INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

STANDING COMMITTEE

ON

RESEARCH AND STATISTICS

PROCEEDINGS AND SELECTED REPORTS

1960

ANNUAL MEETING

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PART I. MEETING REPORTS

1. Report of the Meeting of the Standing Committee on Research and Statistics

Chairman: Dr. Mario Ruivo; Rapporteurs: B.B.Parrish, J.P.Wise

I. CHAIRMAN'S INTRODUCTION

At the 1959 Annual Meeting attention was focused on two tasks of great importance confronting the Research and Statistics Committee. The first is the urgent problem of fishery assessment as a basis for conservation measures; the second the complex question of the effects of the environment on the abundance, distribution and availability of the exploited fish stocks.

The Committee recognized that these tasks could only be fulfilled by close international collaboration, by pooling and jointly evaluating the available scientific data. As a first step in accomplishing the first task, a working group of experts had been formed to examine the present effects of fishing on the exploited stocks and to determine whether, and to what extent, uniform mesh regulations, as a method of management, could be expected to result in improved catches through conservation of the stocks.

To achieve these objectives, the Group had to use all the available data on the statistics of the fisheries, and on the composition of the catches, as well as the basic findings of biological research in the Convention Area. The Statistical Bulletins and the Sampling Yearbooks were of fundamental importance as the main sources of information in suitable form, and their extensive use for this purpose fully confirmed the correctness of the Commission's policy regarding the collection and publication of such data.

The preliminary results of this Working Group's activities during the year provide the first general appreciation of the state of the fisheries in the whole Convention Area, and of the likely effects of one form of conservation measures. They confirm the value of the regulatory measures already adopted and will provide a basis for assessing the potentialities of the fisheries, and for evaluating other possible methods of management.

The results illustrate the importance of direct contact between scientists of different countries. Apart from the immediate benefits of such contact, it plays a significant part in stimulating critical scientific thought, and thus furthers national as well as international scientific progress in these fields. Gaps in present knowledge of matters pertinent to the assessment of the fisheries have been detected, and this is permitting a better formulation of the scientific programme of the Commission.

It has, of course, long been known that natural factors influence greatly the productivity of the fisheries, causing fluctuations in the sizes and composition of catches. The proper understanding, evaluation and prediction of changes in the fisheries, therefore, require a close study of the mechanism of these influences. Work in this field is at present in an elementary stage, and to set in motion the kinds of work needed to elucidate the relations between the stocks and their environment, the Committee has set up an international group of scientists to formulate a plan for appropriate studies in the Convention Area. Such studies would form the basis for eventual advice and assistance to the industry.

Economic factors play a vital role in determining the size, characteristics and distribution of the fishing fleets. Thus understanding of these factors is needed in assessing the condition of the fisheries and for realistic prediction of the effects of regulatory measures. For these reasons it is considered advisable that member countries pursue studies of the economic characteristics of their fisheries.

The importance of direct contacts between scientists has been emphasized above. Such fruitful contacts are made not only at meetings of the Committee and of its Working Groups, but also during symposia on special subjects such as the Redfish Symposium last year in Copenhagen, and the proposed Symposium on fish marking next year - a subject which is of critical importance for fisheries assessment.

It is, however, obvious that all the scientific work of the Commission depends on the availability of sufficient, trained scientists to carry out the plans of study. The number of such men and the physical facilities available to them for their research are the factors which limit the rate of progress in gaining the necessary knowledge about fishery resources. For this reason it has been a most stimulating experience to have the meeting of the Commission this year in the magnificent new laboratory at Bergen, and especially to see the abundant provision for observation of the fish themselves in the experimental aquaria.

Finally, it is most significant that the existence of stocks common to the Northeast and to the Northwest Atlantic, and their exploitation now, and perhaps even more in the future, by vessels ranging the entire North Atlantic, are resulting in closely similar approaches to scientific and management problems on both sides. The collaboration begun in recent years has proved extremely fruitful and will inevitably be more extensive in the future.

II

In order to undertake the program of work in the time available, ad hoc subcommittees and working groups were set up to discuss and report on problems contained in the Committee's program. This report summarizes their discussions and recommendations. Their fuller reports, upon which action will be taken, are attached as appendices. In addition, the Working Group of Scientists on Fishery Assessment in Relation to Regulation Problems, set up at the 1959 Commission meeting, met in Bergen from 19th-21st May and continued its activities during the period of the meeting. The Action Committee met at intervals to assist the Chairman.

The following topics were discussed:

(1) Environmental Studies	(Appendix V)
(2) Statistics and Sampling	(Appendices III, IV, IX, XIII)
(3) Gear Research and Selectivity	(Appendix XII)
(4) Halibut	(Appendix VII)
(5) Sea Scallops	(Appendix I)
(6) Redfish	(Appendix VI)
(7) Marking Symposium	(Appendix II)
(8) Ageing Techniques	(Appendix X)
(9) Publications	(Appendix VIII)

The Second Progress Report of the Fishery Assessment Working Group is attached as Appendix XI.

Plenary sessions of the Committee were held on 23rd, 26th, 27th, 28th, 30th May, 1st and 3rd June, to coordinate the work of the subcommittees and to discuss and approve their reports and recommendations. Recommendations concerning a number of important items were also drawn up by the Committee, and are presented in Section IV under the title General Recommendations.

III

1) Fishery Assessment in Relation to Regulation Problems (Appendix XI)

The second progress report of this Working Group described the work done and conclusions reached since its inception at the Ninth Annual Meeting of the Commission. The report is not a final document and deals only with certain of the tasks given to the Working Group. For this reason the Research and Statistics Committee considered that it was not appropriate to discuss in detail either its findings or its implications at this stage, but only to comment on the way in which the Working Group is dealing with its tasks and to discuss ways and means by which the work may be completed. The report summarized the findings of the Group on the effects of fishing on the stocks in the ICNAF area (mainly cod, haddock and redfish) and gives assessments of the immediate and long-term effects of increase of mesh size at present levels of fishing intensity. To reach this stage of its work, the Group had met at Lowestoft in March and again in Bergen in May 1960; in addition, members of the Group attended the meeting of scientific advisers to Panels 3, 4 and 5 at St. Andrews in December 1959.

The Group had spent considerable time examining the methods of analysis and computation appropriate for mesh assessment work. A method, proposed by Mr.J.A.Gulland, and described in the first progress report (Document No.29), was adopted for most of the assessments. An alternative method, developed by Mr.R.P.Silliman, was also used in some of the assessments, especially for the Subarea 5 fisheries. A comparison of the results, using both methods on the same basic data, showed close agreement. The attention given by the Group to methods of making assessments was most rewarding in terms of the uniformity achieved and the great reduction in the time required for making the large number of computations.

The results of the assessments are given in the report on a species basis within each subarea. No attempt has yet been made by the Group to reach general conclusions for any subarea or for the ICNAF area as a whole, except tentatively for Subarea 5. The assessments refer only to present levels of fishing intensity. In the report it is stressed that, in general, if fishing were to increase, the desirability of mesh regulation would be enhanced, and vice versa. In those fisheries in which both trawls and other, non-regulating, kinds of gear are used, the effects on the fishery as a whole, as well as on the trawl and "other gear" components separately, have been determined. Also, where the trawl fisheries of different countries in an area showed marked differences in the size composition of their catches, assessments have been made separately for each country or group of countries.

The precision with which the assessments could be made for different fisheries varied widely according to the data available, the history of the fisheries and knowledge of the biology of the exploited stock. In some cases, therefore, especially in most of the redfish fisheries, only rough qualitative guides to the direction of the effects of mesh changes are given, while for others, limits have been set to a range of estimated effects. However, a preliminary appraisal of the assessments for the fisheries on the major species at present fishing levels shows that

(a) In most cod fisheries changes in the landings for the total fisheries would be small for mesh sizes up to 5 inches. At larger mesh sizes losses might be experienced, especially by the trawl fisheries.

(b) In most of the haddock fisheries moderate or substantial losses to trawl fisheries would result from increases in mesh size above 5 inches. For increases up to 5 inches, changes for the total fishery would probably be small but predictions are generally more variable than for cod.

(c) In the redfish fisheries for which quantitative assessments were possible, (Gulf of Maine and Nova Scotia banks), long-term losses would be likely to result from an increase of mesh to 4 inches.

(d) In those fisheries pursued both by trawls and by non-regulating gears (e.g. lines, traps), any increase in the trawl mesh size would usually result in long-term gains to the non-regulating gears.

Assessments were also made on the fisheries for other species in Subarea 5, and some consideration was given to the state of the halibut fisheries in the Convention Area.

In the course of its work during the Bergen meeting, the Group reviewed the present gaps in biological and statistical information, and the types of new data necessary for improving the present assessments. These requirements, listed in the second progress report of the Group, were brought to the notice of relevant *ad hoc* subcommittees, set up by the Standing Committee on Research and Statistics at this meeting. They formed the substance of much of these subcommittees' activities, and were the basis of some of their recommendations.

2) Environmental Studies (Appendix V)

The Subcommittee reviewed its tasks in the light of the report of the 1959 subcommittee, the report of the interim meeting in Copenhagen and progress made during the year. Valuable progress had been made within the ICNAF area, both in the plankton and hydrographic fields, where it appeared that more data were available than had been realized, particularly from agencies which do not report directly to the Commission. These data were, however, in urgent need of review for fisheries purposes. Once again no delegation had included a fisheries hydrographer, despite the recommendation made in 1959. This seriously handicapped the work of the Committee.

a) Changes in the abundance and distribution of commercial fish depend not only on the amount of fishing but also on changes in the environment, of which recent signs had been noted, especially in Subarea 1. The Subcommittee therefore endorsed the chief principles set out in the 1959 report and attempted, for economy and precision, to prescribe priorities for a continuing programme of background environmental studies, and ad hoc fisheries environmental studies, covering the following points:

(i) What are the effects of the environment on the survival, growth, distribution and abundance of fish, with particular reference to cod but, where there are relevant data, also to redfish and haddock?

(ii) How can such studies be directed so as to lead to fishery predictions?

(iii) What fundamental studies are needed which are not already in progress?

(iv) What standardization of methods, and what central system of compiling and synthesizing data does the Commission need, and what staff, if any?

(v) How should the Symposium recommended below be planned to further the Commission's investigations?

b) In view of the urgent need for these investigations it was considered essential to bring together fisheries biologists and fisheries hydrographers of the member countries, for planning and assessment tasks, both in the field and in the laboratory. As a preliminary step, it was recommended

(i) that a small working party of these specialists (three fisheries hydrographers and three biologists) be invited to meet during 1960-61, at the Commission's expense (approximate cost, $3,000), to advise on some specific questions, and

(ii) that a Symposium on "the Influence of the Environment on the Distribution and Abundance of the Principal Groundfish in the ICNAF Area" be held by the Commission in 1962 or 1963.

c) In view of the likely value to the Commission, and to fisheries research in general, the Subcommittee also recommended the desirability of funds being made available from appropriate sources for extending the Continuous Plankton Recorder Survey from the Edinburgh Oceanographic Laboratory, and for enabling young scientists from other laboratories to train and work with members of its staff for periods of two or three years.

d) Other recommendations were that:

(i) The World Meteorological Organization should be advised of the Commission's great interest in the effects of climate on hydrography and fisheries and of the Commission's willingness to cooperate in this field;

(ii) A senior European fisheries biologist should be nominated to present the Commission's views at the forthcoming UNESCO Conference on Oceanographic Research (Copenhagen, July 1960).

(iii) The U.S. National Academy of Sciences, Committee on Oceanography should be advised of the Commission's interest in and approval of its programme.

3) Statistics and Sampling (Appendices XIII, III, IV, and IX)

A number of statistics and sampling problems of importance to the Commission were considered by three working groups on (1) standardization of North Atlantic fisheries statistics (Appendix IX), (2) division of stocks and the size of statistical unit areas (Appendix IV), (3) sampling and discards (Appendix III). Their recommendations were as follows:

a) FAO/ICES/ICNAF Statistics Meeting (ESTANA).

That ICNAF use the definitions, classifications, and prescribed forms recommended by ESTANA, and authorize the Biologist-Statistician to attend meetings of the Continuing Working Party (Appendix IX).

No action was taken on the ESTANA proposal to consider economic requirements for statistics, pending a policy decision by the Commission.

b) Size of statistical unit areas.

That (i) until further study of standard unit areas has been made statistics should be collected by unit areas which can be combined into current statistical divisions; (ii) the Secretariat should be continually aware of the smallest statistical areas used by each country and of new information on division of stocks, in order that revision of statistical areas may be considered when warranted. In order to further these considerations, maps describing the distribution of stocks of cod, haddock, redfish, and halibut will be prepared for the next Annual Meeting (Appendix IV).

c) Discards.

