in Div.4T and 4V (spring).

Further information on the present state of the cod fishery in this area was presented in Res.Docs.67/68, 67/69, 67/80 and 67/84. These data suggest that, in the period 1962-66, the size and age compositions of the stock, as gauged from research vessel surveys, have decreased and the estimated total mortality rate has increased, compared with the period up to 1961 when the earlier assessments of mesh changes were made. At the same time, the total fishing intensity on this stock also increased. Although it is necessary for detailed assessments to be made of the effects of increases in mesh size in the light of these recent data, the information suggests that long-term gains in average catch to both the trawl and other gear fisheries would result from increases in mesh size possibly to as much as 6 in (150 mm).

(d) Div.4T and 4V (spring) - Cod

New data were presented in Res.Doc.67/106 on recent changes in the abundance and composition of the cod stock exploited in Div.4T and 4V. They indicated that following the increase in fishing intensity in this fishery in the early 1950's the following changes have taken place:

- (1) the catch-per-unit fishing efforts and the abundance of the older age-groups in the stock have decreased;
- (2) following an initial increase between 1950-1956, the mean sizes of the principal age-groups in the exploited stock have declined steadily;
- (3) recruitment to the exploited stock has increased.

The authors concluded that these changes were the direct consequence of fishery induced changes in the abundance and composition of the stock which affect the results of the earlier assessment of changes in mesh size and intensity of fishing on this stock.

The Subcommittee expressed some disagreement with the interpretation of the data presented, but it recognized that changes in growth and recruitment had taken place concurrently with the increase in fishing intensity. It is also known that features of the environment which might influence the rate of growth and recruitment had also changed during this time. However, it recognized the need to extend the previous mesh assessment in the light of the new data.

The Subcommittee also stressed the importance of continued detailed studies of density dependent changes in the exploited fish populations with special reference to growth and recruitment and possibly concurrent environmental changes in this and other stocks in the ICNAF Area where such changes have been observed.

The Subcommittee accordingly



recommends (1)

*that the results of such studies should be reported to future meetings of R&S.*

(e) Subarea 5 Haddock

The review of catch statistics for Subarea 5 has shown that catches of haddock fell in 1966 from the exceptionally high level of 1965, but they still remained much higher than the long-term average.

Earlier assessments based on data collected over a long series of years prior to the recent large increase in landings had indicated that substantial increases in fishing effort, such as those which have occurred during the past two years, could not be expected to give an increase in the long-term average catch of the fishery. The Subcommittee, therefore, considered in detail the implications to the fishery and to the earlier assessment of the very high catches of 155,000 tons in 1965 and 126,000 tons in 1966.

In its 1965 report, the Subcommittee recommended further detailed study of this stock, with special reference to changes in size and age composition, mortality rates and fishing effort. Some of this information has been collected, and was submitted to the Subcommittee in Res.Doc.67/21, 67/22 and 67/107. Further information will, it is hoped, be made available for a more detailed assessment to be carried out in the near future. The Subcommittee was, however, able to identify the principal reasons for the increased catches and the effect that these recent changes in the fishery will have upon future yields.

The contribution of the various fisheries to these catches of haddock on Georges Bank during the past five years were as follows:

	Total Landings (nominal catch) ( '000 tons)				Catch per effort USA	Index of Fishing Activity (Standard Days Fished)			
	USA	USSR	Others	Total		USA	USSR	Others	Total
1962	49	1	9	59	6.3	7.8	0.2	1.8	9.8
1963	44	2	14	60	4.4	10.0	0.5	3.2	13.7
1964	47	5	18	70	5.3	8.8	1.0	3.4	13.2
1965	53	82	20	155	5.6	9.4	14.6	3.6	27.6
1966	53	48	25	126	5.1	9.9	9.5	4.9	24.3

These estimates of fishing activity are based upon US catch-per-unit effort data and are not exact owing to differences in the distribution of the various fishing fleets. Despite this, they do present a fair guide to recent changes and show that, whereas the US fishing effort has remained steady, there has been a very rapid increase in USSR fishing effort, which is perhaps only transitory, judging from its

decrease in 1966. Haddock fishing in this area by other countries, principally Canada, has also increased steadily and represents 20% of the total.

Data on catch composition were presented by the USA and USSR; Canadian data have also been collected and have been passed to the USA for processing. Verbal report indicated no marked differences between the compositions of these and the US catches. The US data from commercial landings showed that in 1965, the 1962 and 1963 year-classes each contributed about 33% of the total catch in numbers. In 1966, the 1963 year-class contributed 75% of the catch in numbers, and the 1962 year-class correspondingly much less, about 15%. The USSR data on the composition of their catches were less comprehensive and taken from research and scouting vessels. While their age compositions for 1965 were approximately the same as for the US, those for 1966 differed substantially, especially with regard to the relative proportions of the 1962 and 1963 year-classes, the former being much less abundant in the US samples than in the USSR ones. The reason for this discrepancy could not be ascertained from the data available but the USSR agreed to increase its sampling of haddock with special reference to the sampling of the commercial catches.

The US data show that the 1963 year-class was certainly of above-average strength. They also indicate that the 1962 year-class was also a strong one, although probably of lesser strength than the 1963 year-class.

Previous assessments of this haddock fishery have been reduced from "steady-state" models based upon population parameters averaged over a number of years. The present situation required a more detailed investigation of the effects of transitional changes of both fishing effort and recruitment upon such a model, and their implications to the fishery.

The estimates of fishing activity suggest that the effective fishing effort in 1965-66 was about double that of earlier years and the estimates of year-class strength indicate that recruitment also doubled with the entry into the fishery of the 1962 and particularly the 1963 year-classes. These variations were incorporated in a conventional model of the fishery which in all other aspects was essentially the same as that used in the earlier assessment. This model showed that an increase in fishing effort and recruitment of this order would double catches in the first year after the first good year-class appeared, followed by a fall to a lower, but nevertheless outstanding catch in the next year. This corresponds closely to the observed changes in the catch from the haddock fishery, which indicates that the observed changes in catches can be explained on the basis of the model used in the earlier assessment.

With regard to the longer term effects of the increased fishing intensity, the application of this model shows clearly that the level of fishing effort in 1965/66 was higher than that required to achieve the highest potential yield from the stock. Therefore, if the high level of fishing effort is maintained and the average level of recruitment returns to its previous level, the average future yields from the fishery will be slightly lower than in the past. This would be, of course, achieved at much higher cost than at the lower level of fishing effort.

Verbal reports on the current trend in fishing activity in this sub-area suggest that total fishing effort may, in fact, decline from its present high level. Since the heavy fishing in 1965 and 1966 has reduced the 1962 and 1963 year-classes to about average abundance, catches would return to about average if the incoming 1964, 1965 and 1966 year-classes were themselves average. It appears that, in fact, they are poor, so that catches are likely to be below average, probably at least until 1969.

If the fishing effort in 1965 and 1966 had remained at the lower, earlier level, the yield from the 1962 and 1963 year-classes during their life-span would have been rather greater, and also this yield would have been spread out over a longer period. The reduction in yield from these year-classes may be up to 20-30% if the effort returns to a low level, but less if heavy fishing continues. The catches in 1965 and 1966 would have been less if the effort had not increased in 1965-6, but the rich year-classes would have been able to contribute strongly to the catches in 1967-69, and hence balance the effects of the later weak year-classes.

The conclusions of the Subcommittee regarding the recent changes in yields in this fishery and the longer term future prospects are, therefore, summarized as follows:

- (1) The large increases in catch in 1965 and 1966 can be accounted for by an increase in fishing effort to approximately twice its previous level together with an increase in recruitment by the strong 1963 and 1962 year-classes.
- (2) If this high level of fishing effort is maintained, the yield from any year-class will be slightly lower than that which would have been obtained had the increase in effort not taken place, and the contribution of any one year-class to the catches will be concentrated in fewer years. The total cost of taking this catch would, of course, be much higher than at the lower level of effort.

- (3) The intensive fishing in 1965 and 1966 has decreased the potential yield from the 1962 and 1963 year-classes, and will increase the year-to-year variation in catches in the 1967-1970 period compared with what it would have been had the increase in fishing not taken place.
- (4) It seems likely there will be a reduction in fishing effort on haddock in the next few years. This and the recruitment of a series of weak year-classes are likely to result in below-average catches in the year 1967-70.

The Subcommittee wishes to draw the Commission's attention to the fact that with more large, highly mobile vessels fishing in the ICNAF Area, there is likely to be an increase in the occurrence of large, temporary increases in fishing intensity on a fish stock subject to large, short-term variations in abundance due to recruitment fluctuations such as has occurred on haddock in Subarea 5. Although somewhat less marked than in Subarea 5, such a situation occurred on haddock in Subarea 4 in 1965.

(f) Subarea 5 - Yellowtail Flounder

Data on the yellowtail flounder fishery in Subarea 5 were presented in Res.Doc.67/28. They showed that the total landings, fishing effort, and catch-per-unit effort in this fishery have increased since the mid 1950's. Also total mortality estimates were larger in 1960-64 than they were in the mid 1940's. The instantaneous natural mortality rate is estimated to lie between 0.1 and 0.2. Although no new assessments of the effect of mesh changes have been made in the light of these more recent data, the observed changes do not conflict with the results of the earlier assessment and the Subcommittee concluded that no revision is necessary at the present time.

3. Bio-Economic Assessments

The Subcommittee reviewed the Report of the Working Group on Joint Biological and Economic Assessment of Conservation Actions appointed at the 1966 Commission Meeting (Comm.Doc.67/19). It endorsed the Working Group's main conclusions concerning the state of the exploited cod and haddock stocks in the ICNAF Area and in Region 1 of the NEAFC area, that with a reduction in the amount of fishing on them, the same or a somewhat higher average annual catch could be achieved and that the reduction of fishing could also be accompanied by an approximately proportional reduction of costs, with consequential economic benefits to the fisheries. The Subcommittee noted the information presented in the OECD study, included in the Working Group Report, on developments in fishing fleets. It also noted that the 1965 ICNAF vessel list showed that the fleets of countries other than those in the OECD study also included a large proportion of recently

constructed vessels. These pointed to the further growth in the potential fishing power capable of being deployed in the North Atlantic and other areas, which are currently less intensively fished. The Subcommittee therefore strongly endorsed the Working Group's view that these projected developments greatly increase the urgency of the need for steps being taken to introduce effective control measures in these North Atlantic fisheries.

In its consideration of the Working Group's conclusions, the Subcommittee stressed the continued importance of the Commission's mesh regulations, controlling the size at which fish enter the fishery. The fishing mortality rate in most of the cod and haddock stocks is such that even if the largest mesh sizes that are likely to be practicable are used in the fisheries in the ICNAF Area, this will not alter the conclusions noted above that moderate decreases in fishing intensity would not result in a decrease in the long-term average catch and might well result in a small increase, with accompanying opportunities for reductions in total costs.