That

(i) all countries be encouraged to make wider use of logbook records or skippers' estimates of discards, and supplement this by sending observers to sea on commercial trawlers;

(ii) countries report estimates of total discards by species on forms to be distributed by the Secretariat;

(iii) these reports should be supported by short papers on studies of discards and their survival; and

(iv) special attention be drawn to the need for records of halibut discards (Appendix III).

d) List of Vessels.

That detailed requirements for the next list of all vessels over 50 gross tons fishing in the Convention Area, with information concerning their characteristics, for the year 1962, should be reviewed at the next Annual Meeting (Appendix IX).

e) Fishing Power.

That further studies by Canada and the United States, and wherever possible by other countries, should be made with a view to assessing the total fishing effort expended on each major stock of fish in the Convention Area (Appendix IX).

f) Sampling.

That the sampling programme be expanded, with emphasis on gaps which have been noted by the Working Party on Fishery Assessment (Appendix III).

4) Gear Research and Selectivity (Appendix XII)

The Subcommittee considered a large number of items of Gear Selectivity and Comparative Fishing work, of particular importance to the Commission's scientific programme.

a) New information concerning trawl, trap and hook selection was reviewed. Recent experiments with a multiple-flap type topside chafer and a large-meshed version of the ICNAF chafer showed that neither interfered with escapement. The Group noted that the introduction of synthetic fibres might provide for the eventual elimination of topside chafing gears for trawls.

b) In view of the common interest, and of the need for standardization of gear selectivity work in the ICNAF and ICES areas, it is recommended that the report of the ICES Special Mesh Selection Working Group should be distributed to ICNAF selectivity workers as soon as it becomes available. The group also suggests that the decisions reached at the forthcoming ICES meeting concerning a standard mesh measuring gauge for research purposes, should be considered for acceptance by ICNAF at the 1961 meeting.

c) There is need to have all mesh selection data available in condensed form, and it was agreed that a tabulation of these data for the ICNAF area should be solicited by the Secretariat from member countries.

d) The information from the Fishery Assessment Working Group concerning present gaps in selectivity data were considered, and the Group's proposals for future selectivity work were approved.

5) Halibut (Appendix VII)

Tagging of halibut was reported and discussed, and it was recommended that further experiments must be undertaken. The otolith exchange programme is to be continued and augmented by samples from outside the Convention Area.

A bibliography on halibut has been prepared and it is recommended that it be published in the Red Book.

For the evaluation of possible management of halibut stocks it is urged that more information be collected on length composition and on discards of halibut.

6) Sea Scallops (Appendix I)

Continuing experiments have confirmed the growth rate previously established for scallops and their low natural mortality rate. These, taken together with the recent Canadian work on selectivity, are expected to provide the information necessary for quantitative estimates of benefit to be expected from postponement of capture.

7) Redfish (Appendix VI)

a) The work of the Redfish Symposium was discussed. The results achieved provide a wide review of the present state of redfish research, which will form a useful basis for future work and future management.

Editing of the papers has been completed and they will be published shortly as the third volume of the ICNAF Special Publications series.

b) Considering the need for determining the existence of oceanic redfish populations, it was recommended that a fuller analysis should be made of Danish redfish larval data in relation to hydrographic information for the North Atlantic, and that countries be urged to undertake researches in the oceanic region, using echo-sounders, underwater cameras, fishing devices, and other appropriate techniques in search of unexploited oceanic redfish concentrations, and report the results to the Commission.

8) Marking Symposium (Appendices II and XIV)

a) The importance of this Symposium to the current scientific work of the Commission was stressed, especially with regard to the programme of fishery assessment studies with which the Commission is concerned.

The agenda drawn up in 1959 was revised and a prospectus was prepared. The main purpose of the meeting will be to discuss the techniques of marking, the design of marking experiments and the analysis of their results for the estimation of fishing mortality, rates of mixing between stocks, and fish growth rates.

It was decided that invited contributions from workers outside the Convention Area should be included in the programme.

The Symposium will be held in conjunction with the 1961 Annual Meeting, and will be chaired by its convenor, Mr. Beverton, but separate rapporteurs will operate for each major section of the programme.

b) In preparation for the discussions on marking techniques at the Symposium, some participants at the Bergen meeting took part in an experimental tagging trip aboard "G.O.Sars".

9) Ageing Techniques (Appendix X)

The results of the cod otolith exchange programme and of the questionnaire concerning age reading techniques showed that there are still some important disagreements between the methods and readings of different workers. In view of the fundamental importance of age data in the Commission's scientific work, it is recommended that a Working Party on Ageing Techniques should be set up to resolve these disagreements and difficulties, and to decide on a uniform set of terms and symbols.

Dir. Rollefsen (Norway) was appointed Convenor and Mr. A. Jensen (U.S.A.) should be asked to prepare a set of terms, definitions and symbols for consideration by the Working Party. It is proposed that the Group should meet in Bergen in autumn 1961, if the preparatory work is completed in time.

The full programme for the Working Party will be drawn up at the next Annual Meeting.

10) Publications (Appendix VIII)

a) The publication of the annotated list of fishery research papers on work undertaken in the ICNAF area was discussed, and it was recommended that it should be republished in the Red Book, more or less in its present form.

b) The Subcommittee took note with approval of the advanced stage reached in preparing the reports and papers of the Redfish Symposium for publication. It took note also of the information furnished by FAO of the plans to publish the reports and papers of the joint ICES/ICNAF/FAO meeting in Lisbon, 1957, in the coming year.

c) The advisability of publishing a new ICNAF journal or bulletin was discussed on the basis of the opinions expressed by member countries. Opinions were divided and the Subcommittee agreed that it was not opportune to proceed with this project at this time; the question can be re-opened for consideration at a later date.

d) The Subcommittee recommended that the current list of vessels fishing in the ICNAF area be published; and that the halibut bibliography be published in the Red Book.

IV. GENERAL RECOMMENDATIONS

1. In order to ensure preparations as complete as possible for the meetings of the separate Subcommittees and Working Groups under the Standing Committee on Research and Statistics, it is recommended:

that for those ad hoc groups whose work can be expected to continue from one Annual Meeting to another, the Chairman of the Standing Committee on Research and Statistics should, in the interval between each Annual Meeting and a date six months in advance of the following Annual Meeting, appoint the Chairmen of these Subcommittees and Groups in order that they may make the necessary preparations for the meeting. Through the Secretariat, the member countries from which the Chairmen are selected should be informed of the appointments and requested to include those persons in their delegations; in case the country concerned does not expect to be in a position to include the nominated Chairman in its delegation for the Annual Meeting, it should so inform the Secretariat at an early date in order that a new appointment can be made.

2. In order to ensure a greater flexibility in the reporting system during Annual Meetings, it is recommended that Groups of Panel Advisers should provide the Chairman of the Standing Committee on Research and Statistics with copies of their meeting reports, as soon as they have been prepared, apart from copies to be presented to the Panel. This would make it possible for the Research and Statistics Committee to consider, at an early date during the Annual Meeting, various scientific problems arising from their meetings.

3. In order to promote better organization and smoother running of the work of the Research and Statistics Committee, it recommends that the members of the Action Committee should be appointed at the end of each Annual Meeting, and should remain in office until the end of the following one. The Action Committee members should meet with the Chairman immediately before the commencement of each Annual Meeting to draw up the timetable of the work of ad hoc committees and Working Groups. It is recommended also that the Action Committee should itself take the responsibilities previously assigned to the Publications Subcommittee, consider priorities in the research program, and bring to the notice of the Research and Statistics Committee the relevant items contained in the reports of the Commission's observers attending the meetings of other international organizations.

4. In the event of a member of the Action Committee being unable to attend the meeting of the Commission, a substitute will be nominated by the country or group of countries whom he represents.

5. Experts in many scientific disciplines are required for the planning and execution of, and appraisal of the results from, the programs of scientific research required for fulfillment of the aims of the Commission. The Committee considers it of great importance for such experts to participate actively in its meetings.

It therefore recommends to the Commission that member countries be urged to include in their delegations to the meetings of the Commission, as many as possible of the experts who are responsible for the various items of its work.

6. The attention of the Commission is drawn to the growing importance of quantitative fishery assessment work in the ICNAF area as the basis for its conservation aims. This work is fundamentally based on the techniques of population dynamics studies. It recommends to the Commission that member countries be urged to make

provision for the recruitment and training of fishery scientists in this important field. It also recommends that consideration should be given at the next Annual Meeting to ways in which the Commission can assist member countries in fulfilling this need.

7. During the Bergen meeting, the Standing Committee on Research and Statistics considered and approved the proposals of the Working Group on Fishery Assessment on the steps which need taking for completing the present stage of its work. For fulfilling the tasks assigned to it, the Committee therefore strongly recommends that funds be made available for the present group of scientists to continue its activities in the coming year, and for

a) The convenor of the Group, Mr. Beverton, to attend the meeting of Scientific Advisers to Panels 4 and 5 at Woods Hole in December 1960.

b) The Group to meet for two weeks at Lowestoft in February 1961.

It is further recommended that a final report of the Group's work should be prepared and circulated at least two months in advance of the next Annual Meeting.

8. The attention of the Commission is drawn to the UNESCO "Intergovernmental Conference on Oceanographic Research", to be held in Copenhagen in July 1960, the results of which will be of importance to the fishery research programmes of this and other Commissions, and to their member countries. It is recommended that the Commission advise member countries of the desirability of including fishery experts in their delegations to the Conference.

9. In view of the common scientific interests of ICES and ICNAF, and the need for close liaison and collaboration in the scientific work of the two organizations, the Research and Statistics Committee recommends that the Secretariat approach ICES, requesting each year 20 copies of the reports of its scientific committees, together with one complete set of its meeting documents. In return, the Secretariat will furnish ICES with 20 copies of the Red Book, together with a complete set of its meeting documents.

V. POSTERS

It was recommended that Dir. Rollefsen should continues his preparation of a poster designed to illustrate the ways in which mesh regulation improves fish landings.

VI. SPECIAL MEETINGS

Following the practice of recent years, participants were given the opportunity to hear special talks on subjects of general scientific interest. Dir. G. Rollefsen, Director of the Norwegian Institute of Marine Research in Bergen, outlined the development of its new laboratory and aquarium, and conducted participants over the impressive new buildings. Dr. Grim Berge lectured on methods of measuring primary production in the sea, giving examples of Norwegian work on this subject.

VII

a) The Committee wishes once more to express its appreciation of the great assistance provided by the Food and Agriculture Organization of the United Nations in the scientific work of the Commission. In particular, it appreciates warmly the services of Mr.S.J.Holt in the work of the Working Group for Fishery Assessment during the year, in attending the meeting of the Scientific Advisers to Panels 3, 4 and 5 at St. Andrews in December 1959, and the meetings of the Working Group at Lowestoft in March and at Bergen in June.

b) The meeting of the Continuing Working Group on Fishery Statistics for the North Atlantic, set up at the joint FAO/ICNAF/ICES conference in Edinburgh in September 1959 (ESTANA) provided a valuable opportunity for members of the Committee to consult with the Group on its work.

VIII

a) It was proposed that the next meeting of the Committee should be held in Woods Hole in the week prior to the Commission's meeting in Washington in 1961.

b) The following members were nominated to the Action Committee:

Dr.J.L.McHugh
Dr.W.R.Martin
Dr.J.J.Marty
Dr.C.E.Lucas
Dr. J. Ancellin

c) Dr. Mario Ruivo was re-elected Chairman by acclamation.

d) The meeting adjourned at 4:00 p.m.

APPENDIX I

Report of Sea Scallop Subcommittee

Participants: Graham (Chairman), Ancellin, Cole, Dickie, Martin.

The committee considered Canadian Document No.24 "Selection of Georges Bank Scallop by Canadian Draggers" by Neil Bourne and U.S. Document No.30 "United States Sea Scallop Research during 1959 in Subdivision 5Z" by J.A.Posgay.

Landings from Georges Bank in 1959 were 23 million pounds, a record high. Of this total the U.S. landed 18.7 million pounds and Canada 4.3 million pounds. The U.S. landings were up 25% and the Canadian 64% over 1958. Fishing was concentrated on three grounds of limited area. Length frequency samples and age compositions showed over 60% of the landings (three quarters by numbers) was composed of a newly recruited year class. The catch per tow was unusually high and resulted in such quantities of scallops on deck that the rate of shucking of the shellfish was the limiting factor in the production of the vessel rather than the catch per tow.

Growth rate studies of the 1959 population showed as rapid a rate as in previous years, with little difference on the three principal fishing areas.

Studies of ratios of dead (clapper) to live shells confirm previous estimates of low natural mortality. U.S. investigations of fishing mortality by various techniques are progressing. Growth and mortality rates all support the previous conclusion that postponement of capture would result in an increase in yield of a year-class.