Consideration was given to the biological data required to provide a system of catch quotas for the cod and haddock fisheries in the North Atlantic. For this purpose comprehensive data on the abundance of pre-recruit age-groups are needed to permit the adjustment of quotas following changes in stock abundance due to year-class fluctuations (Res.Doc.67/104). A review of the data currently being collected in national research programs indicated that these data are available for one or more years prior to the age of recruitment for most of the important cod and haddock stocks in the ICNAF Area, particularly some such Subarea 1 cod and Subarea 5 haddock which are particularly susceptible to year-class fluctuations. It was recognized that in the event of a catch quota system being introduced in this area, increased research effort would probably have to be devoted to the collection of such data on the abundance of year-classes during the pre-recruit phase.

#### 4. West Greenland Salmon

Since it had not been possible for the ICES/ICNAF Joint Working Party on North Atlantic Salmon to meet prior to this year's ICNAF Meeting, further consideration of the West Greenland salmon problem was undertaken by the Assessments Subcommittee in the light of new data collected since the last Annual Meeting. For this purpose, an *ad hoc* working group was appointed, which was chaired by Mr K.R.Allen, the current chairman of the Joint Working Party (Rapporteur: Mr B.E.Skud). Its conclusions and recommendations were subsequently approved by the Subcommittee, as reported below.

#### ICES/ICNAF Joint Working Party

The reports of the First and Second Meetings of the Joint Working Party (Res.Docs.67/5 and 67/6) were reviewed and accepted. The Subcommittee accordingly

recommends (2)

*that ICNAF should approve the reports and make the necessary arrangements for their publication in consultation with ICES. The Subcommittee considers that the ICES Cooperative Research Report series is the most suitable for their publication.*

The Subcommittee emphasized the need for continuing collaboration between ICES and ICNAF on salmon problems and pointed out that the Joint Working Party provides the means for this collaboration. It

recommends (3)

*that meetings of the Working Party should be held at regular intervals and that, in view of the resignation of the present chairman, special arrangements should be made for a meeting in the near future to be convened by the ICNAF ex officio member of the Working Party. This meeting should, among other matters, consider the documents and reports of the 1967 Meeting in Boston.*

The Subcommittee also

recommends (21)

*that the ICNAF Secretariat should circulate the research documents presented at this year's Annual Meeting and the relevant part of the report of the Assessments Subcommittee to all members of the Working Party.*

Catch and Effort Statistics

Statistics of salmon catches at West Greenland were presented in Res.Doc. 67/102, and from home waters in Ireland, England and Wales, Scotland, and Canada. Only the Scottish data gave a breakdown of catches into salmon and grilse, although the reports of England, Wales and Ireland gave estimates of the proportion of grilse in the total catches. These statistics are summarized in Table 6. They show that in 1966 the salmon catch at West Greenland increased to over 1,300 tons, which was only slightly less than the 1964 level.

The data for home waters catches show no clear trends during the period since the beginning of the West Greenland fishery.

The Subcommittee welcomed the presentation, for the first time, of data on fishing effort in the home-waters salmon fisheries in Ireland (Res.Doc. 67/43), Scotland (Res.Doc.67/60) and Canada (Res.Doc.67/95). These show an increase in fishing effort in Canada and Scotland since 1960, but a decrease in Ireland. No drastic changes in the catch per unit of effort during this

period (Table 7) were noted, but all areas show signs of a rising trend over the last 5 or 6 years. While it welcomes the improvement which had already occurred in the provision of salmon fishery statistics, the Subcommittee

recommends (4)

*that all countries concerned should be urged to continue their efforts to obtain further improvement in statistical reporting for Atlantic salmon. In particular, more comprehensive data on fishing effort and on the breakdown of catches between grilse and salmon are needed.*

Tagging Data

(a) Recaptures at West Greenland of salmon tagged as smolts in home waters

Data were provided by Ireland (Res.Doc.67/43), Scotland (Res.Docs. 67/58 and 67/61), England and Wales (Res.Doc.67/100), USA (Res.Doc. 67/41) and Canada (Res.Doc.67/95) and are summarized in Table 8. Canadian tag returns (Res.Doc.67/108) showed that the rate of recapture at West Greenland of salmon tagged as smolts in the Gulf of St. Lawrence, which had declined slightly for 1964 smolts, rose for 1965 smolts to a much higher level than in previous years (Table 9). The data from the British Isles show a similar change, although the numbers of recaptures were small. The rise in Greenland catches in 1966 does not seem sufficient to account for the rise in the recovery rate of Canadian tags, and while more efficient tag reporting in Greenland may have contributed to the effect, it seems probable that a larger proportion of fish of Canadian origin moved into the exploited stocks at West Greenland in 1966 than in 1964 and 1965. This situation suggests that it cannot be assumed that salmon, after leaving home waters, always follow the same distribution pattern and that the same proportion of salmon from any country appears in the exploited stock at Greenland from year to year. This shows clearly that it will be necessary to examine data over a long series of years before a complete picture is obtained. The Canadian tagging data also showed that recoveries at West Greenland for salmon tagged as smolts in the Bay of Fundy were substantially lower than for those tagged as smolts in the Gulf of St. Lawrence. There were also differences in returns from natural smolts and from different lots of hatchery-reared smolts.

(b) Tagging at West Greenland

In tagging experiments in Greenland in 1966 (Res.Doc.67/58) 728 salmon were tagged. There were 27 local recaptures, all but 2 being taken in the Godthaab district where they were tagged. These two were taken in the Fiskenaasset area, 50 miles south of the tagging site. One long-distance recapture came from the River Tweed, Scotland, in March 1967.

From the 223 salmon tagged at Greenland in 1965, one long-distance recapture was taken on the south coast of Newfoundland in June 1966.

#### Growth Rate in the Sea

In the first report of the Joint Working Party (Res.Doc.67/5), a preliminary estimate was made of the growth rate of salmon during their migration between West Greenland and Canada. Additional length and weight data (Res. Doc.67/93) confirm the earlier estimate of a mean monthly instantaneous growth rate in weight of 0.04. Therefore, no revision is required of the Working Party's estimate of 70% as the critical exploitation rate in home waters of fish which have been exploited at West Greenland, above which the effect of the West Greenland fishery would result in a decrease in the total salmon catch.

#### Stock Separation

Preliminary studies in Canada (Res.Doc.67/96) and Scotland (Res.Doc.67/99) on the use of parasites and serological studies respectively, to distinguish between stocks show promise. Only limited data have been collected, and it is not yet possible to reach any definite conclusions regarding the origin of salmon taken at West Greenland.

#### Natural Mortality Rate

No additional data on natural mortality rate of salmon at sea have become available, and the Subcommittee agrees with the view of the Working Party that this critical factor in determining the effects of the Greenland fishery will prove difficult to assess, and that even if considerable effort can be concentrated on it, it is likely to be some years before good estimates are available.

#### High Seas Fishing for Salmon

The Subcommittee noted that ICNAF had received notice for a Canadian proposal for the prohibition of salmon fishing on the high seas in the ICNAF Area. The available data on high seas fishing showed that in 1965 and 1966 two vessels, one from Norway and one from the Faroes, fished for salmon on the high seas (Table 6) in the ICNAF Convention Area. Most of these catches were taken not far from shore, but the exact proportion taken outside 12 miles is not known. The Subcommittee noted that part of the Canadian drift net catch is also taken beyond 12 miles from the coast.

Canadian data on the distribution of salmon in the open sea showed that the fish at night were generally caught very close to the surface. At present, however, the distribution of salmon in the open sea, and especially their migration routes and areas of major aggregation are not known, but from the present data it appears possible that at certain times of the year, salmon



may be congregated in fishable concentrations in certain open-sea areas. In order to determine their open sea distribution and migration routes, further studies would be needed.

With regard to the effect of high seas fishing on salmon yields, the Subcommittee concluded that such fishing in the vicinity of West Greenland would have the same effect as that of taking the same weight of fish in the coastal Greenland fishery. Similarly, high seas catches near Canada would tend to have the same effect as catches in Canadian inshore waters. High seas fisheries in other areas further from any coast could take fish on their way to Greenland or during their return, or fish which were remaining far from land, and would not visit the Greenland or other coast before returning to their home waters. The effect of such a fishery on home-water stocks and catches would depend not only its magnitude, but also on which of these classes of fish it was taking and, of course, upon their countries of origin.

#### Research Programs for 1967

Research plans for 1967 include:

- (a) A further joint salmon marking program in the West Greenland area by Scotland and Denmark. A trap net will be used in an effort to obtain fish in better condition for tagging.
- (b) Canada will undertake an exploratory fishing cruise by the *A.T. Cameron* for salmon in the waters between Newfoundland and West Greenland. Drift nets and floating longlines will be used, and fish in suitable condition will be tagged.
- (c) The Danish R/V *Dana* will use drift nets in the area between Iceland and Greenland.
- (d) All countries concerned will continue their smolt tagging programs.
- (e) Scotland and Canada will continue studies of parasites in the attempt to find suitable "biological tags."
- (f) United Kingdom and Danish workers will continue serological studies on race separation.

#### Salmon Tag Rewards

The Canada representatives announced that they were increasing the usual reward from \$1.00 to \$3.00, and raised the question whether some standardization of salmon tag rewards was felt to be desirable. The U.S. reported that it would agree to the \$3.00 payment. The Danish Government pays 30 kroner (\$4.50) for tags recovered in Greenland, and Canada pays \$25.00 for

fish tagged in Greenland and recovered in Canada.

The Subcommittee considers that while there may be some advantage in having standard levels of reward in the eastern and western Atlantic respectively, there seemed to be no need for a standard reward across the Atlantic. It was agreed that the matter should be brought to the attention of ICES at its forthcoming meeting in Hamburg.

#### IBP Salmon Proposal

The Subcommittee took note of a communication from the International Biological Programme (IBP) regarding possible means of increasing the stocks of Atlantic salmon with special reference to the large-scale development of smolt rearing. While the Subcommittee was unable, in the absence of any supporting data, to comment on the accuracy of some of the statements made in this communication, it is well known that the spawning stocks of salmon in some rivers have been substantially reduced or have even disappeared. It agreed that the artificial propagation of smolts could, in some areas, offer means of increasing salmon production. Whether this was an economic proposition would depend on several factors, many of which would vary from area to area.

The Subcommittee, therefore, was pleased to note that studies of various aspects of hatchery smolt production were continuing in Canada, the US and a number of European countries.

#### EIFAC Synoptic Review of Salmon Biology

Mr Gulland described an FAO program for providing synoptic reviews of major commercial species of fish and shellfish. The European Inland Fisheries Advisory Commission (EIFAC) of FAO was sponsoring the preparation of such a review on salmon and had invited ICNAF to nominate experts to participate in the preparation of data. The salmon bibliography being prepared through ICES would be ready in October and would be most useful in preparing the review.

The Subcommittee

#### recommends (22)

*that ICNAF should advise EIFAC to approach directly the North American organizations involved in salmon research, particularly the Atlantic Salmon Commission (US), Quebec Department of Tourism, Fisheries and Game, and the Fisheries Research Board of Canada with a request that they nominate scientists who could contribute to the preparation of the synoptic review.*

5. FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains

Note was taken of and interest expressed in the proposed plans for this symposium, which is due to be held in Denmark in July 1968. It was agreed that much of the subject matter to be dealt with in the symposium was of direct relevance to the Subcommittee's assessment work, especially those aspects of it concerned with density dependent changes in growth, recruitment and mortality.

6. Seal Fisheries in the ICNAF Area

Although no detailed consideration was given by the Subcommittee to any specific problems concerning the seal fisheries in the ICNAF Area, an introductory review of the fishery and the biology and state of the exploited stocks of the harp seals was given by Dr Sergeant of the Fisheries Research Board of Canada's Arctic Biological Station. Arrangements were also made for relevant documents presented to the special meeting of Panel A which took place in Copenhagen in October 1966 to be made available for study by members of the Subcommittee.

7. Data Submissions for Assessments

At last year's meeting of the Subcommittee a review was made of statistics and sampling data submitted by countries for their principal fisheries in the ICNAF Area for publication in the Commission's journals. This revealed substantial gaps in the data submitted for some fisheries and by some countries. The Subcommittee again stresses the importance for assessment work of routine information on nominal catches, fishing effort, discards, length and age compositions of commercial catches and effective mesh sizes in use and, therefore, wishes to draw the attention of ICNAF scientists to the recommendation passed last year (Redbook 1966, Pt. I, Rec. 11) concerning the provision of these data. In particular, it stresses the importance of data being supplied for new fisheries developed by countries on the major ICNAF species.

8. Interaction between Species

In its consideration of the recent changes in the Subarea 5 haddock fishery and stock, attention was drawn to the possible interaction between haddock and silver hake as a factor determining the recent variations in haddock year-class strength. The Subcommittee noted that silver hake are known to be predators of small haddock, but the available information on changes in abundance of silver hake in recent years provided no evidence of this type of interaction being the principal cause of the changes in the haddock stock. It was agreed, however, that research effort should continue to be devoted to the problem of species interaction in this and other areas, in relation to changes in the composition and abundance of exploited stocks.

Table 1. Subarea 1. Landings (=Nominal catches), landings per unit effort and fishing activity, 1957-1966.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Landings (000's tons)										
All Gears	269	320	234	243	345	451	406	350	360	362
Redfish	28	18	33	44	54	60	47	30	19	17
Total	304	345	273	295	414	526	475	409	399	395
(all species) a)										
Otter Trawl	140	173	110	101	171	247	244	250	209	199
Total	169	192	143	147	236	318	306	290	238	209
(all species) a)										
Landings (tons) of Otter Trawlers (all size groups) per day on ground (all groundfish species)	19.6	19.6	16.1	17.7	18.7	22.4	19.7	-	-	-
Landings (tons) of Otter Trawlers per day fished (all groundfish species)	-	-	-	-	-	29.1	25.1	20.3	21.1	-
Estimated total fishing activity for all ground-fish species										
Days on ground	7,614	9,781	8,864	8,286	12,618	14,165	15,519	-	-	-
Days fished						10,928	12,185	14,282	11,281	-
Days on ground	15,500	17,600	18,200	16,200	22,100	23,400	24,100	-	-	-
Days fished						18,100	18,900	20,050	19,481	-

a) excluding Herring, Other Pelagic Species and Shellfish

Table 2. Subarea 2. Landings (=Nominal catches), landings per unit effort and fishing activity, 1957-1966.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Landings (000's tons)										
Cod										
Otter T.	20	29	41	172	246	231	191	197	306	314
Inshore	12	11	19	17	19	25	25	16	26	24
Total	32	40	60	188	265	255	216	213	333	338
Redfish										
Otter T.	-	78	53	83	26	7	6	27	24	14
Haddock										
Otter T.	-	-	-	-	0	-	-	0	0	0
Flounder										
Otter T.	-	-	-	2	1	-	-	2	7	3
Total (all species) a)	32	119	114	280	297	266	224	251	377	365
Landings (tons) per day fished (all groundfish species)										
Otter T. > 1800 GRT	-	32	22	39	37	36	45	40	34	-
Otter T. 901-1800 GRT	16	10	13	25	23	29	29	24	24	-
Otter T. 501-900 GRT	-	39	43	36	29	(46)	(22)	14	21	-
Otter T. 151-500 GRT	-	-	-	-	-	-	-	-	8	-
All Otter T. over 500 GRT	(16)	23	32	30	28	30	31	22	25	-
Estimated fishing activity for all groundfish in days fished										
b)										
1,960 5,247 3,585 9,311 10,575 8,719 7,255 11,018 15,056										

a) excluding Herring, Other Pelagic Species and Shellfish

b) estimates based on reported effort data for all trawlers over 500 GRT. Hours fishing by UK trawlers 1965 converted to days fished using the ratio hours fishing/days fished for trawlers of other countries

Table 3. Subarea 3. Landings (=Nominal catches), landings per unit effort and fishing activity, 1954-1966.

Landings (000's tons)	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Cod	472	429	390	449	294	425	470	461	389	466	581	496	499
Haddock	55	104	84	68	44	35	67	80	35	15	12	9	10
Redfish	37	18	30	58	159	246	99	90	61	69	95	112	79
Halibut	1	1	1	2	2	2	3	2	2	1	2	1	1
Flounders	11	19	18	26	24	25	35	30	27	34	54	81	111
Other													
Groundfish	10	9	9	8	9	19	17	11	8	7	7	17	11
Total													
Groundfish <sup>a)</sup>	586	581	522	611	532	752	691	674	522	592	751	716	711
Herring	8	5	4	8	11	5	6	4	5	6	3	8	23
Others <sup>b)</sup>	16	15	14	8	9	6	7	6	6	7	15	7	8
Herring and Others <sup>b)</sup>	24	20	19	16	20	11	13	10	11	13	18	15	31
Total													
(all species) <sup>c)</sup>	610	602	542	627	552	764	704	684	533	605	769	731	742
Landings (tons) per day fished (all groundfish species) <sup>d)</sup>	17	18	19	19	18	19	18	19	16	18	17	15	-
Estimated fishing activity for groundfish in days fished by trawlers <sup>e)</sup>	34,300	31,900	28,100	32,300	30,400	39,000	38,400	36,000	32,400	33,100	45,200	47,400	-
											(40,200)	44,200	

a) includes Cod, Haddock, Redfish, Halibut, Silver hake, Other Groundfish and Flounders; b) includes Other Fish and Other Pelagic; c) includes all species except Shellfish; d) figures in brackets are estimates for European trawlers only, other figures refer to combined Canadian and European trawl fishery; e) top figure based on catch/day of combined Canadian and European fishery, figure in brackets based on European fishery only. Estimates of fishing activity based on all trawlers except that the days fished by USSR trawlers (150-500 GRT) were estimated in terms of equivalent days by larger (>1800 GRT) USSR trawlers. Hours fishing by UK trawlers for years up to 1963 and by UK and France (St. Pierre) in 1965 were converted to days fished using the ratio hours fishing/days fished for trawlers of other countries.

Table 4. Subarea 4. Landings (=Nominal Catches), landings per unit effort and fishing activity, 1957-1966.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Landings (000's tons)	188	213	214	218	212	219	218	229	225	217
Cod	48	49	53	46	47	44	51	60	85	66
Haddock	55	55	42	50	42	43	59	53	68	106
Redfish	3	3	2	3	2	2	2	2	2	2
Halibut	16	17	20	26	27	25	30	34	48	55
Flounders	-	-	-	-	-	9	123	81	50	10
Silver hake	369	403	395	406	387	412	586	548	565	543
Total a)	91	92	102	105	81	116	111	140	180	236
Herring										
Landings (tons) per day fished (all groundfish species) b)	14	15	14	13	13	12	13	14	13	13
Estimated fishing activity for all groundfish in days fished	26,400	27,100	27,900	31,000	28,800	35,200	45,000	39,100	43,500	

a) include all species except Shellfish and Herring; b) based on catch per day of all otter trawlers over 50 gross tons and all pair trawlers. Catches of Herring and Shellfish are excluded from the estimates of landings per day and fishing activity.

Table 5. Subarea 5. Landings (=Nominal catches), landings per unit effort and fishing activity, 1957-1966.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Landings (000's tons)										
Cod	13	16	16	14	18	26	30	28	42	58
Haddock	55	45	41	46	52	59	60	70	155	127
Redfish	18	16	16	11	14	14	10	8	8	9
Flounders	23	26	25	27	29	38	48	58	57	54
Silver hake	57	48	50	47	42	86	147	220	323	162
Total (a)	310	262	276	221	228	300	391	475	728	608
Herring: inshore	23	81	48	69	27	71	70	28	34	31
offshore	-	-	-	-	68	151	97	131	40	135
Landings (tons) of groundfish per day fished <sup>b)</sup>	-	7.3	7.0	6.5	7.3	8.2	7.9	7.0	6.0	6.0
Catch (tons) of herring per hour fished (offshore) <sup>c)</sup>	-	-	-	-	-	1.2	0.8	1.9	?	?
Estimated fishing activity for groundfish in days fished <sup>b)</sup>	-	36,000	39,000	34,000	31,000	36,000	50,000	68,000	120,000	120,000
Estimated fishing activity for herring (offshore) in hours fished <sup>c)</sup>	-	-	-	-	-	130,000	123,000	67,000	?	?

a) includes all species except Shellfish and Herring; b) estimates based on US trawlers of 50-150 GRT; c) estimates based on USSR middle-sized trawlers. This class of vessel did not operate on Herring in 1965 or 1966.



Table 6. Salmon catches at West Greenland and from the home waters of some countries, 1960-1966, in metric tons round fresh weight.

A. West Greenland Area (data mainly from ICNAF *Statistical Bulletin*)

	<u>Drift Nets</u>		<u>Greenland</u>	<u>Total</u>
	<u>Norway</u>	<u>Faroes</u>	<u>Inshore fishery</u>	
1960	-	-	?	?
1961	-	-	127	127
1962	-	-	244	244
1963	-	-	466	466
1964	-	-	1,539	1,539
1965	+	36	825	861
1966	+	87	1,251	1,338

B. Home Waters (data from national reports)

	<u>Ireland</u> <sup>1</sup>	<u>England and Wales</u> <sup>2</sup>		<u>Scotland</u>			<u>Canada</u> <sup>4</sup>	<u>US</u>
		<u>No.</u>	<u>Approx. Wt</u> <sup>3</sup>	<u>Salmon</u>	<u>Grilse</u>	<u>Total</u>		
1960	514	57,176	229	955	473	1,428	1,635	<2
1961	522	44,578	178	816	374	1,190	1,581	<2
1962	1,180	67,231	269	1,010	721	1,731	1,718	<2
1963	1,130	62,996	252	1,280	410	1,690	1,855	<2
1964	1,188	61,064	264	1,209	695	1,904	2,126	<2
1965	1,112	?	?	1,060	548	1,608	2,182	<2
1966	1,090	73,141	293	1,060	552	1,612	2,311	<2

<sup>1</sup> Grilse seem to be about 70-80% by weight or 80-90% by number in total Irish catches. Commercial catches only.

<sup>2</sup> The reported data indicate that with the exception of the northeast coast, the percentage of grilse in net and fixed engine salmon catches is below 13 or 14 and the percentage in rod catches much lower than this.

<sup>3</sup> Estimated values from the reported data in numbers, using a factor of 250 salmon per ton.

<sup>4</sup> Commercial catches only; angling catches are about 10% additional. Very few grilse are taken in Nova Scotia and New Brunswick but form a significant part of Newfoundland catches.