Canada and U.S. both conducted further experiments on gear selectivity. The Canadian experiments compared selectivity of a 4-inch ring size against the standard 3-inch ring size on a commercial dragger. The results showed that the larger gear caught few unmarketable scallops and less trash; appeared to be more efficient in catching commercial-size scallops; was slightly less expensive; was fully as durable as the present gear and showed no distortion of the rings. The captain of the commercial vessel considered the large ring gear so superior that he continued to use it after conclusion of the experiment.

It is anticipated that conclusion of the experiments now in progress by the U.S. will provide the information necessary for quantitative estimates of benefit to be expected by postponement of capture.

APPENDIX II

Report of Working Group on Marking Symposium

Present were: J. Gulland (Chairman), McCracken, Beverton, Holt, Bertelsen, Hansen, Bratberg, Marcotte, Chrzan, Soltan, Horsted, Fridriksson, Cadima, Cannone, Wise, Jónsson, Templeman (Rapporteur).

The ICNAF Marking Symposium for 1961 was considered. It was reaffirmed that purely descriptive papers dealing with fish migrations would not be accepted, but that this should not preclude the acceptance of related papers on methodology and methods of interpretation.

The agenda for the tagging meeting was rearranged, as in the prospectus which follows. The main items are:

1. Liberation techniques. Rapporteur: E. Bertelsen
2. Recovery of tags. Rapporteur: F. D. McCracken
3. Design and analysis of marking experiments. Rapporteur: J. A. Gulland

It was decided that people working outside the ICNAF Area should be invited.

It was agreed that (a) some basic papers should be produced by special invitation, and (b) the aims of the symposium must be carefully defined so that contributions would be suited to the aims and subjects of the symposium.

At least two months before the meeting a 500-word abstract should be sent to the Secretariat, who should circulate this abstract well in advance of the meeting. If possible, papers should be prepared in time to be duplicated by the Secretariat.

The meetings of the symposium should be held in a single group, under the symposium chairman (Mr. Beverton), but with rapporteurs for each section.

The preliminary approaches to solicit titles and authors for symposium papers should be made by the ICNAF Secretariat to the various fisheries laboratories, etc. of the ICNAF countries. Subsequent correspondence should be carried on mainly by the Chairman of the symposium assisted by the rapporteurs above and by such persons as he may designate.

An Action Committee composed of the Chairman, Dr. McCracken, Mr. Beverton and Dr. Templeman was asked to prepare a prospectus for the symposium. This prospectus is appended.

The meeting reaffirms the previous decisions that the papers and reports of the symposium should be published in the ICNAF Special Publications series, and that the meeting should last four days. It was felt that it should precede the ICNAF Annual Meeting, but the precise date was left open pending further consideration by the whole Research and Statistics Committee.

The meeting adjourned at 2:30 p.m.

Prospectus for
North Atlantic Fish Marking Symposium

to be convened by the
International Commission for the Northwest Atlantic Fisheries

The main purpose of this symposium will be to discuss the techniques of marking, the design of marking experiments and the analysis of their results for the estimation of fishing mortality, rates of mixing between stocks, and fish growth rates. Particular attention will be paid to studies of North Atlantic marine species, especially cod, haddock and redfish. Contributions referring to experience with other marine species in the area or elsewhere, and to freshwater marking, which describe methodological aspects of marking, will, however, be welcomed.

Comparative experimental studies with different types of tags and of various catching and handling procedures will be discussed, as well as accounts of analytical methods. The following topics are listed as a guide to contributors; it is hoped that the proceedings of the symposium will follow a similar pattern.

1. Liberation techniques.

Methods of catching and handling fish for tagging (with the objective of minimizing and perhaps estimating the mortality due to tagging); the efficiency of various types of tags and marks; methods and position of attachment of tags to fish.

2. Recovery of tags. (Under this heading only material additional to that previously compiled by ICNAF should be submitted.)

Ways of improving the standard of the reporting of recaptures by the commercial fishery (e.g. publicity, rewards etc.). Studies to measure the effectiveness of the recovery procedures.

3. The design and analysis of marking experiments.

The use of marking experiments (including "biological marks") to measure mortalities, rates of mixing between stocks, and growth. All aspects of the design and analysis of marking experiments for these purposes, including the requirements and use of auxiliary information such as fishing effort data. The integration of tagging experiments with other methods of estimating these population characteristics, such as with the analysis of age-composition data for estimating mortalities and growth, and with "racial" studies for measuring rates of mixing.

Contributions should be in English and should not exceed about 5000 words. An abstract not exceeding 500 words should be sent to the Executive Secretary of ICNAF by 1st April 1961.

It is expected that the contributed papers will be edited and published in the ICNAF Special Publications series, together with a report of the symposium.

APPENDIX III

Report of Working Group on Sampling and Discards

Participants: Jónsson (Chairman), Ancellin, Cadima, Cole, Dickie (Rapporteur), Fridriksson, Graham, Gulland, Horsted, Keir, Marcotte, MacKenzie, McCracken, Wise, Martin, Hodder.

The group met at 3:30 p.m., 24th May, 1960.

The Working Group considered Document No.28 reporting progress in compiling and publishing sampling data. It noted with satisfaction the publication of Volume 3 of the Sampling Yearbook, and commended the progress made by the Secretariat in simplifying the arrangement of presentation of the data toward conformity with the order of presentation of data in the Statistical Bulletin.

The amount of sampling carried out in the Convention Area and reported to ICNAF is not yet sufficient to meet the needs of the Commission in its assessment of the fisheries. The Group strongly recommends that programs of sampling be initiated or expanded to fill gaps in existing coverage, such as those listed by the report of the Working Party on Fishery Assessment.

The Group considered Documents Nos. 8, 21 and partly 26, dealing with discards. While recognizing the difficulty of collection of such data, it underlined their importance for determining total effects of fishing on stocks. The Group concluded that every effort should be made to compile existing information, perhaps unreported because judged by observing agencies to be insufficient to give complete coverage by itself; to extend coverage by making wider use of log-books or skippers' estimates; and to supplement this information by observers at sea.

It recommends that the Secretariat distribute standard forms on which countries be urged to report estimates of total discards, broken down by species where possible. These reports should be accompanied by figures showing the observed proportion of the total catch from which the estimates were calculated. In addition, countries should be invited to prepare and submit short papers on individual experiments or observations on discards and on their survival, which may be added to similar reports from other agencies.

The Committee further recommends that in all cases countries attempt to collect information on discards of commercially important species other than those being marketed by the observed vessels. It is particularly important that discards of halibut be reported separately from gross discards by vessels fishing for other species.

The meeting adjourned at 5:15 p.m.

APPENDIX IV

Report of Working Group on Division of Stocks and Smallest Statistical Units

Participants: Templeman (Chairman), Wise, Gulland, McCracken, Cadima, Ancellin, Hansen, Marcotte, Marty, Bogdanov, Pokrovsky, Studenetsky, Keir and Martin (Rapporteurs).

Mr. Gulland, for the Assessment Group, presented a number of questions and subjects on which it requires further information:

(a) What degree of stock mixing occurs between our presently recognized statistical areas?
(b) Tag returns should be analyzed with particular reference to the fishing intensity.
(c) There is a great need for more research on division of stocks and for the publication of information on stock division already available in individual laboratories.

There was general agreement on the importance of these points.

Mr. Wise presented a summary of the paper by Wise and Jensen (Document No.25) on the division of stocks of cod, haddock, redfish and halibut in the ICNAF area. This paper was discussed and Mr. Wise was commended on his efforts. There followed a discussion regarding how far Mr. Wise or others could presently go in transforming written descriptions and other available information on division of stocks into a more pictorial form such as maps, from which stock divisions could be readily apparent. It was agreed that maps describing existing knowledge of divisions of stocks of cod, haddock and halibut in the Convention Area should be prepared by the next Annual Meeting of ICNAF. Reference material should be included on the front or back of these maps. Dr. Templeman agreed to take responsibility for the cod map, the United States for the haddock map and Dr. McCracken for the halibut map. In all cases all available experts would be consulted. The U.S.S.R. agreed to document for the next Annual Meeting Soviet information on division of stocks of redfish, and all other countries having redfish information bearing on stock divisions in the ICNAF area are urged to take similar action so that it may be possible to prepare a redfish stock division map at the next Annual Meeting.

Mr. Keir presented Document No. 5 on Basic Statistical Unit Areas and urged, on behalf of the Assessment Group, the gathering of statistical information by very small statistical areas. It was agreed that the collection of statistics for small areas was desirable. Such areas should be combinable into previous statistical subdivisions, and also be conformable between countries. The Secretariat should be continually aware of the smallest statistical areas used by each country. This information should be circulated to all ICNAF countries. It was also agreed that until further study had been made of this information and of the most desirable size and form, for biological purposes, of these small areas, no change should be made in the basic areas for collection of statistics and for reporting of statistics to ICNAF. The Commission should continue to take note of new information on division of stocks and consider division of statistical subdivisions wherever warranted.

APPENDIX V

Report of Environmental Subcommittee

9:30 - 12:30, Tuesday, May 24, 1960.

Participants: Lucas (Chairman), Graham, Templeman, McHugh, Martin, Rollefsen, Rasmussen, Ruivo, Bertelsen, Ancellin, Cole, Holt, Marty, Lundbeck.

In opening the meeting, the Chairman referred to the serious illness of Dr. Walford, the former Chairman, from which he had recovered but which had seriously handicapped him in his plans for the past year. The Chairman then drew attention to the agenda passed to this Committee by the Research and Statistics Committee, to which had been added the subject of an invitation from UNESCO for the Commission to be represented at the forthcoming Intergovernmental Conference on Oceanographic Research, to be held in Copenhagen (July 11-16).

A brief discussion on the exchange of programs between participating countries suggested that this had worked very satisfactorily during 1959.

After a brief discussion of the lines along which the Committee might deal with the agenda, consideration was given to the results of several projects initiated at the 1959 meeting, as follows:

Thermograph records. Information was not yet available from all countries, but so far it has only been in France, U.S. and U.S.S.R. that plans are being made for the installation of thermograph recorders on commercial vessels. In some other countries the project had been abandoned as impracticable at present.

Hydrographic stations. Hydrographic stations have been occupied from research vessels by the majority of member countries, and accounts of hydrographic work appear in a number of the annual reports for 1959. The representative of France said that stations had been occupied by their vessel "l'Aventure" and results will be made available in the Bulletin COEC (Comite d'Oceanographie et d'etude des Cotes).

Plankton sampling. While plankton investigation had not been as intensive as the hydrographic work, research vessels of several countries had undertaken surveys of which the results were outlined in the annual reports. In addition, the U.S.S.R. had obtained automatic station samples from research vessels and scouting vessels, while the Canadian representative referred to special plankton investigations in the Bay of Fundy, forming part of their Passamaquoddy investigation.

The Chairman then referred to the 1959 proposal that countries should attempt to obtain routine information by the use of Continuous Plankton Recorders. Perhaps not surprisingly, it was only in the United Kingdom that progress in this direction had been possible, although valuable offers of assistance had been made by Canadian and U.S. laboratories in the servicing of any plankton recorders which might be running between Europe and North America, whilst Canada had obtained occasional records running towards Baffin Island. It was reported from the Edinburgh Oceanographic Laboratory that the initial Continuous Plankton Record, mentioned at the last meeting, had been followed by several more between southwest Iceland and Newfoundland, nearly 3,000 miles having been recorded within the ICNAF area and rather more in the waters between Iceland and the eastern boundary of the area. It was requested that this brief report, which had just arrived from Edinburgh, might be duplicated and circulated to members of the committee.

The U.S. representative reported that, although progress was being made, it has not been possible for Dr. Walford, owing to his illness, to complete his report on the plankton of the ICNAF area in time for this meeting.

The subject of the standardization of techniques, the collection, compilation and circulation of data was postponed for discussion later in the meeting.

Planning of Environmental Studies. After discussion of these various developments, the committee reviewed the 1959 report, together with the report of the interim meeting held during October in Copenhagen, and resolved to endorse the chief principles set out there in the following order:

i. Environmental studies in fisheries laboratories should be directed towards the ability to predict both the availability of fish to the fishermen and the size of the stock.

ii. Such studies should consider the fish in relation to its environment and biology throughout its life, including such matters as the identity of populations, behaviour, physiology, feeding and the possibility of capture or escape from capture by man. Observations at all seasons of the year are necessary.

iii. The study of the effects of environment on early development and survival is particularly important for the understanding of year class variations and in these studies experimental work is particularly valuable.

iv. Sudden changes in fisheries do occur and they cannot be explained after the event unless there is an adequate basis of environmental knowledge built up before the event.

v. The most profitable method of planning an attack on fishery environmental problems is the setting up of hypotheses based on present information.

vi. The quickest results will be obtained when workers with training in different sciences work together as a team testing these hypotheses.

vii. Unless sufficient effort is put into a program, the program is not likely to be effective.