Table 7. Estimates of salmon catches per unit effort for some home-water fisheries.

	<u>Canada</u> <sup>1</sup>	<u>Ireland</u> <sup>2</sup>		<u>Scotland</u> <sup>3</sup>
	(Drift Nets and Traps)	(Drift Nets)	(Licenses)	(Fixed Engines)
1960	191	325	950	12.8
1961	165	224	1,030	12.3
1962	160	563	2,210	14.8
1963	197	456	1,940	19.9
1964	255	430	1,720	23.2
1965	254	520	1,700	17.8
1966	-	516	1,250	-

<sup>1</sup> Miramichi area. Approximate pooled monthly means for all gears in pounds per unit of gear.

<sup>2</sup> Fish per drift net (engine) and pounds per license.

<sup>3</sup> No. of salmon (not including grilse) per fixed engine (trap nets and other stationary gear).

Table 8. Number of smolts tagged and recovered in Greenland and home waters.

	<u>Year of Tagging</u>	<u>No. Tagged</u>	<u>Greenland Recoveries</u>	<u>Home Waters</u>
Canada	1963	13,182	15	245
	1964	64,933	14	130
	1965	62,829	111	520
Scotland	1963	17,748	10	474
	1964	12,180	6	516
	1965	12,778	6	165
England and	1963	9,485	6	49
Wales	1964	17,129	11	115
	1965	5,974	5	35

Table 9. Relative recoveries of tagged smolts in Greenland and home waters.

Smolt	<u>Year</u>	<u>Tagged</u>	<u>Greenland</u>	<u>%</u>	<u>Grilse</u>	<u>Greenland</u>	<u>2 sea-</u>	<u>Greenland</u>
						<u>Grilse</u>	<u>yr</u>	<u>2 sea-yr</u>
<u>Canada</u> (Gulf of St. Lawrence)								
	1963	12,710	13	.10	196	.07	37	.35
	1964	40,135	14	.03	260	.05	100	.14
	1965	41,980	110	.26	445	.25	-	-
<u>Scotland</u>								
	1963	17,748	10	.06	291	.03	150	.07
	1964	12,180	6	.05	299	.02	217	.03
	1965	12,778	6	.05	165	.04	-	-
<u>England</u> (R. Axe)								
	1963	2,854	1	.03	9	.11	14	.07
	1964	2,920	1	.03	15	.07	34	.03
	1965	5,974	5	.10	35	.14	-	-

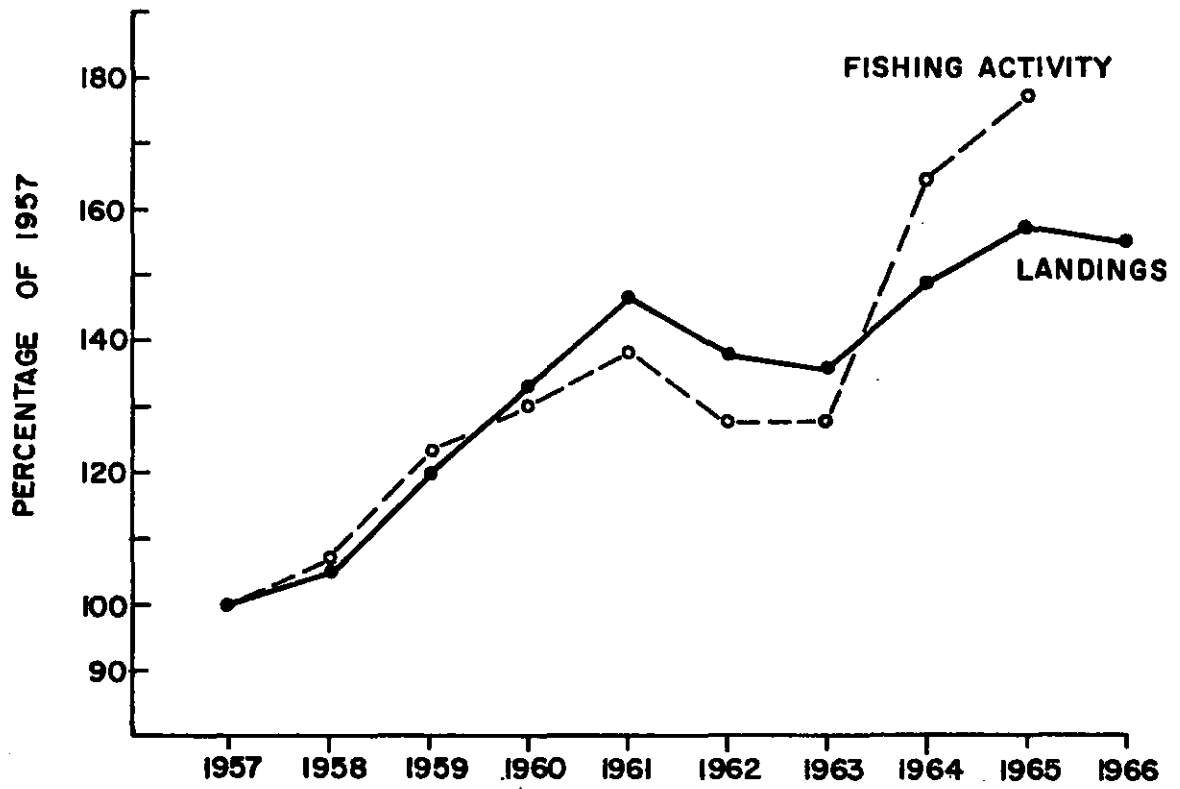


Fig. 1. Groundfish landings and fishing activity relative to 1957 for Subareas 1, 2 and 3 combined.

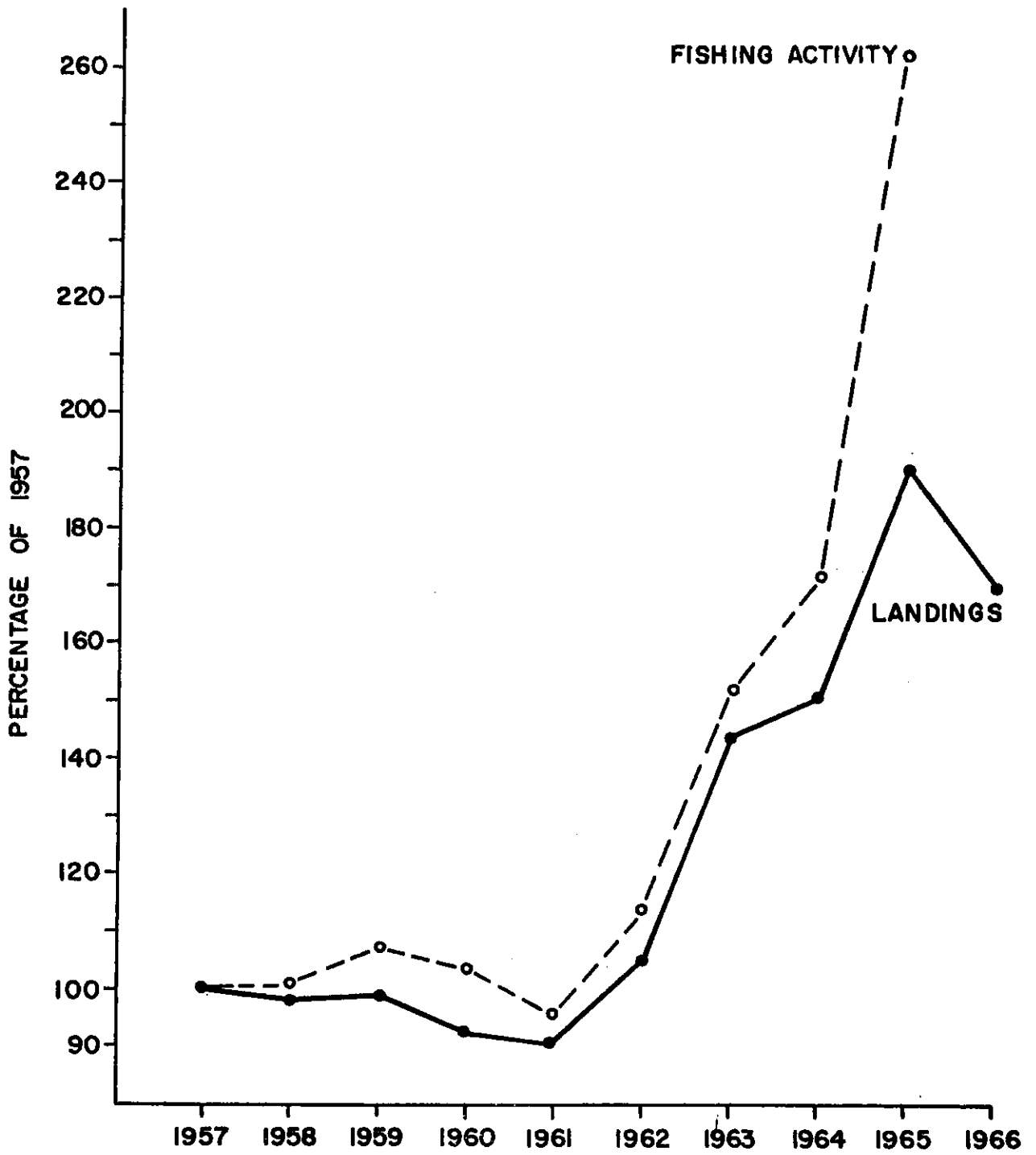


Fig. 2. Groundfish landings and fishing activity relative to 1957 for Subareas 4 and 5 combined.

APPENDIX II - REPORT OF THE STATISTICS AND SAMPLING SUBCOMMITTEE

Chairman: F.D.McCracken; Rapporteur: R.L.Edwards

The Subcommittee met on 27, 29 and 30 May 1967.

1. Sampling Yearbook Vol.9 and 10

A review of Sampling Yearbook Vol.9 and 10 indicated no serious problems although some data submitted had to be reorganized by the Secretariat. No changes in forms or format were recommended. All data should be in the metric units if feasible and submissions should include procedural information or a reference to it.

Opinions that age/length keys for redfish (*Sebastes*) would significantly increase the usefulness of the redfish data were expressed, but the difficulties in ageing were recognized and no firm recommendations made.

The age/length key data for 1961 to 1963 have been transferred to punch cards and verified. The material will be forwarded to Canadian scientists, analyzed and reported upon as soon as possible.

2. Joint ICES/ICNAF Sampling Meeting 1965, Recommendations

Recommendations from the 1965 meeting (Res.Doc.66/13) were discussed along with Res.Doc.66/64. The following decisions were reached:

- (a) Countries fishing Subarea 1 agreed that Total Length, defined in Res. Doc.66/13 as the maximum length measured by bringing the longest lobe of the caudal fin into the mid-line of the fish, should be adopted for that Subarea, except for tunas and salmonids.
- (b) Use of Total Length for species in Subareas 2, 3, 4, and 5 was not adopted since many countries prefer to continue using Fork Length as recommended in 1957. Consideration of herring measuring differences was referred to the Herring Subcommittee.
- (c) Although most countries agreed that lengths should be recorded to the centimeter below, not all countries agreed to making the change. The need for a clear statement of the dimension measured and interval used in each submission to the Secretariat was re-emphasized.
- (d) No changes in grouping length data for the ICNAF Area were recommended. A suggestion that all length data be submitted by centimeter interval and subsequently grouped as desired was considered. The subject was left open for exploration at a future meeting.