It was generally agreed that, in the light of these principles, the specific objectives of high priority were:

(a) prediction of environmental changes
(b) studies of the effects of salinity, temperature and other factors on fish distribution
(c) in particular, their effects on the distribution etc. of young fish

(d) the influence of water movements on adults and young fish.
(e) the significance of key features of the environment in relation to the feeding and growth of fish (particularly plankton and bottom fauna).
(f) The influence of the environment on the internal systems of the fish (reproduction, sight, etc.) - action and reaction.

Within these main objectives, and their application to particular species and situations, subsequent discussion emphasized the need for (1) continuing background environmental studies and (2) ad hoc fisheries environmental studies in relation to one or more of the objectives (a) to (f).

Continuous Plankton Recorder. It was recognized that plankton studies in this area were less well developed, with certain classic exceptions; vital work, however, was being done from several research vessels, and the committee could look forward to receiving Dr. Walford's report on the plankton of the area in due course. In particular, the potentialities of the Continuous Plankton Recorder method were endorsed and the committee commended the Edinburgh Oceanographic Laboratory on the continuous records already being obtained in and adjacent to the ICNAF area, and welcomed the news that a proposal for introducing yet another C.P. route was being considered in the United Kingdom.

Attention is also given in Edinburgh to the possibility of producing recorders which by undulations could sample a wider vertical band of water.

It was considered that a regular survey of the plankton of the area and adjacent waters by C.P.R.'s was very desirable and that information of considerable value about the distribution, etc. of the young fish should accrue. Arising from the earlier suggestion that other laboratories initiate similar recorder programs, the committee recognized the special nature of the techniques being used by the Edinburgh laboratory. It was therefore unanimously resolved to recommend to the Research and Statistics Committee, in view of the likely value to the Commission and to fisheries research in general of extending this program, the great desirability of funds being made available for that purpose and for enabling young research workers from other laboratories to spend a period of two or three years in the Edinburgh laboratory alongside members of its permanent staff.

Fisheries Hydrography. Subsequent discussion ranged principally over the problems of obtaining and analyzing appropriate hydrographic data. This discussion took place in the light of several hints of environmental changes, with possible effects on local fisheries, which have been observed in the more northern areas; the importance of such happenings for the fisheries and for fisheries assessment, was repeatedly stressed. The discussion revealed that more background hydrographic data was in fact available than had previously been realized. Not only was useful work being done from the fisheries research vessels of member countries, but considerable quantities of data were being obtained by agencies which do not report to the Commission. Representatives of the U.S. and the United Kingdom, for example, referred to the very numerous surface temperature observations being obtained by their respective meteorological organizations. Work on these data was proceeding in Dr. Walford's laboratory, while a paper was circulated (Document No.32) by Mr. Lee of the Lowestoft Laboratory, illustrated by a representative synoptic chart for the North Atlantic during a 5-day period in January 1954. It was further noted with approval that the United States Hydrographic Office is now producing 10-day synoptic charts of meteorological data, which could be of considerable value to this Commission in its hydrographic work, and the U.S. representative undertook to obtain further information about these and the possibility of their circulation for the use of fisheries scientists. The Committee welcomed the news that Dr. Walford hoped to produce a report on surface temperature distributions in the area, in relation to the distribution of particular organisms, in good time for the meeting in 1961.

The Committee endorsed the potential value of this mass of material, while drawing attention to some gaps in time or in space which still existed and the need for these gaps (for example in and to the south of the Davis Strait) to be filled as soon as possible. There was, moreover, an urgent need to review the data already collected and being collected, in the light of fisheries objectives, and it was noted that once again it had not been possible for any country to send a professional hydrographer to the meeting; the urgent need for the assistance of fisheries hydrographers was stressed. It was also stressed that the biologists must set out clearly for the hydrographers the nature of the problems they have in mind and their relative priorities.

Environmental Symposium and Working Party. In proceeding to plan for an immediate and practical program of environmental studies, the Committee had constantly in mind that changes in the abundance and distribution of commercial fish depend, not only on the amount of fishing but also, and sometimes dramatically, on changes in the environment. The principles on which environmental studies should be based have been endorsed in points i-vii above and objectives of high priority have been specified in points (a) - (f). In order to make progress in these investigations, it is essential to bring together fisheries biologists and fisheries hydrographers for planning and assessment of information, and to make arrangements for them to work together, both in the field and in the laboratory. If this is to be achieved it may well be that the laboratories of member countries will have to accept liabilities to undertake work or lend members of their staffs in the general fisheries interest.

The urgency and scope of the problems suggested that the Commission should be advised to take two preliminary steps towards their solution: (1) to appoint a small working party of fisheries biologists and hydrographers, which should be given the two-fold task of advising the committee on some specific questions and making plans for (2) the Symposium on environmental studies.

It was therefore decided to recommend to the Research and Statistics Committee: (1) That a symposium on "The Influence of the Environment on the Distribution and Abundance of the Principal Groundfish in the ICNAF Area" be held in 1962 or 1963; and (2) That a selected working party of fisheries biologists and hydrographers be requested to advise, at the expense of the Commission, on the best methods for answering the following questions:

(a) What are the effects of the environment on the survival of the eggs and larvae, and on the abundance and growth of year classes of cod, and what are its effects on long-term abundance and distribution of adult cod, in the Commission's area; while the main emphasis should be on cod, it would be useful in such studies to obtain any relevant evidence on both redfish and haddock.

(b) Further, how can such studies be directed so as not only to provide evidence of associations and correlations but also to lead speedily towards the prediction of such effects as long in advance as possible.

(c) Thinking in terms of the more immediate actions and reactions between the fish and factors in their environments, what fundamental studies not already proceeding should be initiated in one laboratory or another.

(d) Dependent upon the answers to (a) and (b) in particular, what standardization of methods is needed and what system of compiling, collecting, synthesizing and circulating data is needed for the Commission's purposes - with what staff, if any - bearing in mind the Commission's general principle that the bulk of its research should be done in and by the member laboratories, and the advantages to be gained by evolving methods similar to those adopted by ICES.

(e) How plans can best be laid for holding the Symposium set out in (1) above, so as to further the Commission's environmental investigations both before it and thereafter.

In making these recommendations the Committee decided that the members of the Working Party should be selected both for their special qualifications and for their access to or knowledge of data accumulated or being accumulated for the Commission's subareas and adjacent regions. For reasons of finance and efficiency, this group should be small, and it is proposed that it comprise three hydrographers and three biologists, to be nominated by the Chairman of the Research and Statistics Committee, who will also nominate a convener. While regional meetings may be useful, it is hoped that only one meeting of the whole group will be required, for one week early in 1961, for which the expenses are estimated to be approximately $3,000. Concerning the Symposium, the principal objectives should be as defined but this should not preclude inviting some recognized authorities to contribute on relevant topics.

In order to assist the new Chairman of the Environmental Subcommittee and members of the working party, a review was made of the national correspondents in environmental studies and the following list was compiled:

Canada	- Dr. Martin	Norway	- Mr. Bratberg
Denmark	- Dr. Hermann	Portugal	- Dr. Ruivo
France	- Dr. Ancellin	Spain	- --
Germany	- Prof. Dietrich	U.S.S.R.	- Dr. Fedosov
Iceland	- Dr. Hallgrimsson	United Kingdom	- Mr. Corlett
Italy	- --	United States	- Dr. Walford

In particular, one of the primary duties of the correspondents should be to provide information as early as possible on national cruise programs, in order to permit their maximum coordination, and the possible exchange of scientific personnel where appropriate.

Liaison with WMO, UNESCO, and the U.S. National Academy of Science . In order to deal with correspondence and invitations from these three bodies, the Subcommittee appointed a working group comprising Dr. Martin (Convenor), Dr. Bertelsen and

Dr. Cole, to consider and advise on replies. The report of this subcommittee was read and their respective recommendations, which were unanimously endorsed by the Environmental Subcommittee are set out below:-

(1) World Meteorological Organization. It is recommended that this organization should be advised of the Commission's great interest in the effects of climatic factors on changes in hydrographic conditions of the Northwest Atlantic area, and thereby on fluctuations in the distribution and abundance of commercial fishes. Forecasts of immediate and long-term changes in the environment are most important to rational development of the fisheries. The World Meteorological Organization should be informed of ICNAF willingness to collaborate in investigations and predictions of the environment in the Convention Area. During the next year it is expected that any requests that WMO may make to ICNAF for specific assistance can be dealt with by correspondence through the Secretariat.

(2) United Nations Educational, Scientific and Cultural Organization. In the interest of overall efficiency in the collection, compilation, circulation and assessment of hydrographic data, it is recommended that ICNAF should be represented by a senior European fisheries biologist, provided that he may be permitted full opportunity to express the Commission's views and to participate in the work of the conference. It is further recommended that a letter conveying this view be sent immediately to UNESCO.

It is proposed that Dr. Ruivo represent the Commission, if necessary at the expense of the Commission, with power to appoint a deputy if he cannot attend.

(3) U.S. National Academy of Sciences. It is recommended that the Commission express their keen interest in the United States proposals for rapid expansion of oceanographic research. The Committee on Oceanography should be advised of ICNAF interest in the oceanography of the Convention Area as it is related to fluctuations in and predictions of fish stocks. To this end, the Commission is now engaged in a program designed to increase and coordinate oceanographic research to meet fisheries management needs in the Northwest Atlantic area. It is recognized that, via the United States Bureau of Commercial Fisheries, the U.S. Committee on Oceanography is informed annually of the Commission's program in environmental research.

The following items taken from the recommendations in the Report by the Committee on Oceanography were particularly commended by ICNAF scientists:

(a) The recognition of the need to make adequate provision for fundamental as well as applied research.
(b) The suggested development of unmanned instruments (for attachment to buoys, etc.) for recording oceanographic data.
(c) The proposed use of Continuous Plankton Recorders towed by commercial vessels, especially if modified so as to undulate over a range of depths.
(d) The development of research on fish behaviour so as to facilitate the concentration and capture of fish at minimum cost.
(e) Laboratory studies of the environmental requirements of the young stages of fish and shellfish, so as to determine the factors governing survival.
(f) Research on genetics of marine organisms directed towards the improvement of stocks by selective fishing, hybridization and selective breeding.

(g) Studies of the feasibility of transplantation and introduction of useful species of marine organisms.
(h) Studies of primary production and food chains.

The recommendation submitted by the Redfish Working Group (see Proceedings No.4, Appendix VI) for consideration. This recommendation was considered by the Committee at some length. Finally, it was decided to recommend that the Redfish Working Party's proposal should be endorsed. The further suggestion was made that the data collected by the Edinburgh Oceanographic Laboratory should be taken into consideration along with those from the Danish workers.

In concluding the meeting, the Chairman warmly thanked the members of the sub-committee and those of the working groups for their assistance in the series of meetings, which had been held daily over Tuesday, 24th, to Friday, 27th May inclusive.

APPENDIX VI

Report of the Working Group on the Redfish Symposium

Participants: Lundbeck (Chairman), Bertelsen, Bratberg, Graham, Hansen, Horsted, Jónsson, McHugh, Parrish, Templeman.

I. Report on the Redfish Symposium

The ICNAF/ICES Redfish Symposium was held on 12th to 16th October, 1959, in Copenhagen (Charlottenlund Slot).

At the Annual Meeting of ICNAF 1957 it had been resolved that because of an increasing utilization of the redfish stocks in the ICNAF area and obvious gaps in the knowledge on redfish biology, especially systematics, there was an urgent need for an extended review of the present state of redfish research as a basis for future work as well as for consideration of conservation and optimum commercial exploitation of the North Atlantic redfish populations. For these reasons it had been further resolved to invite ICES to co-sponsor the meeting and to publish the results in a form to be decided at the meeting.

According to the advance planning, discussions were conducted under five headings, two minor ones being combined with others for reasons of simplification:

1. Systematics, including natural marks (discussion leaders: Dr. Mead and Dr. Sinderman).
2. Distribution, including hydrographic influences (discussion leader: Dr. Templeman).
3. Larval studies (discussion leader: Dr. Einarsson).
4. Sex and maturity (discussion leader: Dr. Magnússon).
5. Age determination (discussion leader: Mr. Rollefsen).

A bibliography of publications dealing with redfish was presented by Mr. Trout.

At the final session an Editorial Committee was elected consisting of: Mr. Trout (Chairman), Mr. Parrish, Dr. Templeman, Dr. Mead.

It was agreed that, together with the reports of the discussion leaders and a summary report, the papers presented to the meeting should be published, either in their entirety or as abstracts when single papers were to be published in national journals.

The printing will be done in Copenhagen as the third volume of the ICNAF Special Publications series, as well as a volume of Rapports et Proces-Verbaux of ICES. It was noted that considerable saving would be achieved by changing the format of the ICNAF Special Publication to that of the Rapports et Proces-Verbaux, and that the Report of the Meeting be so printed. According to the information given by the Editorial Committee, all papers are now ready for printing. The summary report will be available in the near future for approval by the Working Group on the Redfish Symposium during the Annual Meeting, or, in case of delay, by the discussion leaders.

II. The group discussed the Progress Report of the Working Group of Scientists on Fishery Assessments in relation to regulation problems, Appendix II: proposals for future work and data required for fishery assessments in the ICNAF area. As far as the redfish is concerned, the Group fully endorsed these proposals, especially those related to problems of determining the abundance of oceanic redfish populations. It recommends that a fuller analysis should be made of Danish larval data, in relation to hydrographic information for the North Atlantic. The Group also recommends that the attention of the Committee on Environmental Studies be drawn to this problem. Further, it urges countries to undertake researches in the oceanic region, using echosounders, underwater cameras, fishing devices and other appropriate techniques in search for unexploited oceanic redfish concentrations.

APPENDIX VII

Report of the Halibut Subcommittee

Present: McCracken (Chairman), Bertelsen, Bratberg, Hansen, Horsted, Jónsson, Saetersdal, Wise (Rapporteur).

The Committee met on 25th May, 2:00 p.m., and on 26th May, 11:00 a.m.

Some members reported on current work on halibut in their countries, and the committee noted that Canada now has a seasonal worker on the species.

Tagging of halibut was reported and discussed. Bertelsen described a new type of anchor tag, employing synthetic materials, which could be useful for halibut. It was agreed that some consideration should be given to use of more than one tag on a single fish in the hope that this would increase return percentages.

The halibut otolith exchange program, started last year, was considered, and it was agreed that it should be continued and augmented by samples from outside the Convention Area. It was hoped that by next year some report could be made.

Dr. McCracken called the attention of the group to the bibliography (Document No. 41), and it was agreed that this be called to the attention of the Publications Subcommittee for consideration as a more permanent record.

The recommendations concerning halibut contained in the reports of the Working Group on Sampling and Discards and the Working Group on Mesh Assessment were noted and endorsed. The committee agreed that the following are needed for evaluation of possible management of halibut stocks:

1. Length composition (and information on condition of discards).
2. Information on survival rate of discarded halibut.
3. Length composition of the commercial landings, particularly from incidental catches.
4. Further tagging experiments.

With these in hand, it was felt that there would be a means to assess the possibility of increase in yield through application of appropriate size limits.

APPENDIX VIII

Report of the Ad Hoc Subcommittee on Publications

Participants: McHugh (Chairman), Cole, Graham (Rapporteur), Lundbeck, Martin Marty, Bogdanov, Poulsen, Rasmussen, Ruivo.

1. The Subcommittee met on Wednesday, May 25, 1960. A tentative agenda, prepared in advance, was approved with minor modifications.

2. Terms of reference of the Subcommittee.

Dr. Poulsen reported that the Subcommittee has no established terms of reference. Its work is guided by past years' activities, particularly the report on the previous year's meeting.

3. Review, for publication, of annotated list of fishery research papers on work undertaken in the ICNAF area (Document No. 6).

Dr. Poulsen stated that this document was compiled from the FAO bibliography and contributions from individual countries. Several questions were considered:

(a) Should the bibliography be republished, or is it sufficient to leave it in its present form?
(b) If republished, should it be reproduced in a form similar to the FAO bibliography so that citations can be clipped and filed as individual cards?
(c) Should annotations be included?
(d) What criteria should be followed in deciding whether to include papers?
(e) Should names of journals be cited in full?

The Subcommittee recommended that the bibliography be republished in the Red Book, more or less in its present form. Annotations should be included, citations should be restricted to papers clearly relevant to the ICNAF area, and the method of listing journal names should be standardized at the discretion of the Executive Secretary. The present procedure, of submitting listings to individual countries for approval, and of providing draft copies of the bibliography to Subcommittee members for approval prior to the Annual Meeting, should be continued.

4. Status of plans to publish Redfish Symposium.

Dr. Lundbeck referred to the report of the Redfish Symposium Subcommittee. All papers have been prepared for printing, and costs will be divided by ICNAF and ICES. The prompt completion of this task was noted with approval.

5. Status of arrangements for publication of Lisbon papers.

The chairman emphasized that this does not come under the responsibility of the Subcommittee, but that it was included in the agenda for information. Part 1, a general report of the meeting, is now in press, and Part 2 will be ready soon. The delay in publication, it was explained, was caused by illness of the editor, and the difficulty of securing funds. Document No. 31 gives further details.

6. Advisability of publishing a Journal or Bulletin.

The Secretariat, as instructed, corresponded during the past year with Commissioners, to ascertain the opinions of the member countries. Replies have been received from six of the twelve member governments: Canada, Iceland, Norway, Spain, United Kingdom, and United States of America. Dr. Lundbeck states that opinions of West Germany are divided, that it would be good to have papers more generally available than is now provided through publication in the Proceedings, but that the number of manuscripts that they might submit would be small. Dr. Marty states that USSR would approve, and would contribute about five manuscripts per year for the next few years, and somewhat more later. The general consensus of the replies was divided, and it was noted that since the USA did not see the need for such publication, and Canada, while it might approve with reservations, was not enthusiastic, a new serial was hardly advisable at this time, since the two major supporters of scientific research in the ICNAF area were unlikely to offer many manuscripts. The Subcommittee agreed that it could not recommend publication of a new Journal or Bulletin series at this time but that the Commission continue to exercise the authority it now has to publish in the Proceedings, or as supplements to this or other authorized publications. The question can be reopened for consideration at some later date if circumstances warrant.

7. Approval of 1960 Documents for publication in Proceedings and Red Book.

It was pointed out that this is the function of the Editorial Board, which is composed of the Chairman of the Standing Committee on Research and Statistics, the Executive Secretary, and the Chairman of the Ad Hoc Subcommittee on Publications. The Board agreed to meet after adjournment of the Subcommittee meeting.

The Subcommittee also considered the present publications of the Commission. The Proceedings and the Statistical Bulletin are issued in 1500 copies each. In the first year 800 to 900 are mailed out and the remainder are held for future requests. The Sampling Yearbook is prepared in 350 copies, distribution of which is regulated by the member countries. The Red Book is produced in 350 to 400 copies, and this is more than adequate for present needs. The Biarritz reports were printed in 2200 copies, and 300 to 400 are left. About 1000 copies of the Redfish Symposium will be printed. This will be sufficient, since ICES also will distribute about another thousand. The Subcommittee agreed that sufficient copies of all official publications are being printed and recommended that the 1960 editions be produced in equivalent numbers of copies.

8. Other Business

Dr. Martin pointed out that the Standing Committee had recommended at the 1959 meeting that the list of vessels fishing in the ICNAF area, with their characteristics, be published at intervals. The Subcommittee recommended that the current list be published in a format similar to the Red Book, and that the Executive Secretary determine the number to be printed by consulting with the member governments.

Item 3(d) of the 1959 report, on page 80 of the Proceedings of the Standing Committee on Research and Statistics (Red Book), recommended that authors must return "proof" copy of edited contributions to the Proceedings within two months of receipt. The Subcommittee believes that this represents an unnecessary delay in publication, and recommends that this section be amended to read "and, if they have not been returned within one month, it shall be assumed by the Secretariat that the copy is satisfactory for publication".

9. The Editorial Board reported that, after the usual editing -

(a) the following documents of the 1960 meeting should be published in the Annual Proceedings, Nos. 1, 9, 11, 12, 13, 14, 15, 17, 18, 22, 26, 35, 37, 38;

(b) the following documents should be published in the 1960 Red Book, Nos. 3, 6, 19, 24, 31, 41, as well as the Proceedings of the Standing Committee on Research and Statistics, with appendices (these possibly, in cases, in an abstracted form).

APPENDIX IX

Report of Working Group on Fisheries Statistics and Standardization of Fishing Effort

The group met at 9:30 a.m. and 4:00 p.m. on 25th May.

Participants: Dickie (Chairman), Cadima, Chrzan, Fridriksson, Friis, Gulland (Rapporteur), Holt, Horsted, Hylen, Jónsson, Keir, Lundbeck, McCracken, MacKenzie, Marcotte, Martin, Parrish, Popper, Rasmussen, Soltan, Wise.

The group began work with Documents No. 21 (Report of Expert Meeting on Fishery Statistics in the North Atlantic Area, by R.S. Keir) and No. 33 (An Approach to Standardized Effort Statistics for U.S. Vessels, by J.P. Wise and G. Kelly). The group reaffirmed the proposal (A.1 in Document No. 21) that ICNAF should request statistics from member countries in the form of nominal catch, i.e. metric tons, round fresh weights. Recognizing the importance of reliable statistical information on the area of capture, the group asks that the Secretariat collect from member countries information on the method of allocating these nominal landings (catches) by area of capture.

The group noted the proposal, para. A.4, Document No. 21, that "the international bodies concerned should give early consideration to their likely requirements in this (economic) field and to state them as fully as possible". They considered that before further action could be taken, the nature of ICNAF economic requirements would have to be defined by policy decision, and suggested that the Research and Statistics Committee draw the attention of the Commissioners to this ESTANA proposal.

The definition and classification of catch and effort statistics were discussed, and the group concluded that the ESTANA proposals would probably fulfil the needs of ICNAF. It commended ESTANA on the progress made in clarifying and standardizing these concepts and recommended that the Secretariat be authorized to use these terms and definitions in collecting information from countries and in publishing it, and to represent the Commission at meetings of the ESTANA Continuing Working Group. In reply to a request from the ESTANA Continuing Working Party, the group agreed that no separation within boat categories of motor into diesel and gasoline was necessary for ICNAF biologists.

The group noted and wished to congratulate ESTANA and its Continuing Working Party on the progress made towards the general introduction of a standard statistics reporting form, and recommended that ICNAF use these standard forms for collecting statistics from member countries unless particular difficulties arise during the experimental stages.

The group noted that FAO is collecting information on the factors used in converting landings to nominal catch, and requests that the ICNAF Secretariat obtain copies of the data so collected in the ICNAF area. Recognizing the importance of continually reviewing the values of these factors, the group urges that member countries should lose no opportunity of obtaining more accurate information on these factors at all seasons and on all fishing grounds under normal commercial fishing conditions.

Effort statistics were discussed in detail, and it was recommended that fishing time of trawlers should be collected and published in the form of hours fished; failing this, the nearest equivalent should be used. It was also agreed that fished days - defined as all days on which fishing took place - supplied additional information, and that publication would be useful and should be done when such data are available. In the interests of uniformity in publications, the group recommends that the Secretariat collect information from member countries on the sampling or observation systems used for collecting these effort data and on their definitions and method of calculation of their indices.

The problem of measuring fishing power was discussed, with particular reference to Document No.33. The group congratulated the authors on their work, and considered that such papers, especially when containing basic data on catches and size of vessel, were fundamental to understanding the problem. The group strongly recommended that similar studies should be made in other fisheries. Such studies would enable the fishing effort of different otter trawlers to be expressed in common units; this is essential when there have been changes in the composition of the fleet. In particular the joint study by the United States and Canada, of boats which have moved from the United States to the Canadian fishery, is recommended (see Document No.33). This should, as far as possible, be combined with economic studies.

In this connection the group also considered the letter from Mr. Jan-Olof Traung in Document No.28. It requested the Secretariat to thank Mr. Traung for his offer of assistance in a pilot study of the possibility of using propeller specifications and their operating R.P.M. as an index of fishing power, and recommended that the Secretariat seek the necessary information from countries that may have it available, so that this research can be carried out. It further recommends that no additional requirements should now be added to the ICNAF "List of Vessels" but that these requirements should be reviewed at the next Annual Meeting.

In conjunction with the ESTANA Continuing Working Party, the group noted the recommendation of the Edinburgh Meeting that ICNAF and ICES should adopt a wholly uniform tonnage classification. The group noted that ICNAF catch statistics are linked with the current tonnage classification, and, to preserve continuity in the series, recommended that there should be no change in the present ICNAF tonnage classification.

APPENDIX X

Report of Subcommittee on Ageing Techniques

Participants: Rollefsen (Chairman), Ancellin, Bertelsen, Bratberg, Dragesund, Gulland, Hansen, Horsted, Hylen, Keir, Lundbeck, McCracken, Marcotte, Parrish, Østvedt, Wise.

As a next step following the exchange of cod otoliths, the Committee on Research and Statistics suggested that a questionnaire concerning the reading and interpretation of otoliths be circulated. This has been done. Answers have been received, and the replies have been compiled and tabulated by R.S.Keir (Document No.4).

The answers show that there is pronounced agreement among otolith-readers; but there are also disagreements on very important points. The group realizes that some of the differences in views may be due to the techniques used, others to the time and place of sampling, still others to differing conceptions or interpretations. It is absolutely necessary that the nature of these disagreements should be studied, because the resolution of them is essential for the full use of otolith data.

The group recommends that a Working Party on Ageing Techniques should be established with a view to resolving these difficulties in the use of scales, otoliths and other bony structures in studies of age, growth and maturation, and stock separation and mixing.