3. ICNAF List of Vessels for 1965

The ICNAF vessel list was reviewed for ICNAF purposes and in the light of CWP recommendations (Res.Doc.67/9). The Subcommittee

recommends (5)

*that the list of fishing vessels be examined carefully by workers in all countries to determine which items are useful and to suggest corrections and possible changes in definitions of various parameters.*

It was agreed that the fishing effort summary in the vessel list is useful and that it should continue to be compiled and published.

4. Statistical Reporting

Dr Kowalewski reviewed the current status of statistical reporting (Res. Doc.67/89).

From national reports received to date, it appears that some countries will be able to distinguish between side and stern trawlers in effort statistics for 1966.

Mr Parrish reported that ICES has decided also to distinguish between statistical data for side and stern trawlers.

Ambiguities in the summary of discard data for 1965 (Res.Doc.67/7) were noted. It was agreed that the ICNAF Statistics Form 4 (Revised) will help solve a number of these problems. Any suggestions for further improvement of ICNAF Stat. 4 should be forwarded to the Secretariat. The Subcommittee

recommends (23)

*that the Secretariat prepare the 1966 discard data for detailed evaluation before the next Annual Meeting.*

The Subcommittee

recommends (24)

*that member countries carefully consider the problems of inadequate reporting of statistical information as listed under Item 18 in Res. Doc.67/89 and take any possible corrective action.*

ICNAF Statistical Bulletin Vol.15 (1965) was prepared according to instructions (Redbook, Pt.I, p.56, 1966). Its early production and distribution was commended. Apparent duplications of gear category entries were resolved as being related to motive power and the Subcommittee

recommends (25)

*that, in the future, statistics for steam and internal combustion engines be combined.*

Changes proposed for ICNAF Statistical Bulletin Vol.16 (1966) were considered in other sections of this Report.

5. Report of ICES Statistical Committee

The Chairman of the Statistical Committee of ICES reviewed its activities (Res.Doc.67/2), and reported that ICES is still exploring the preparation of a vessel list. The ICES List of Names of Fish and Shellfish plus Charts of ICES and ICNAF Fishing Areas has been published by ICES and will also be included in the FAO Bulletin of North Atlantic Species Names. ICES will include nominal catches of main species from the ICNAF Area in their Bulletin Statistique. The close cooperation between the Secretariats of ICES and ICNAF was commended.

6. Report of the 5th Meeting of the CWP

The Report of the Fifth Session of the Continuing Working Party on Fishery Statistics in the North Atlantic Area, held at Aberdeen, 10-14 April 1967, (FAO Fisheries Reports 45; ICNAF Res.Doc.67/9) was introduced by Mr Doucet, FAO. He called attention to the various international statistical programs and noted recommendations pertinent to ICNAF statistical problems. These were considered in detail.

(i) Changes to ICNAF Statistical Bulletin:

The Subcommittee, agreeing with the CWP,

recommends (26)

- (a) *including a subtotal of the nominal catches of groundfish species including groundfish (not specified) in Table I, if feasible;*
- (b) *deleting the list of conversion factors in ICNAF Statistical Bulletin. The Subcommittee agreed that ICNAF should continue publishing conversion factors and that the proposed FAO List of Conversion Factors when completed should be reviewed and a decision on the above recommendation made at that time;*
- (c) *adding "major" before "species" in the legend for ICNAF Statistical Bulletin Table 1 and footnote the aggregate "All species";*
- (d) *introducing a space or comma to separate thousands, whichever is the most practical proposal.*

(ii) Inclusion in ICNAF Statistical Bulletin of ICES Landings:

The Subcommittee, agreeing with the CWP,

recommended (27)

*that ICES total landings be included in Table 3 of ICNAF Statistical Bulletin for species of common interest.*

It was noted that ICES is including ICNAF totals in its publications. Consideration should be given eventually to eliminating the FAO Bulletin of Fishery Statistics "Catches in the North Atlantic."

(iii) Standardized abbreviations:

As recommended the CWP Secretary will circulate a standard list of abbreviations and symbols for international use. Adoption by ICNAF can be considered at the 1968 meeting.

(iv) Codification and Automatic Data Processing:

Steps being taken by FAO in this matter were reported. The Subcommittee asked that FAO consider the needs of ICNAF when undertaking a feasibility study.

(v) Factory Trawler Statistics:

The Subcommittee, agreeing with the CWP,

recommended (28)

*that in reporting data not properly allocated by month or fishing area, every effort should be made to footnote such data until the national statistics and collecting systems succeed in conforming with specified standards.*

(vi) Notes for STANA Form IW and Definition of Effort:

In agreement with the CWP, the Subcommittee

recommends (6)

*that countries should be urged to make sure that their national statistics collection systems would produce data required to report on STANA forms all the following three effort details:*



(a) either (i) no. of hours or 1000 hooks fished (line 1)  
or (ii) no. of hauls, drags or sets made (line 2)

(b) no. of days fished (line 3)

(c) no. of days on grounds (line 4)

The items (a), (b) and (c) are not alternatives.

and further recommends (7)

that the proposed changes in the notes for completion of form STANA 1W, Section 4, as drafted by the Secretary of the CWP and presented in Res.Doc.67/101, be made as follows:

In giving data on fishing effort, lines (1), (3), and (4) should all be completed. If data to complete (1) cannot be obtained, line (2) should be completed.

Examples of effort definition included in Res.Doc.67/101 were discussed. The Subcommittee noted that revision of definitions by FAO will be available for consideration at the 1968 ICNAF meeting.

(vii) FAO Bulletin on Interagency North Atlantic Statistics Programs:

The Subcommittee noted that the FAO Bulletin on the subject will be circulated for comments to all countries fishing the North Atlantic and to all international agencies concerned.

(viii) Representation on the CWP:

At its Fifth Session, the CWP considered its terms of reference, the continuing need for such a group, its name, and possible changes in representation on the CWP. The Subcommittee supported the conclusions reached by the CWP to rename the group the Coordinating Working Party on Fishery Statistics in the North Atlantic. The Subcommittee agreed that one country from North America should be included in national representation on the CWP. For immediate action it was agreed that the Federal Republic of Germany should be replaced by Denmark. After the 1968 meeting of the CWP, it is expected that the USA will replace Canada.

The Subcommittee agreed with the CWP in its proposal to meet each year and

recommends (8)

that ICNAF continue to be represented at future meetings of the CWP.

7. Proposed Extension of ICNAF Statistics Collection Southward

In 1966, R&S recognized the need to extend its catch/effort statistics collection southward to the Cape Hatteras region. Advice sought from the CWP was transmitted in Res.Doc.67/44, and a summary of landings compiled by the Secretariat in Res.Doc.67/51. A working party of the Subcommittee considered the proposal. The Subcommittee noted their report and

recommends (9)

- (i) *that ICNAF collect and publish data from a proposed Statistical Area 6;*
- (ii) *that this area be designated as that part of the western North Atlantic bounded by a line beginning at a point on the coast of Rhode Island in 71°40' west longitude; thence due south to 39°00' north latitude; thence due east to 42°00' west longitude; thence due south to 35°00' north latitude; thence due west to the coast of North America; thence northwards along the east coast of Hatteras Island, past Oregon Inlet along the coast of North Carolina, Virginia, Maryland, Delaware, New Jersey, New York, Connecticut, and Rhode Island to the point on Rhode Island at 71°40' west longitude;*
- (iii) *that the divisions of Statistical Area 6 be established as recommended by CWP, except for the line separating Div.6B and 6C, which should run along 37°00' north latitude from 70°00' west longitude to 76°00' west longitude; thence due south to shore (Annex 1);*
- (iv) *that the Secretariat provide a specific description for each subdivision using any advice necessary.*

The USA reported that it would not be able to submit statistics for Chesapeake Bay in time to meet Commission deadlines for the Annual Meeting, but that they would be submitted in time to be included in the published Statistical Bulletin. This arrangement was accepted.

Those species which might be expected in landings from Statistical Area 6 (Res.Doc.67/51) were arranged in species groups according to the ICNAF list of species (Annex 2).

8. Statistical Subdivision of 5Z

The USA proposed a division of 5Z along the 70°00' west longitude line. This division is based on natural separation of stocks. The USSR pointed out that there was no actual separation of the fishing banks at this point and it would be very difficult to comply with this proposal. The Subcommittee

recommends (10)

- (i) that Div.5Z be divided at 70°00' west longitude into an eastern subdivision 5Ze and a western subdivision 5Zw (Annex 1);
- (ii) countries should submit statistics separately for 5Ze and 5Zw where possible.

9. Proposed Regrouping of Species by Categories

The Subcommittee considered the necessity for regrouping and coding of species for ICNAF statistical publications and having considered a proposal,

recommends (29)

*that the idea of a revised ICNAF species grouping be accepted and that the actual grouping and its subsequent adoption be determined after consultation with the CWP and other international groups concerned.*

10. Designation of Hakes (Urophycis)

Information on separation of *Urophycis chuss* and *Urophycis tenuis* contained in Res.Doc.67/76 was reviewed. The Subcommittee