The Working Party should make a careful study of: (1) Techniques (including photography), (2) Interpretations, and decide on (3) A uniform set of terms and symbols, with definitions.

The group also stresses the importance of methods of projecting or methods for tracing and recording the differences on the cut surface of the otolith. Photographic techniques will be most useful for study.

Participants in the Working Party should be those scientists actually engaged in reading or directing the work of others in reading and interpretation, for example, those whose names appeared on the replies to the questionnaire.

The Institute of Marine Fisheries at Bergen has offered the use of its facilities for this meeting, which should be held in the autumn of 1961, if the preparatory work can be finished by then.

It is recommended that the differences in terminology, definitions and symbolism between scientists be resolved as far as practicable by correspondence before the meeting, and that a scientist be asked to volunteer to supervise this task. He should bring to the Working Party a draft proposal on a standard set of terms, definitions and symbols generally acceptable to his colleagues in other countries, to serve as a basis for a proposal by the Working Party. The program will be drawn up at the next Annual Meeting.

APPENDIX XI

Second Progress Report of Working Group of Scientists on Fishery Assessment in Relation to Regulation Problems

The part of the report republished here only includes Sections 1, 2 and 3 of the report submitted, i.e. the sections dealing with the Group's working arrangements, with the scope of the work, and describing some general comments on methods and interpretations.

The following Sections 4-9 include detailed information on the main fisheries and stocks of commercial fish in the five subareas (where possible given by subdivisions) as follows:

Subarea 1 : Cod, Redfish
" 2 : Cod, Redfish
" 3 : Cod, Haddock, Redfish
" 4 : Cod, Haddock, Redfish
" 5 : Cod, Haddock, Redfish, Yellowtail Flounder, Silver Hake
Subareas 1-5 : Halibut

As the Group is continuing its work in 1960-61, the considerations described and the conclusions included in these sections are to a certain degree provisional, for which reason it has not been found adequate now to republish the Sections 4-9.

Finally, attached to the report (but not republished here), are:

Appendix I : Table of equivalent mesh sizes in inches and millimeters
Appendix II : Proposals for future work and data required for fishery assessment in the ICNAF Area.

Section 1. Meetings and Participants

1.1 The first stages in assembling and processing the available data followed the general plan drawn up at the Ninth Annual Meeting of ICNAF at Montreal in 1959. Those scientists concerned with Subareas 1 and 2 had some discussions during the 1959 ICES meeting. Compilations of data and some preliminary assessments for Subareas 3, 4 and 5 were examined in December 1959 at the meeting of scientific advisers to panels, and detailed plans were drawn up for the next stage of the work. A report of this meeting was presented at the 10th Annual Meeting of ICNAF (Document No.3, Appendix II).

1.2 The full Working Group met in Lowestoft from March 17th-26th and again in Bergen from May 19th-22nd and during the following two weeks. A progress report of the Lowestoft meeting was distributed as ICNAF 10th Meeting Document No.29. Participants at the meetings of the full Working Group were as follows:

R.J.H.Beverton (U.K.) (Convenor)
L.M.Dickie (Canada)
V. Hodder (Canada)
G. Saetersdal (Norway)
E. Cadima (Portugal)
S.J.Holt (FAO)
B.B.Parrish (U.K.)
J.A.Gulland (U.K.)
R.P.Silliman (U.S.)
R. Jones (U.K.))
V. Travin (U.S.S.R.)) Attended Lowestoft meeting only
L.G.Nazarova (U.S.S.R.))

Section 2. Scope of this Report

2.1 The tasks set to the Working Group were as follows:

To complete the processing and evaluation of studies made on an area basis by groups of scientific advisers to panels. In each of the five subareas "...the prime objectives would be to obtain the best estimates of the immediate and long-term effects of enforcing minimum meshes of, say, between 4 inches and 6 inches, on a per-recruit basis for each of the three species (cod, haddock and redfish...) including determinations of the minimum fish sizes appropriate to the minimum mesh sizes postulated. These estimates should be made first in relation to the present rate of fishing, and preferably also in relation to a hypothetical (or, if possible, "expected", as determined by national forecasts) future rate of fishing. The results should be formulated so as to permit comparison of the individual values with the results of applying overall any particular minimum mesh and...include...preliminary evaluations of greater benefits to be expected in any instance where the data suggested that increases beyond 6 inches were likely to be more beneficial for that stock. The possible consequences...for other fisheries should be borne in mind". The subarea reports, and subsequently therefore, that of the Working Group"...should refer to the possible benefits to be obtained by other conservation methods". (Quotations from Report of the Standing Committee on Research and Statistics. Annual Meeting, June 1959, Proceedings No.4, ICNAF Serial No.643).

2.2. This report sets out in summary form the conclusions reached by the Working Group on the fisheries in the ICNAF area, so far as can be judged from the data available at the time of the Lowestoft meeting. The third volume of the Sampling Yearbook published since then may contain data for 1958 which have not been taken into account in this report; neither has relevant information in the documents for the 10th Annual Meeting been appraised.

An evaluation of the influence of fishing on the stocks is fundamental to assessing the effect of applying a regulative measure.

2.3 For most of the main cod and haddock fisheries it has been possible to establish that fishing is having an effect on the stocks, and for these fisheries calculations have been made of the probable long-term effects of increase of mesh size. The accuracy of the assessments is seldom high, however, and the procedure is adopted of giving a range of possible effects according to the reliability of the data. In some fisheries, including nearly all those for redfish, it has not been possible to determine from existing data whether or not the stocks have yet been affected by fishing, and so the kind of assessments that can be made are even more restricted. Of the minor species, some appreciation has been made for halibut in the whole area and for 'ellowtail flounder in Subarea 5. Some few analyses and computations have yet to be undertaken before assessments of the effects of increases in mesh size at the present level of fishing, dealt with in this report are properly completed to the stage at which they take account of all available data; these are listed in paras 1(a)-(f) of Appendix II (not printed here).

2.4 It has not been possible to undertake such further assessments of mesh regulation and other conservation measures as would be needed to complete the tasks set to the Working Group, although much of the necessary preliminary work of collating and analysing the data has already been done. In particular no assessments (except in one instance, Georges Bank haddock) have been made which take into account changes in the amount of fishing. However, it is generally true that if the fishing on any stock increases, then the desirability of mesh regulation of that fishery is enhanced and vice versa.

It is the group's understanding that the fishing effort in most parts of the ICNAF area is expected to increase; in other parts it may decrease. It is possible to make assessments for a wide variety of hypothetical situations, but for the computation to be completed in a reasonable time they will have to be limited to a restricted range of situations. So that this range should include as realistic an appreciation as possible of the consequences of likely future changes in total fishing effort by each gear, and its distribution it is necessary to have national forecasts of what these changes are likely to be.

The assessments outstanding are listed in para.2 of Appendix II (not printed here); it is thought that they could, for the most part, be completed independently by members of the Working Group during the next few months, but it would be necessary for the members of the Group to meet to examine and compare their results.

2.5 Although not specifically mentioned in the tasks given to the Working Group as set out above, reference was made in the proceedings of the Ninth Annual Meeting to the question of the adoption of a uniform mesh for the North Atlantic region. The Working Group has not considered fisheries outside the ICNAF area, but wishes to draw the attention of the Committee to recent developments concerning the northern part of the Permanent Commission area. These are that a scientific report on the state of the cod and haddock fisheries of the Northeast Arctic, and an assessment of the probable effects on them of further increases in mesh above the present regulation size of 110 mm (approx. 4 1/4")*, was submitted to the Eighth Meeting of the Permanent Commission in May 1960 by a Working Group of ICES. Further, at the request of the Permanent Commission, ICES has set up another working group to make a similar appraisal for the remainder of the northern part of the Permanent Commission area, which includes Iceland and East Greenland. It is suggested that when the report of this latter group is available, it will be desirable to make a joint scientific appraisal of the stocks of fish in the two Commission areas. Such a joint study is particularly appropriate where (as at Greenland) there are significant movements of fish between the

ICNAF and Permanent Commission areas. It is also important in so far as changes of fishing effort in the two areas are inter-related.

2.6 During the course of its work, the Group paid attention to locating gaps in existing information and to delimiting the needs for future research which might lead to a better understanding of the effects of fishing on the stocks.

2.7 No attempt has been made in this report to document the evidence on which are based the summarised conclusions presented here. The Group believes it is important that it be given the opportunity to prepare a full report containing the tabulated data and describing and illustrating the analyses on which present findings are based.

Section 3. Mesh assessments - some general comments on methods and interpretation

3.1 When the size of mesh is increased, a certain number of small fish that would have been retained by the original mesh escape capture. With a reasonably small increase of mesh, such as would be practicable to introduce in one step, most of these fish escaping capture will survive and grow to a size at which they can be retained by the larger mesh. A certain proportion, E, of these survivors will eventually be caught, and their average size when they are caught will be the same as that of fish in the rest of the catch. If this proportion is high enough, their total weight will exceed the weight of the fish released, and so there will be a long-term nett gain. The basic information needed to assess the long-term effect of a relatively small increase in mesh size is therefore the present size composition of the catches by all components of each fishery (and landings, if these are different), the selectivity of the gear for various mesh sizes, and the proportion E. In addition information on growth and mortality is essential for more precise assessments particularly for large increases in mesh size. E and the mortality rates are estimated from age-composition and tagging data.

3.2 An efficient method of making an assessment from such data has recently been worked out by J.A.Gulland. This method, which had previously been used for the Northeast Arctic assessments referred to in para 2.5, was discussed in detail by the Working Group at Lowestoft, which decided to use it for most of the assessments reported here. The method is outlined in the appendix to the First Progress Report (ICNAF 1960 meeting Document 29); a full description is being prepared by Gulland for separate publication. It does not differ in principle from other methods, but uses data more efficiently, is much quicker to apply and is especially useful for assessing complex fisheries in which the size-compositions of catches taken by various gears or fleets are different.

3.3 Assessments for haddock in Subarea 5 have been made by an extension, developed by R.P.Silliman, of the more conventional method and which is based directly on age-compositions and the distribution of length-at-age; this method, referred to here as the "arithmetic method", will be described in detail in the full report. Trial assessments using the same basic data showed that Gulland's and Silliman's methods give essentially the same results.

3.4 The long-term assessments calculated by these methods show how a given increase in mesh size would be expected to influence the average level of landings compared with what would have been obtained had no change in mesh been made. The assessments are expressed as a percentage increase or decrease on present landings, and refer only to present levels and pattern of fishing activity. General experience in fishery research is that E is the most difficult to estimate of the quantities required in assessment, and may critically affect the conclusions reached. The procedure has therefore been adopted of calculating long-term assessments for a range of values of E within which the true value is thought to lie. In most of the fisheries considered here it has been possible to obtain only very approximate estimates of E, and the range of values used in assessment is correspondingly very wide. This sometimes results in a rather wide range of assessments, but in certain circumstances useful conclusions can nevertheless be drawn. In some fisheries (e.g. most redfish fisheries) no estimate of E can be obtained from present data and so no long-term assessments are yet possible. In such cases that value of E can be calculated which, for a given increase in mesh size, would leave the long-term landings unchanged; this critical value of E (called the "break-even" value) serves to indicate in a general sense how intense the fishing would have to be to enable the mesh increase in question to result in a long-term gain. When the value of Z is unknown an underestimate of the break-even value of E can be calculated. This estimate is the break-even value of E', E' being defined as the proportion of the fish retained by the original mesh but escaping capture by the larger mesh, which will eventually be caught. The break-even value of E' is the ratio of the average weight of these released fish to their average weight when recaptured (i.e. the average weight in the retained catch), and for given conditions is always less than the corresponding value of E as defined in para 3.1.

3.5 It has been supposed for the assessments of this report that the selectivity of only the trawls is regulated. For this reason, and also because there are often differences in the size compositions of catches and landings by the various trawl fleets even when they are fishing the same stock, a given increase in mesh size will produce different short-term and long-term effects on the landings by the various gears and fleets. Assessments have therefore been made, so far as was possible from the information available, for the effects on each important component of the fishery.

3.6 Inevitably, any increase in mesh size will cause an immediate loss of small fish which previously would have been caught. This can be calculated directly from the size compositions of catches and landings and the selectivity of the gear. Assessments of immediate loss calculated in this way will, however, for several reasons tend to give an exaggerated impression of the percentage reductions in landings. In interpreting the results the following points should be borne in mind.

(a) There is substantial evidence that an increase in mesh size increases the fishing power of the gear and results in greater catches of larger fish beyond the selection range of the mesh.

(b) The reduced catches of smaller fish caused by an increase in mesh size might result in vessels fishing more on grounds where larger fish are relatively more abundant.

(c) There may have been discarding with the smaller mesh in use. It is to be expected that with the larger mesh proportionally fewer of the small fish caught would be discarded.

(d) The figures quoted are of the losses at the moment the large mesh is introduced, but from then on the fish released grow into its retention range. The losses over the first full year of fishing with the larger mesh will therefore be less than the rate experienced initially; in later years the landings approach the figures given for the long-term effects.

All the above points mean that the figures given in the tables give an exaggerated impression of the percentage reduction in landings. In addition the practical significance of the calculated immediate losses must be judged against the normal seasonal and year-to-year variation in catches which is encountered in each fishery. This is often relatively large.

3.7 The assessments given in the report, refer to changes in trawl selectivity from that which is currently effective. Thus, in Subareas 3, 4 and 5, the assessments refer to changes in mesh size from the present regulation size. If, however, the present effective mesh size is smaller than has been assumed, then the assessments given will underestimate the immediate losses and the long-term effects. If the effective mesh size is larger than assumed, both changes will be overestimated, but the error will not be so great. To obtain some idea of the errors if the effective mesh size is smaller than assumed, assessments have also been given on the assumption that the selection range of the present gear is wholly below the observed size-composition of the catches.

3.8 In some situations for which assessments were needed, there were few or no data on the sizes of fish landed by gears other than trawls. In such cases it has usually been assumed, for purposes of calculation, that the average sizes of fish landed by such gears are the same as that by the larger meshed trawls. If in fact the fish taken by other gears were larger than those landed by the trawls, the method used underestimates the long-term gains to all gears.

APPENDIX XII

Report of the Working Group on Gear Research and Selectivity

The Group met on May 25th, 27th and 28th.

Present were: Saetersdal (Chairman), Ancellin, Bratberg, Brackett, Cadima, Hansen, Horsted, Hylen, Jonsson, Keir, Lucas, McCracken (Rapporteur), Marcotte, Parrish, Ruivo, Wise.

Gear Selection Research

Under this item the Group first considered the new information which has been obtained in the ICNAF area during the past year.

On trawl mesh selection the results of some Canadian tests of cod-ends of polyester fibres (terylene) were noted (cfr. Document No. 11, Canadian Research Report). They indicated that this type of synthetic is similar to polyamids in giving higher selection than manila. Dr. Templeman reported verbally on some alternate haul experiments on haddock in Subarea 3 which his laboratory is at present undertaking, particularly with the object of studying the relation between escapement and catch size.

On hook selection a verbal report of Portuguese experiments was heard.

New data on trap selection were presented by Canada (Document No. 44). It was noted that selection by trap meshes appears to be higher than in trawls, but with a considerably wider range. A brief film of some Norwegian tank experiments on escapement of cod from traps was shown. Result of these tests agreed with the Canadian ones in showing high escapement values.

Some experiments on the effects of topside chafers on selectivity were reported by Canada (Document No. 19). An important feature of the results is that they agree with English tests (reported by Beverton at ICES C.M. 1959, Paper No. 117) in showing that the multiple-flap type of chafer does not influence escapement. Nor did the Canadian experiments show any effect on escapement of an extra large mesh chafer of the ICNAF type.

Standardization of methods in gear selection research

The Chairman reported on the work carried out in the ICES area to achieve a higher degree of standardization. The report of an ICES Special Mesh Selection Working Group on this problem was reviewed. It was agreed that standardized methods in both the ICNAF and ICES areas would be of great value, and it was recommended that the report of the Special Mesh Selection Group should be distributed to ICNAF selectivity workers for consideration when it becomes available, after the 1960 ICES meeting.

Compilation and tabulation of selectivity data

There is a need to have all mesh selection data available in a condensed form, and it was recommended that a tabulation of all mesh selection experiments in the ICNAF area be attempted on a form similar to that now in use by the ICES Comparative Fishing Committee. To achieve this the ICNAF Secretariat should be asked to circulate to the various ICNAF countries copies of this form, to be provided by Mr. Saetersdal, with the request that each laboratory tabulate its selection data, so that complete sets are available for the 1961 Annual Meeting.

Needs and plans for future work

These were considered with reference to the report of last year's Subcommittee on Gaps in Gear Selection (Red Book, 1959 Annual Meeting) and to the requests from the Assessment Group.

It was noted that in the past year, significant progress has only been made on topside chafers and trap selection.

The Group noted with satisfaction the suggestion made by the Assessment Group that length/round fresh weight relations could supplement limited experimental data on mesh selection, and countries were asked to collect such observations, particularly for cod in Subareas 1 and 2 at different seasons of the year.

The most obvious gaps in our knowledge of trawl mesh selection at present appear to be for redfish in Subareas 1 and 2, and for cod in Subarea 2. No countries have research plans for the coming year which would fill these gaps.

As to synthetic fibres, the Group agreed that there is substantial information at hand from the ICES and ICNAF areas on polymids, but that little is known of the selective properties of other synthetics which are coming into use in various fisheries, such as polyesters and polyethylenes. Under the ICES selectivity program for the present year several countries will test these new fibres, and it was also noted that Canada plans to test the selectivity of cod-ends of polyethylene.

The progress on trap selection was noted with satisfaction, but it was hoped that such work would also be carried out in other areas.

The state of knowledge on hook selection is still unsatisfactory. It was noted that Portugal will continue work in Subarea 3, and Denmark will start work in Subarea 1.

Referring to the results of some fish behaviour experiments, Mr. Parrish suggested that light condition may be an important feature in determining selection in various gears, and proposed that data should be analysed with respect to light where possible.

Future work on chafers was discussed at length. Norway expects to do some selectivity tests with the multiple-flap chafer this summer. The Group felt that there is a need for tests of the practical suitability of this type of chafer on commercial side-trawlers. There was also a general agreement that sight must not be lost of the possibility of eliminating chafing gears altogether, particularly since the increasing use of the stronger synthetic fibres in recent years may have reduced the need for the use of chafing gears, and it was suggested that this could be done by: (1) circulating questionnaires to the industry; (2) arranging practical tests of commercial vessels fishing with and without chafers.

Mesh measuring gauges

Mr. Parrish reviewed the latest development of mesh measuring gauges in the ICES area with particular reference to v. Brandt's latest report to the Comparative Fishing Committee (ICES C.M. 1959, Paper No. 10) on this subject. It is probable that a common standard gauge for research purposes in the ICES area will be agreed upon at this year's ICES meeting, and the Group suggested that this gauge should be proposed for acceptance by ICNAF at the 1961 meeting. It was noted that the United States has dropped further work on the hydraulic gauge.

Comparative Fishing Studies

Progress was only reported by Canada (Canadian Research Report, Document No. 11) which has compared fishing power of Danish seiners and trawlers.

Other items

FAO Selectivity Manual: It was noted that provision has been made for publishing such a manual (Document No. 31).

Mesh Certification: At last year's meeting attention was drawn to the valuable experience that the United States has gained in its mesh certification program, and the United States was asked to prepare a paper on this subject. Such a paper is now available and was reviewed by Mr. Brackett (Document No. 7). The Group wish to draw the attention of the Research and Statistics Committee to this interesting paper, and also asks that the paper should, if possible, be made available to the Comparative Fishing Committee of ICES.

APPENDIX XIII

Report of the Working Group on Statistics and Sampling
Summary of Appendices III, IV and IX

Chairman: W.R.Martin

A variety of statistics and sampling problems were considered by three working groups. Working Group 1 dealt with standardization of North Atlantic fisheries statistics. Group 2 considered division of stocks and the size of statistical unit areas. Group 3 discussed sampling and discard problems. Their conclusions are summarized as follows:

1. The FAO/ICES/ICNAF statistics meeting (ESTANA) at Edinburgh in September 1959, and the meeting of its Continuing Working Party at Bergen in May, 1960, achieved considerable progress in the standardization and efficient reporting of North Atlantic fisheries statistics of catch and effort.

   It is recommended that ICNAF use the definitions, classifications, and prescribed forms recommended by ESTANA, and authorize the Biologist-Statistician to attend meetings of the Continuing Working Party. (see Appendix IX).

   No action was taken on the ESTANA proposal to consider economic requirements for statistics, pending a policy decision by the Commission.

2. The size of statistical unit areas had been questioned at the last Annual Meeting of ICNAF, by ESTANA, and by the Working Party on Assessment. Present statistical divisions were reviewed in relation to statistical unit areas used by some member countries and knowledge of division of fish stocks. It is recommended that (a) until further study of standard unit areas has been made, statistics should be collected by unit areas which can be combined into current statistical divisions, and (b) the Secretariat should be continually aware of the smallest statistical areas used by each country and of new information on division of stocks, in order that revision of statistical areas may be considered when warranted. In order to further these considerations, maps describing the distribution of stocks of cod, haddock, redfish and halibut will be prepared for the next Annual Meeting. (see Appendix IV.)

3. Discards. Reports by ESTANA and the Assessment Group emphasized the urgency of implementing previous recommendations from ICNAF concerning the great need for more statistical data on the quantities and sizes of fish discarded at sea.

   In order to encourage the collection of such data, the Biologist-Statistician prepared Document No. 8 as a valuable reference paper on methods of estimating discards. It is recommended that: (a) all countries be encouraged to make wider use of log-book records or skippers' estimates of discards, and supplement this by sending observers to sea on commercial trawlers; (b) countries report estimates of total discards by species on forms to be distributed by the Secretariat; (c) these reports should be supported by short papers on studies of discards and their survival; and (d) special attention be drawn to the need for records of halibut discards (see Appendix III).

4. List of Vessels. The 1959 list of all vessels over 50 gross tons fishing in the Convention Area, with information concerning their characteristics, will be reported by the Secretariat in a form similar to the Red Book. It is recommended that detailed requirements for the next list of vessels, for the year 1962, should be reviewed at the next Annual Meeting. (see Appendix IX).

5. Fishing Power. The ICNAF Secretariat in consultation with FAO, and the United States, reported on studies of standardization of fishing effort. It is recommended that further studies by Canada and the United States, and wherever possible by other countries, should be made with a view to assessing the total fishing effort expended on each major stock of fish in the Convention Area. (see Appendix IX).

6. Sampling. The Secretariat was complimented on modifications of the Sampling Yearbook toward conformity with the Statistical Bulletin format. It is recommended that the sampling program be expanded, with emphasis on gaps which have been noted by the Working Party on Fishery Assessment. (see Appendix III).

APPENDIX XIV

Report of Tagging Cruise aboard G.O.Sars

Participants: Aasen, Bertelsen, Cannone, Chrzan, Hansen, Horsted, Hylen, Jónsson, Marcotte, Marty, McCracken, Rasmussen, Rollefsen, Soltan, Sundnes, Wise.

On Sunday, 29th May, 1960, the G.O.Sars made an experimental tagging trip to the Hjelte Fjord. The ship left Bergen at 9:00 a.m. and returned at 8:30 p.m.

During the cruise cod and mackerel were tagged, with specialists from various countries showing various tags and methods of application. The Norwegian tagging sluice for delicate clupeids and scombrids was also demonstrated. (Following is a supplement showing the types of tags and serial numbers used and exhibited.)

Demonstration sets were made with the otter trawl and with the prawn trawl.

All of the foreign participants expressed their thanks to Dir. Rollefsen and his staff for this valuable opportunity and for the outstanding hospitality shown by the Norwegian biologists and the officers and crew of the G.O.Sars.

SUPPLEMENT

Tags Actually Used

COD

Canada: Petersen disc attached by a stainless steel wire between the 1st and the 2nd dorsal fin: 12307 - 57 cm; 12308 - 56 cm.

Denmark: Pear-shaped plate of "Alcathene" attached by a spun nylon thread in front of the 1st dorsal fin: 4162 - 67 cm.

Norway: The hydrostatic tag attached by a monofilament nylon thread in front of the 1st dorsal fin: 37801 - 57 cm; 37802 - 64 cm; 37803 - 67 cm; 37804 - 70 cm; 37805 - 56 cm; 37806 - 61 cm.

United Kingdom: Plastic flag attached by a braided nylon thread between the 1st and 2nd dorsal fin: EA-7002 - --; EA-7003 - 58 cm; EA-7004 - 76 cm; EA-7005 - 64 cm; EA-7006 - 65 cm; EA-7007 - 103 cm.

United States: A. Spaghetti tag attached in front of the 1st dorsal fin: J5034 - 76 cm; J5035 - 78 cm; J5058 - 66 cm; J5049 - 58 cm; J5037 - 64 cm.
B. The hydrostatic Lea tag anchored by a plastic plate in the body cavity.
Lea with anchor in coelom: 5758 - 72 cm; 5778 - 65 cm; 5774 - 59 cm; 5757 - 61 cm.

MACKEREL

Norway: "Alcathene" message roll attached by: (1) Stainless steel wire; (2) Monofilament nylon thread in front of the 1st dorsal fin. H2618 - 35.5 cm; H2620 - 40.0 cm; H2621 - 41.0 cm; H2622 - 40.5 cm; H2623 - 40.0 cm; H2624 - 37.5 cm; H2625 - 43.5 cm; H2626 - 40.5 cm; H2628 - 40.5 cm.