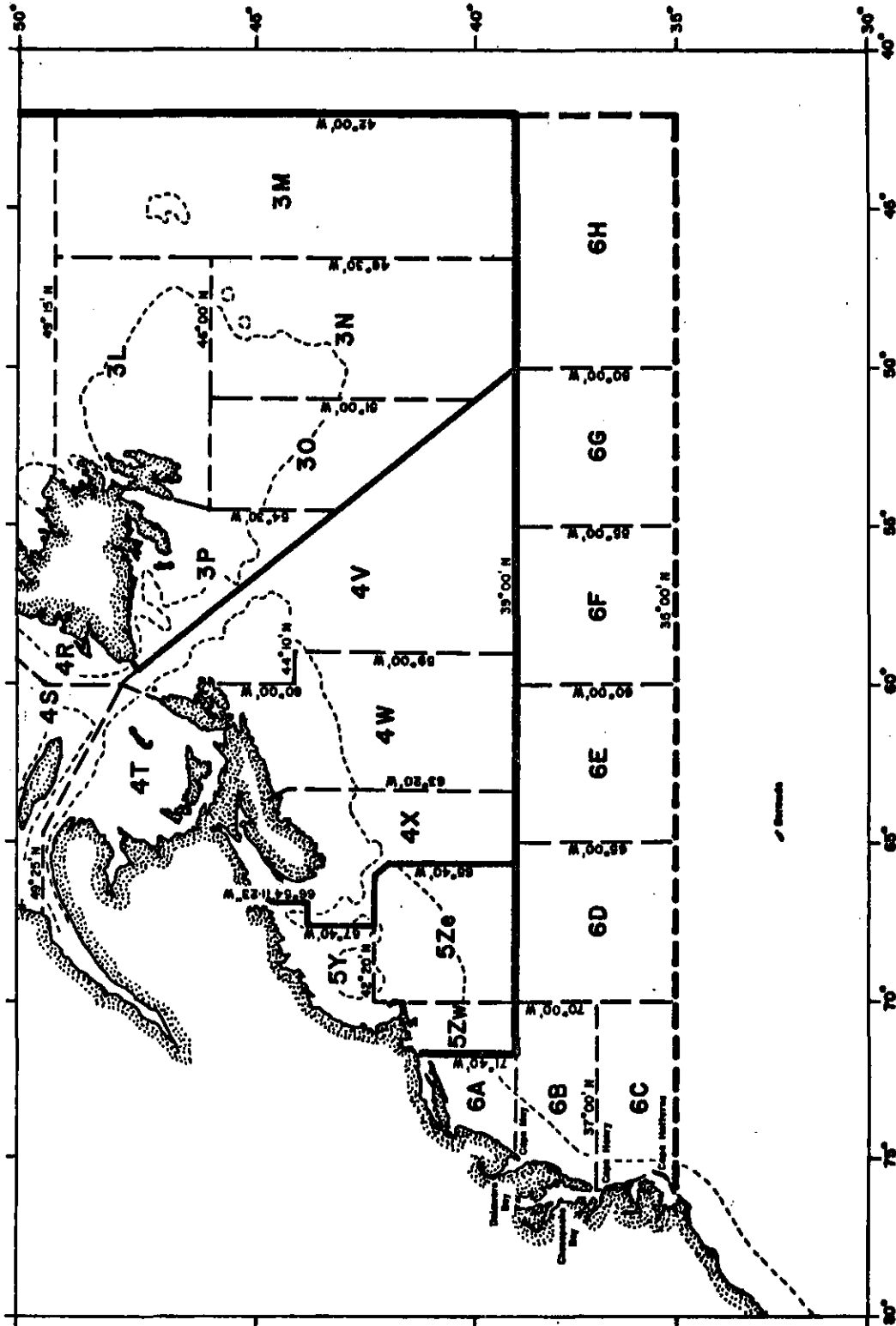
recommends (30)

- (i) that for statistical purposes, any hake (*Urophycis*) reported for Subareas 1, 2 and 3, and Div.4S, R, T, Vn and Vs should be designated as White Hake (*U. tenuis*);
- (ii) that any hake (*Urophycis*) taken by hook and line from Div.4W, 4X, Subarea 5 and the new Statistical Subarea 6 be designated as White Hake (*U. tenuis*);
- (iii) that, for those regions listed in (ii) above, hake (*Urophycis*) caught other than by hook and line may be separated on the basis of size, area, season, depth of capture according to criteria set out in Res.Doc.67/76;
- (iv) that, for permanent and easy reference, Res.Doc.67/76 be published in Redbook 1967, Part III.

11. FAO Data Centre Questionnaire

Mr Gulland, FAO, outlined the need to extend information available on biological statistics relevant to fish stock assessment for FAO Fisheries Data Centre. It is proposed to circulate a questionnaire to national fisheries laboratories to attempt to pick up information not being

published in regular series. The Subcommittee agreed that for appropriate laboratories in eastern Canada and the eastern United States, circulation should be through the ICNAF Secretariat so that ICNAF may be kept informed.



Proposal for extension of ICNAF statistics collection southward and for subdivision of 5Z

Additions to the ICNAF List of Common and Scientific Names  
(including allocation to species groups)

<u>Common Names</u>	<u>Species Grouping</u>	<u>Scientific Names</u>
Amberjacks	Other Fish	<i>Seriola</i> spp.
Cobia	Other Fish	<i>Rachycentron canadum</i> (Linnaeus)
Croaker, Atlantic	Other Fish	<i>Micropogon undulatus</i> (Linnaeus)
Drum, Black	Other Fish	<i>Pogonias cromis</i> (Linnaeus)
Drum, Red	Other Fish	<i>Sciaenops ocellata</i> (Linnaeus)
Grunt	Other Fish	<i>Haemulon</i> spp.
Harvestfish, Northern	Other Fish	<i>Peprilus paru</i> (Linnaeus)
Herring, Thread	Other Fish	<i>Opisthonema oglinum</i> (LeSueur)
Hogchoker	Flounders	<i>Trinectes maculatus</i> (Bloch&Schneider)
Mackerel, King	Other Fish	<i>Seomberomorus cavalla</i> (Cuvier)
Mackerel, Spanish	Other Fish	<i>Seomberomorus maculatus</i> (Mitchill)
Marlin	Pelagic Fish	<i>Makaira</i> spp.
Needlefish, Atlantic	Other Fish	<i>Strongylura marina</i> (Walbaum)
Perch, Sand	Other Fish	<i>Diplectrum formosum</i> (Linnaeus)
Porgy, Red	Other Fish	<i>Pagrus sedecim</i> Ginsberg
Pompano, Common	Other Fish	<i>Trachinotus carolinus</i> (Linnaeus)
Sea Bass, Black	Other Groundfish	<i>Centropristes striatus</i> (Linnaeus)
Shad, American	Other Fish	<i>Alosa sapidissima</i> (Wilson)
Shad, Gizzard	Other Fish	<i>Dorosoma cepedianum</i> (LeSueur)
Shad, Hickory	Other Fish	<i>Alosa mediocris</i> (Mitchill)
Sheephead	Other Fish	<i>Archosargus probatocephalus</i> (Walbaum)
Silverside, Atlantic	Other Fish	<i>Menidia menidia</i> (Linnaeus)
Spot	Other Fish	<i>Leiostomus xanthurus</i> Lacépède
Tuna, Little	Pelagic Fish	<i>Euthyrnus alletteratus</i> (Rafinesque)
Weakfish, Grey	Other Fish	<i>Cynoscion regalis</i> (Bloch & Schneider)
Weakfish, Spotted	Other Fish	<i>Cynoscion nebulosus</i> (Cuvier)
Crab, Blue	Shellfish	<i>Callinectes sapidus</i> Rathbun
Crab, Horseshoe	Shellfish	<i>Limulus polyphemus</i> Linnaeus
Crab, Rock	Shellfish	<i>Cancer irroratus</i> Say
Scallop, Calico	Shellfish	<i>Aequipectin gibbus</i> Linnaeus
Terrapin	Shellfish	<i>Malaclemys</i> spp.
Turtles, Green	Shellfish	<i>Chelonia mydas</i> (Linnaeus)
Turtles, Loggerhead	Shellfish	<i>Caretta</i> spp.
Turtles, Sliders	Shellfish	<i>Pseudemys</i> spp.

APPENDIX III - REPORT OF SUBCOMMITTEE ON GEAR AND SELECTIVITY

Chairman: A.W.May; Rapporteur: F.D.McCracken

The Subcommittee met on Wednesday, 31 May 1967. The Chairman expressed appreciation on behalf of the Subcommittee for the work of Dr Bohl during the past two years and his regret that he was unable to be present this year. The agenda as distributed was adopted by the Subcommittee without change.

1. Report of ICES Comparative Fishing Committee

This report (Res.Doc.67/3) was presented by Mr Zijlstra who was rapporteur of the ICES Comparative Fishing Committee meeting in 1966. The Subcommittee expressed its interest in the progress of the FAO Training Manual in Acoustic Methods in Fisheries Research, which is now nearing completion, and plans for a training course in acoustic methods to be held either in Bergen or Lowestoft in 1968. It was noted that plans for this training course would probably be finalized at the 1967 meeting of ICES.

Discussion of items from the ICES Comparative Fishing Committee's Report dealing with mesh measuring and topside chafers was taken up under the appropriate agenda items of this Subcommittee.

2. Tabular Summaries of Selectivity Data

Tabular summaries of data given in meeting documents from 1962 to 1966 were presented by the Secretariat as Res.Doc.67/75. It was noted that some data arrived too late for inclusion but could later be added to the summaries. Because of the importance of these standardized summaries to the work of the Subcommittee, it

recommends (31)

*that these tabular summaries be published every 5 years in Redbook Part III, beginning with Redbook 1967.*

3. Selectivity of Different Codend Materials

New data of relevance to this topic were presented in Res.Doc.67/31. These confirmed earlier findings that selection factors for polypropylene codends were closer to those for manila than to the polyamide-polyester group. For polyethylene, however, selection factors were intermediate between polyamide-polyester and polypropylene-manila. The Subcommittee concluded that because of past variability in selection factors for polyethylene, the data at hand do not warrant a transfer of polyethylene from the polypropylene-manila group for purposes of mesh size differentials and that further research on the relation of polyethylene selectivity to that of other materials would be desirable.

New data by USSR were presented to the Subcommittee, indicating that double Kapron (polyamide) gave mesh equivalents of 97 mm and single Kapron 92 mm

compared to 114 mm double manila. USSR agreed to document this information for next year.

The Subcommittee noted with great interest the similarity of selection factors between 1965 German experiments with a side trawler and 1966 experiments with a larger stern trawler, indicating that characteristics of the towing vessel have no appreciable effect on selectivity.

#### 4. Length, Weight and Girth Data

Reports on girth-length (Res.Docs.67/31 and 67/78) and length-weight (Res. Doc.67/78) relationships of cod were noted. It was further noted that much cod length-weight data for Subarea 1 had been made available to the Greenland cod working group. The Subcommittee agreed that it would be useful at this time to have a listing of available data, while at the same time recognizing that many gaps in such information did exist, especially for species other than cod. It accordingly

##### recommends (32)

- (i) *that a bibliography of available data on length-weight and girth-length be prepared by the Secretariat and presented as a meeting document at the 1968 Annual Meeting;*
- (ii) *that collection of girth, length and weight data, especially for redfish and other species besides cod, be continued. Results should be presented as meeting documents. Measurements of girth should be as stated in Rec.24, Redbook 1963, Part I.*

It was observed that length-weight data was particularly useful in determining the weight of samples of measured fish where this was not known.

#### 5. Meshing of Redfish

No new information on this subject was available. Recognizing the importance of this matter if mesh sizes were increased, the Subcommittee

##### recommends (33)

*that countries should report in meeting documents on the meshing of redfish, especially data for large-mesh codends, and for marinus and mentella species separately.*

#### 6. Catch Size and Selectivity

The Subcommittee noted that this information was of continuing importance and that data of this sort were particularly needed for redfish. No new information was available.



7. Trawl Materials and Mesh Sizes

It was apparent from national submissions that the revised Trawl Material and Mesh Size Sampling Form was adequate for the purpose. It was noted that some countries measured mesh sizes in inches but converted these to millimeters when reporting. It was, therefore, concluded that equivalents in fifths of inches could be deleted from the form.

The Subcommittee reviewed the summaries of trawl material and mesh size sampling for 1964-65 (Redbook 1966, Part III) and 1966 (Res.Doc.66/23) and agreed that the form of these summaries was adequate. It was noted, however, that some countries were not reporting this information and that other submissions were not being made in sufficient detail. The Subcommittee reaffirmed the importance of this information and

recommends (34)

*that all countries report annually on trawl materials and mesh sizes in use, including data on chafers, and that separate forms be completed for each subarea, species, trawler type, and type of trawl.*

8. Mesh Measurement

(a) Adoption of Standard Gauge for Enforcement

The report of the ICNAF Working Group on Mesh Problems was reviewed and items of relevance to this Subcommittee considered. Comparisons of mesh gauges were presented by the USA (Res.Doc.67/114) and UK (verbally). The USA experiments were conducted with wedge-shaped gauges with pressure applied in three ways: spring loading of 12 lb. (5.4 kg), suspension of dead weight for a total weight of 12 lb. and personal estimation of pressure. The UK experiments were conducted with the ICES gauge, wedge-shaped gauges with and without attached 5 kg weight, and the modified NEAFC gauge (incorporating wedge-shaped and parallel-sided sections).

Both series of experiments revealed no significant differences in average mesh sizes between gauges used carefully by experienced operators. In both experiments it was noted that the use of a wedge-shaped gauge with attached weight increased the time required for measurement.

The Subcommittee noted that there was considerable range in the size of individual meshes in a codend and that there was, therefore, some variation even in the mean size of 50 meshes. The standard error of this mean has been estimated as being from 0.3 to 0.7 mm, depending on the mesh size, material, and method of manufacture. The corresponding standard errors for the mean of 20 meshes are 0.5 to 1.0 mm.

The number of meshes that should be measured in each codend will depend on what degree of variation is acceptable to the Commission.

(b) Mesh Equivalents for Different Gauges and Trawl Materials with 130 mm Manila Mesh in Subarea 1

The Subcommittee noted that a single mesh gauge has not yet been prescribed and that data presented at this meeting for a variety of gauges gave similar results. It therefore concluded that mesh size equivalents for different gauges were of doubtful necessity. The Subcommittee agreed that equivalents for different trawl materials should conform as closely as possible to those in Region 1 of NEAFC and

recommends (11)

*that mesh equivalents for different trawl materials with 130 mm manila mesh be the same as those in Region 1 of NEAFC, namely 110 mm for seine nets, 120 mm for such part of any trawl net as is made of cotton, hemp, polyamide fibers or polyester fibers, and 130 mm for such part of any trawl net as is made of any other material.*

9. Topside Chafing Gear

(a) Specifications of Large-Mesh (Polish-type) Chafer

The Subcommittee examined the specifications of the Polish-type chafer as given in Notification Series No.1 (Comm.Doc.67/12). It noted that investigations by the Federal Republic of Germany (Res.Doc.67/32) and USSR (Res.Doc.67/63), using a topside chafer which differed from the Polish-type chafer only in that it was approximately the same length as the codend, did not impair the codend selectivity. Recognizing that the primary purpose of this chafer is to strengthen the codend, that most escapement of fish occurs in the after part of the codend, and that the specification as presently written permits the chafer to cover only the rear three-fifths of the codend, the Subcommittee

recommends (12)

*that the specifications of the Polish-type chafer be amended to permit the length of the chafer to be the same as the length of the codend.*

(b) Review of further experiments with Polish-type Chafers

Reports of further experiments with the Polish-type chafer (Res.Doc. 67/32 and 67/63) were presented and discussed. These experiments, together with three studies presented to the ICES Comparative Fishing Committee and recent unpublished Norwegian results, show that the Polish-type chafer has no appreciable effect on selectivity.

It was noted that experiments reported by USSR (Res.Doc.67/63) showed no effect on selectivity with twine size of the chafer slightly larger than that of the codend. The Subcommittee agreed that further studies with chafers of the Polish type having twine size greater than codend twine size would be valuable in that this modification could increase the strengthening function of the chafer.

(c) Elimination of Topside Chafers

The Subcommittee was informed that UK experiments on means of eliminating topside chafers were in progress. As this topic is of major importance to the Commission, the Subcommittee

recommends (13)

*that experiments on means of eliminating the need to use topside chafers be continued.*

10. Field Identification of Net Materials

This topic was discussed from the viewpoint of possible future requirements. It was noted that various countries are studying practical means for field identification of various twines.

APPENDIX IV - REPORT OF THE ENVIRONMENTAL SUBCOMMITTEE

Chairman: A.J.Lee

The Environmental Subcommittee met on 30 May.

1. Report on the NORWESTLANT Surveys

The Chairman reported that the bulk of the material was now with the Executive Secretary and virtually ready for publication. The summary chapter had yet to be finished but he hoped that he could do this in the next two months. Mr Bratberg explained that Mr Grim Berge had been ill and so unable to complete the section on Turbidity, but he thought that it could be finished soon. The Chairman said that Mr Corlett of the Lowestoft Laboratory had agreed to act as editor of Part 4: Biological Data. He also drew attention to the fact that some of the national research reports contained indications that the 1963 year-class of cod in Subarea 1 was stronger than had been anticipated from the results of the NORWESTLANT larval surveys. Denmark, Germany, Iceland and Norway undertook to look further into the strength of this year-class and to report to the Chairman by end October 1967, so that a note on its strength could be included in the NORWESTLANT Report. The Executive Secretary reported that the cost of publication of Parts 1-3 had been underestimated as the volume of the material had turned out to be much greater than expected: the estimated cost of publication of Parts 1-4 was now about \$10,000. Dr Laevastu described progress with the use of the NORWESTLANT material for oceanographic forecasting purposes (Res.Doc.67/72).

2. Publication of ICNAF Environmental Symposium 1964

The Executive Secretary reported that Special Publication No.6 had now been issued and that it was selling well. He thought that the cover might have been improved. The Subcommittee congratulated the Secretariat on their so successfully completing such a large piece of publishing work.

3. Environmental Aspects of the National Research Reports

The national research reports (Res.Docs.67/11-67/22) were considered. The volume of environmental material they contain shows a substantial increase over last year and indicates the rapidly increasing effort in marine science in the ICNAF Area.

4. Environmental Changes in the ICNAF Area

At the 1966 meeting of R&S it was recommended that the Chairman of the Environmental Subcommittee take steps to obtain from the appropriate experts (a) further information about the environmental factors that may have affected the growth of cod in Subarea 2; (b) a synthesis of hydrographic and meteorological fluctuations in the ICNAF Area in recent years, and report back to the 1967 meeting of R&S.

In response to (a) in this recommendation, Res.Docs.67/56, 67/77 and 67/99 were presented, and in response to (b), Res.Docs.67/26, 67/27, 67/37, 67/59, 67/64, 67/66, 67/68, 67/70 and 67/73. Much discussion of these papers took place and attention was also paid to the possibility of oceanographic forecasting. The work of the US Fleet Numerical Weather Facility at Monterey, California, in this respect (Res.Docs.67/40 and 67/71) was noted, as was the USSR work described in Res.Doc.67/38, and Dr Flittner of the US Bureau of Commercial Fisheries Laboratory in La Jolla, California, described the use of such forecasting in relation to forecasts of albacore tuna availability in the Eastern Pacific (Res.Doc.67/91).

5. USA-USSR Proposal for an ICNAF Georges Bank Survey

Dr Graham (US) presented the revised plan drawn up by the Working Group on the Georges Bank survey (Res.Doc.67/115). Mr Gulland feared that the survey might not give the specific information about stock and recruitment which the Assessments Subcommittee desired. Dr Graham said that it was hoped that the survey could be run for one year in order to see whether or not continued work on the basis outlined would yield this information. The USA proposed to have discussions with the USSR over the next 12 months about the details of the survey and to carry out joint USA-USSR trials of the sampling gear, etc. Mr Posgay said that it was hoped that a small trial survey could be carried out on Georges Bank in 1968. It was agreed that, in order to see quickly if the survey was yielding results of value to the stock and recruitment studies, the analysis of the samples collected should in the first place concentrate on the numbers of fish eggs and larvae present. It was also agreed that further examination of the samples might be done later by specialists in various subjects (*e.g.* larval feeding) and that it might include a study of the predators of fish larvae. The Subcommittee endorsed the proposal for the USA-USSR to carry out joint discussions on sampling trials over the next year. Mr Posgay presented a paper on tests with zooplankton samplers including the ICES/SCOR/UNESCO Working Party 3 net (Res.Doc.67/110).

6. Other Papers of Interest to the Environmental Subcommittee

Res.Docs.67/25, 67/35 and 67/50 were considered.

7. Dr Kort's Proposal for a Cooperative Study of the Dynamics of the North Atlantic

The Chairman outlined the background to this proposal, summarized the proposal itself (Res.Doc.67/1) and described the actions taken upon it by ACMRR and SCOR (Res.Doc.67/8). The Subcommittee felt that the fisheries laboratories of member countries of ICNAF were so fully engaged with their own research programs that they could not spare research vessels to take part in such a project. It also felt that fisheries research vessels were best employed in the shelf and slope areas, and that it was better that

they should take part in international fisheries surveys like that proposed for Georges Bank and its adjacent areas, rather than participate in oceanographic surveys in the deep ocean. The Subcommittee

recommends (14)

*that these views on Dr Kort's proposal be sent to ACMRR and SCOR by the Executive Secretary.*

8. Other Matters

The Chairman reported on the Southampton Conference on Electronic Engineering in Oceanography (Res.Doc.67/39) and on progress in convening the FAO/ICES/ICNAF/UNESCO/IBP Symposium on Marine Food Chains in Denmark in July 1968.

Dr Graham proposed a vote of thanks to the Chairman for his work over the past three years.

APPENDIX V - REPORT OF SUBCOMMITTEE ON HERRING AND OTHER PELAGIC FISHES

Chairman: S.A.Studenetsky; Rapporteur: G.J.Ridgway

The meeting of the Subcommittee was held on 29 May 1967. The Chairman listed the following meeting documents as being of interest to the Subcommittee: Res.Doc.67/10, 67/11, 67/17, 67/21, 67/22, 67/24, 67/25, 67/29, 67/30, 67/35, 67/51, 67/53, 67/88, 67/98 and 67/111.

A. Herring

1. Status of the Fisheries and Research

Newfoundland herring landings from Subareas 3 and 4 in 1966 increased to 25,500 tons against 12,900 tons in 1965. This was due to an increased purse seine effort to supply herring for industrial purposes. Herring landings in Subarea 4 in 1966 amounted to more than 220,000 tons, an increase of nearly 30% over the 1965 landings. There was no significant herring fishery by Canada in Subarea 5 in 1966. Owing to an increased herring fishery in Subarea 3, Canada intensified its research work. The size and age composition of catches, as well as peculiarities of spawning of herring in that area, were studied. Canada continued to study composition of herring catches taken by trawl and purse seine in Div.4X. Investigations showed that during the early months of 1966, the 1964 year-class predominated (86.7%); the 1963 year-class was second in importance. During the summer time, the 1963 year-class was dominant southward off New Brunswick (65%), and to the southwest off Nova Scotia this year-class made up 45.7%. Fat content variations depending on the size of herring, on the area and period of fishing were studied. Canada conducted studies of different tag types on tagging mortality. In 1966 Canadian studies of the composition of catches taken from the Georges Bank area (5Z) showed that in July-August period the 1961 year-class was dominant (69%); the next in importance were the 1960 (20%), 1962, 1959 and 1963 year-classes.

Poland increased herring catches in the Convention Area in 1966 up to 14,663 tons against 1,447 tons in 1965. In Subarea 4 only 190 tons were caught. The remaining catch was taken from Subarea 5. The size composition of herring catches taken from the Georges Bank area in November-December was studied.

The USSR catches of herring in 1966 increased up to 119,573 tons against 42,295 tons in 1965. Only 1.5% of the total catch was taken from Subarea 4. All the rest was caught in the Georges Bank area. An increase in the USSR catches of herring was due to the growth of fishing effort in 1966. Fishing for herring in May and June was conducted, as usual, on the southern slopes of Georges Bank at 50 to 100 meters depth. In July and August herring was caught on the eastern, northern and southern slopes, and in

September and early October herring was taken from spawning grounds on the northern slopes of Georges Bank. In the first fortnight of October herring dispersed after spawning and herring fishery was terminated.

In 1966 the USSR conducted regular studies of the size and age composition of herring catches taken from the Georges Bank area. Individuals 28-33 cm long were predominant in the catches. In the first half of the year, the mean length of specimens in samples ranged from 25.8 cm to 30.5 cm. In July-August herring was somewhat bigger and the mean length in that period varied from 29.7 cm to 31.9 cm. Two- and three-year-old herring was found only as single individuals and averaged only 1.5% in the catches for the whole period. Four-year-old specimens made up 5.9%; five year-olds (1961 year-class) - 31.6%; six-year-olds (1960 year-class) - 47.3%; and seven- and eight year-olds 11.6% and 2.1% respectively. Thus, in 1966, as in 1963-1965, the 1960 year-class was dominant in catches. This year-class has obviously been reduced considerably due to natural and fishery mortality. Since other year-classes are much poorer than the 1960 year-class, the Soviet scientists presume that in 1967 one can expect some reduction in herring stocks in the Georges Bank area.

In September and in early October of 1966, the USSR continued observations on herring spawning on the northern slopes of Georges Bank to estimate the eggs deposited and to determine the abundance of the spawning population. Research work of this kind was started by the USSR in September 1964. As a result of this work the grounds, period, conditions and square area of spawning were determined precisely and the abundance of the spawning population of herring on Georges Bank was estimated which in 1964 made up 1,180,000 tons; in 1965 - 580,000 tons; and in 1966 150,000 tons.

By means of comparison of the absolute abundance of herring year-classes in different years, the total mortality was determined. According to the research reported in Res.Doc.67/98, total mortality in 1964-1965 was estimated to be 66%; fishery mortality 3%, and natural mortality 63%. In 1965-1966, total mortality was 75%; fishing mortality 20%, and natural mortality 55%.

In samples taken by US research vessels on Georges Bank, the 1961 year-class dominated, followed by the 1960, 1962, 1963, 1959 and 1958 year-classes (Res.Doc.67/24).

The Maine catch of small-size herring by the USA was 27,200 tons, the second lowest catch in 20 years. It was noted that in 1966 herring fishery was mostly carried out in eastern Maine, whereas the bulk of the catches was usually taken from western Maine. The reasons for a decline in herring catches are not clear. There was no indication of an unusually high mortality to account for the lack of fish during the past year. However, environmental conditions for herring were somewhat different from past years. Water temperatures were unusually low in the winter of 1965, continuing the downward trend that has occurred since 1963. During August the



amounts of dissolved gases in the inshore water were the highest for the three-year period that records have been kept, perhaps influencing herring migration toward inshore areas. The content of dissolved gases in water was low in September and October and catches improved measurably. Studies of the influence of dissolved gases on herring behaviour were reported by the US as well as studies on changes in sea water temperature and changes in zooplankton abundance and distribution.

According to the US data, age composition of the Maine sardine landings showed three-year-old fish (the 1963 year-class) most abundant in 1966 (49.3%); the next in importance was two-year-olds of the 1964 year-class (42.4%). One-year-olds of the 1965 year-class made up 5.1%. Herring older than three years constituted 3.2%.

The USA continued racial studies on herring, using a variety of biochemical, serological and morphological methods. Blood typing indicated that adult herring from Nova Scotia, Georges Bank, and eastern Gulf of Maine belong to separate sub-populations. Meristic studies by the USA indicate that herring from coastal Maine and Nova Scotia comprise one complex which is significantly different from the Georges Bank-Cape Cod complex of herring.

The USA conducted a study of fecundity of herring. In the areas studied, it showed that the mean egg number of mature females for age groups IV through VII ranged from 40-65,000; 75-85,000; 90-120,000; and 100-125,000 respectively.

The USA research indicated two periods of spawning on the western coast of the Gulf of Maine, one in early September and another in October. The growth rate of larvae during the winter was well below that observed in previous years.

Table 1. Herring catches by countries for 1964, 1965 and 1966 in metric tons.

Country	1964	1965	1966
Canada	141,021	182,655	242,560
Denmark	18	3	6
Poland	35	1,447	14,663
USSR	113,195	42,295	119,573
USA	27,984	34,454	30,511
Non-members	-	1,982	2,677
Total	302,253	262,836	409,990

Table 2. Herring catches in 1966 by countries and subareas in metric tons.

Subarea	Canada	Denmark	Poland	USSR	USA	non-members	Total
1		6					6
2							
3	8,783						8,783
4	233,730		190	2,227			236,147
5	47		14,473	117,346	30,511	2,677	165,054
Total	242,560	6	14,663	119,573	30,511	2,677	409,990

Herring otoliths were exchanged among Canada, Poland and USA in order to compare ageing techniques as recommended (Rec.20) in the 1966 Redbook. Discrepancies were noted which point to the need for continuation of studies of ageing techniques. It was agreed that the exchanges should continue on an informal basis and that the exchanges should be arranged through the Secretariat. It was also pointed out that the past record of agreement concerning the dominant year-class of herring on Georges Bank indicates that there is general agreement on ageing herring.

Catches per trawling hour taken by vessels of BMRT type which caught the bulk of the USSR landings are as follows (in tons):

	<u>1966</u>	<u>1965</u>
June	2.4	2.0
July	2.6	-
August	2.6	-
September	5.2	10.4
October	5.3	2.5

In October 1966 herring fishery was conducted only during the first fortnight.

Poland submitted data on herring catch per unit of effort for factory ships in 1966 in Div.5Z during May-October. Catch per trawling hour is 4.3 tons.

The US research (Res.Doc.67/29) showed that age composition of herring catches taken in inshore areas in 1960-1966 is mostly represented by I, II and III age groups. The II-group was mainly predominant and only in 1966 the III-group was dominant for the first time in the whole period.

## 2. ICES Herring Symposium

In 1968 ICES plans a "Symposium on the biology of early stages and recruitment mechanisms of herring". The subject matter of the symposium has four major divisions: (1) spawning stock; (2) eggs; (3) larvae, and (4) adolescents.

The symposium's agenda would concentrate on herring of the Northeast Atlantic, but contributions from herring workers in other geographic areas would be included.

B. Other Pelagic Species - Catches and Research

In 1966 Canada increased its swordfish catch in Subarea 3 by 28% against that in 1965. It was due to fishing in a new area 3K, eastward of the Grand Bank. In Subarea 4 swordfish landings were 4,400 tons, lower by 5% than in 1965 and higher by 15% than in the previous year. In 1966 Canada caught in Subarea 5 and southward about 2,000 tons of swordfish, less by 700 tons than in 1965. The main reduction was noted in the area of Cape Hatteras where the effort and catch per unit of effort were considerably lower in 1966. In 1966 Canada continued studies on the size and age composition of catches, as well as on sex and maturity of swordfish. Attempts were made to continue tagging of swordfish.

Canadian catch of tuna in Subarea 4 in 1966 was 200 tons. The catch was taken in inshore waters (bluefin tuna) and on high seas (bluefin tuna and bigeye tuna). Research on tuna undertaken by Canada was limited to studies on the species and size composition of catches. Some number of tuna specimens was tagged in Div.4X and 4W.

The USA also carried out tagging of tuna, skipjack and marlin.

Canadian mackerel landings in 1966 in Subarea 4 made up 11,500 tons, higher by 4% than in 1965. In 1966 Canada carried out a variety of research on mackerel in Nova Scotia and the Gulf of St. Lawrence. The size, age, sex composition and maturity of mackerel were determined. Studies showed that the 1959 year-class was dominant in samples taken from Div.4T. The next in importance are the 1960, 1964, and 1963 year-classes. Tagging of mackerel indicated that they migrated along the coastline northeastward.

According to Polish data three size groups of mackerel were noted in catches; the mean length of specimens were 37 cm, 28 cm and 21 cm.

US landings in ICNAF waters were: for mackerel 2,011 metric tons in 1966 compared to 1,467 in 1965; for swordfish 385 metric tons in 1966 compared to 327 in 1965; for bluefin tuna 871 metric tons in 1966 compared with 1,139 in 1965.

Norway's porbeagle catch decreased to 500 tons in the ICNAF Area due to a decrease in fishing effort.

Canadian catches of various shark species in 1966 in Subarea 4 were 100 tons, *i.e.* twice as big as in 1965.

APPENDIX VI - REPORT OF THE SUBCOMMITTEE ON AGEING TECHNIQUES

Chairman: E. Bratberg; Rapporteur: Sv. Aa. Horsted

The Subcommittee met on 29 May, 1400 hrs. The following documents were referred to: Res.Doc.67/78, 67/87, 67/109, 67/111, 67/113.

1. Cod Otolith Photograph Exchange Program (Res.Doc.67/113)

The Subcommittee noted with appreciation the further progress made in the exchange program. As a report by Mr Blacker summarizing the exchange hitherto undertaken is expected to be available for next year's meeting, no further steps were taken, but the program should be reviewed next year. The Subcommittee expressed its great appreciation of Mr Blacker's services in the exchange program and hopes he will be able to assist in the coming year.

2. Redfish Otolith Photograph Exchange Program (Res.Doc.67/113)

The Subcommittee appreciated that in accordance with last year's recommendation, otolith photographs had been sent to some experts. The Subcommittee also noted that burning of redfish otoliths may improve age reading for this species. Although scientists working on redfish agree that redfish is a slowly growing fish, the need for further studies was expressed and the Subcommittee

recommends (15)

*that in order to discuss recent progress in the problems of age determination and related biological problems of the redfish stocks of the North Atlantic, a working group of redfish experts be convened and that ICES should be invited to participate.*

Dr Arno Meyer kindly agreed to establish the group if possible shortly before the ICNAF meeting 1968. It was thought that this meeting might be held immediately before the meeting of R&S in London, preferably at Lowestoft.

3. Silver Hake Otolith Photograph Exchange (Res.Doc.67/109)

The Subcommittee noted that good progress had been made in the exchange program and that certain problems concerning the age reading of silver hake otoliths seem to have been overcome. The Subcommittee encouraged that further study be made.

4. Validation Studies (Res.Doc.67/78, 67/87)

Good progress had been made concerning otolith age validation in cod from the northeastern Gulf of St. Lawrence and Strait of Belle Isle. The Subcommittee appreciated the reports and encourages further studies. It

recommends (16)

*that experts having made validation studies circulate among member countries photographs of selected otoliths to demonstrate their findings.*

5. Herring Otolith Exchange by Canada, Poland and USA (Res.Doc.67/111)

This item was referred to the Subcommittee on Herring and Other Pelagic Fish.

6. Other Matters

As there were no other matters, the meeting was adjourned at 1540 hrs.

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