Demonstrated but not Used on Cruise

Petersen discs of various types; Danish anchor tags - subcutaneous plastic plate with external plastic message roll; Danish plastic arrow tags.

2. Report of Regional Meeting of ICNAF Scientists

St. Andrews, N.B., December 8-12, 1959.

Dr. Hart acted as Chairman. Drs. Martin and Graham served as reporters. A list of participants is presented in Appendix I.

SEA SCALLOPS

Bourne reported on Canadian investigations in the fishery, Medcof on the causes of scallop mortality, and Posgay on the activities of the U.S. fleet in 1959 and assessments of effect of delaying age of capture, based on the recent fishing distribution and earlier estimates of growth and mortality.

Canada made four sampling trips on two commercial scallop boats in the summer and fall of 1959 in six scallop unit areas on Georges Bank (Subdivision 5Z). The purpose of these trips was to obtain information on cull points and fishing mortality. The data have not yet been completely analyzed.

The culling practice has not changed. The cull point is still at about 95 mm. The fleet is fishing populations which are mostly recent recruits. About half the catch is less than 95 mm and is discarded, while 15% of the catch is 110 mm in size or larger.

In accordance with recommendations of the last Annual Meeting, Canada carried out experiments with large-mesh drags. Observational studies with 3-inch and 4-inch rings were completed in November 1959. Canadian vessels attach additional links to the rings as the drags are used. It was suggested that experiments be conducted to obtain information on effects of multiple linkage on selection.

Scallops are very abundant on Georges Bank today. Canada's landings from this bank up to October 1959 have increased 56% over last year. Increased effort in the form of larger and more efficient crews, combined with high densities of scallops on the fished grounds, account for these increases. The effort is expected to increase further next year as two new 95-foot vessels are now under construction.

Canada reported that she now has log books on all offshore scallopers. She also reported on the initiation of experiments on early life-history studies and on the rate of separation of valves in dead animals. To date, natural mortality rates have been calculated from rate of separation of valves determined from a single tank experiment.

Medcof discussed the vicissitudes of scallops and enumerated the various kinds of natural mortality. He suggested a study of the importance of mortalities due to handling of the discards aboard commercial draggers.

The United States is continuing its studies of earlier tagging experiments designed to re-examine growth rates and to determine fishing mortality rates. Returns from these taggings are continuing. During the last few months the returns have been mostly from Canadian vessels since Canadian vessels have fished more in the area of tagging than the U.S. fleet.

Recent U.S. studies of scallop beds confirm previous opinions that the beds, once established, are stable in location. There are differences in the relative strengths of recruited year-classes from bed to bed, but the degree of variation in natural mortality between beds is small and appears low. There are marked differences in fishing intensity among beds from month to month.

The U.S. fleet continues to fish intensively on newly-recruited sizes. This was vividly demonstrated this year when the fleet moved to a new bed on the southeast part of Georges Bank. This population had been sampled by a research vessel in May when a large year-class was found having a modal size of 88 mm. The fleet started fishing this population in July when the mode had advanced to 92 mm and fished it until October when the vessels shifted to other grounds. About 3.5 million pounds of scallop meats were landed from this bed during the period. Posgay's calculations indicate that if the distribution of fishing effort remained unaffected the yield from this bed would have been about 30% greater for the same amount of effort, if fishing had been delayed one year. This calculation is based on a growth rate which is well established and upon a natural mortality rate of 10% which may be an over-estimate of the average annual natural mortality.

RECENT ADVANCES IN COD STUDIES

Subarea 5

Wise reported that cod landings by otter trawls from Subdivision 5Z increased from 14 million pounds in 1955 to about 19 million pounds in 1959. This has resulted from better recruitment, and perhaps from increased effort for cod because of lower landings of haddock. A possible slight, further increase in cod landings is anticipated in 1960 and 1961 because of the relatively high proportion of scrod cod in current landings.

As previously observed in Subarea 4, tagged cod move farther to the north and east than to the south and west. This movement may be related to the preference of cod for colder water as they grow to large size.

Subarea 4

Jean presented data on discards of cod from Canadian draggers fishing with 4 1/2-inch mesh codends during 1959 in Subdivision 4T. In June and July discards of small fish were 3% by number and 1% by weight. In August and September discards increased to 20% by number and 10% by weight, because of a change in culling practice as catches increased, and because of faster spoilage of small cod at this season.

A comparison of sizes of Subdivision 4T cod caught by hook and line and otter trawl, from 1951 to 1959, shows that lines generally catch and land larger cod than otter trawls. In some years the larger cod appear to concentrate in shoaler water, where they are available to longliners but not to draggers.

Observations on the abundance of cod in survey hauls in Subdivisions 4T, 4V and 4W show that few cod were caught at depths greater than 100 fathoms, either in winter or summer. Greatest concentrations of cod were found at temperatures of 1° to 3°C in 4W and 4V South in winter, of about 0° to 4°C in 4V North in the spring, and of less than 0° to 5°C in 4T in summer.

Marcotte reported for LaCroix that Chaleur Bay (4T) cod move off bottom with euphausiids, an important part of their food. Floating longlines, fished at 10 and 20 fathoms from the bottom, showed that euphausiids and 50- to 70-cm cod move vertically at night. They concentrate just below the thermocline, particularly when it is sharp.

Kohler described annual variation in growth of 4T dragger-caught cod. Larger sizes at each age in 1955 to 1957 are thought to be the result of more food per fish because of decreased density of cod and/or increased abundance of available food. Special collections of small cod are serving to clarify anomalies in otolith readings of 4T cod. The effects of varying amounts of food on cod growth were tested by controlled experimentation in tanks.

Dickie reviewed some problems raised by preliminary analysis of Subarea 4 data, particularly Subdivision 4T cod. Although available samples have indicated a variety of growth rates with area, gear, and time, it appears clear that all these fish are taken from the same stock, and are representative of parts of it fished in various ways. The assessment analysis should be able to predict effects of fishing change on the different parts of the stock represented, provided that data on length and age compositions and age-length keys are supplied separately for the components.

Problems of assigning catch and effort to particular stocks may be clarified by tag results.

RECENT ADVANCES IN HADDOCK STUDIES

Subarea 5

Wise reported that landings of Subarea 5 haddock decreased from about 100 million pounds per year from 1951-1957 to 80 million pounds in 1958 and 1959 because of relatively weak year-classes in 1953, 1955, and 1956. There is no indication from survey catches of small haddock or from catch-per-unit-effort data that much change can be expected in 1960 landings.

Subarea 4

McCracken described the commercial fishery for haddock in Subarea 4 and its relation to the distribution of fish by area, depth, and temperature, as determined from research vessel catches. The total annual landings are about 100 million pounds; about half is taken from the western Subdivision 4X and more than half the total landings are taken in winter (Feb.-April). Canada and the U.S. share the landings about equally. McCracken noted the limited area of commercial fishing in relation to total distribution, the differential distribution of different sizes of fish, the seasonal changes in the sizes of haddock available to the fishery in commercial concentrations, the apparent mixing of large haddock in Subdivisions 4T, 4V, and 4W, and differences in average size at each age between some survey results and commercial landings observations.

Subarea 3

Hodder reported no current haddock fishery on St. Pierre Bank (3P), and no significant survival of year-classes in 3P since that of 1949. The fishery by Canadian otter trawlers is now mainly in Subdivision 3O (deep) in winter and spring, and in 3N (shoal) during the latter part of the year. The 1949, 1952, and 1953 year-classes are being fished, but these fish have been declining rapidly in numbers since 1956. It is expected that the 1955 year-class will contribute a major part of the 1960 landings. Research-vessel surveys have shown poor survival of year-classes since 1955. A sharp decline in Subarea 3 haddock landings is anticipated subsequent to 1961.

When compared with older year-classes, the 1949 year-class was a slow-growing one. Recent year-classes in 1952, 1953 and 1955 are even slower-growing than that of 1949.

Research-vessel cruises have shown vertical movements of haddock, feeding on capelin, a deeper distribution of the large fish of a year-class, and reduced catches with 4 1/2-inch mesh manila codends as compared with smaller meshes.

REDFISH

Kelly gave a resume of the highlights of the Redfish Symposium held in Copenhagen in October 1959, stating that growth rate was no longer a major issue in redfish biological discussions. The problem of systematics, however, is still in a confused state. Discussions at the Symposium pointed out lines of attack but did not lead to any agreement as to the status of such entities as "marinus" and "mentella".

Kelly reported on his tagging experiments at Eastport, Maine. Tagged fish grow at a much slower rate than untagged fish. Holt pointed out that growth rates from tagged fish are still very useful for assessment purposes and can also be used for verifying growth rates determined from otolith examinations.

Magnusson briefly reviewed his studies of redfish biology which have to do with fertilization of eggs, sex ratios, migrations, and growth. He is currently working at Woods Hole with George Kelly under an arrangement between the Icelandic and U.S. governments. He also reported on trips to the ICNAF area on board Icelandic redfish trawlers.

Hodder described some studies of redfish in the Gulf of St. Lawrence which show the progression of length modes with time. Information on growth will be obtained from these studies.

FLOUNDER STUDIES

Yellowtail flounder

Annual yellowtail flounder landings from Subarea 5 have been as high as 70 million pounds and as low as 12 million pounds. The 1958 landings were about 32 million pounds. Lux reported on his studies of this species. It is fished on three principal grounds in the subarea: off southern New England, on Georges Bank, and off Cape Cod. Results of tagging experiments involving about 1,500 fish indicate that the Cape Cod fish are separate from the other two stocks, and that the Georges Bank and southern New England stocks are either a single stock or two intermingling stocks.

Age and growth studies indicate somewhat different growth rates for each of the areas.

American plaice

The American plaice is second to cod in the relative importance of Gulf of St. Lawrence (4T) commercial groundfish landings. Powles discussed plaice research in this area. Measurements of sizes of fish caught on research vessels and of those caught and landed by commercial draggers, with 4 1/2-inch mesh codends, showed commercial culling at about 34 cm and discards of 62%, 65%, and 73% by number in 1957, 1958, and 1959, respectively. Tagging, size-at-age, and maturity studies indicate two shallow-water stocks and a deep-water stock in the northern part of Subdivision 4T. About one quarter of the tagged fish are recaptured during 12 months following tagging. The growth of plaice taken in 1958 appears to be higher than that for samples taken in 1918 and in 1946 to 1949.

OTHER GROUNDFISH

Martin presented data on landings and sizes of groundfish other than cod, haddock, redfish, halibut, and plaice for Subarea 4. Pollock, hake, and witch flounder fisheries each yield annual catches of more than 10 million pounds. The sizes of these fish are large, and use of 4- to 6-inch manila meshes in codends would not affect landings.

LOBSTER SEMINAR

At a special session Wilder and Paloheimo described the calculated and observed effects of minimum size limits on a Canadian lobster fishery in Subarea 4. Attempts to observe effects of the size-limit regulations are obscured by the lack of data to take account of normal variations in recruitment and catchability. Models of the fishery show that benefits from reduced fishing effort are much greater than those to be expected from changes in size limits.

THE SUBAREA 5 HADDOCK REGULATION

Silliman reviewed the history of the Georges Bank haddock regulation. He pointed out that the large-mesh nets had been beneficial in various ways. Discards have been reduced to a negligible quantity, alleviating the necessity for culling at sea. The catches are cleaner and contain fewer unwanted fish such as hake, herring, etc.

He re-examined the strengths and yields of the 1948 and 1952 year-classes with a view towards evaluating effects of saving the small fish. On the basis of a length-frequency method, he concluded that the 1952 year-class was 1.07 times the size of the 1948 year-class. Taylor's method gives a figure of 0.9 and Paloheimo's 1.0. Silliman concluded that the two year-classes were of about equal initial size. He then pointed out that the 1952 year-class has now substantially passed through the fishery so that yield figures for ages 2-5 (nearly equivalent to total yield) are available for both the large pre-regulation 1948 year-class and the large post-regulation 1952 year-class. The comparison shows that the two year-classes produced about the same number of fish but the 1952 year-class produced about 20% greater weight of fish. Fewer fish were caught at age 3 but increased yields at ages 4 and 5 more than compensated for the lower catches at age 3. This is what had been predicted for the use of larger mesh gear.

Silliman also reviewed the assessment of the regulation, that is, the expected benefit computed on the basis of growth rates, mortality rates, and availability of fish. He took into account the differential distribution. Biological knowledge of differential availability of the smaller sizes on the banks was not used in the original computation of expected yields. The original theory assumed an availability of 1.0 for all ages. It now appears that age 1 has an availability of about 0.4 and age 2 about 0.7. Using these figures, Silliman arrived at predicted benefits somewhat smaller than those estimated from the original computations.

In the discussion of this paper, it was pointed out that evaluation of the regulation from all possible angles should continue, and that such factors as increased efficiency of the larger meshes, change in cull size, change in catchability, and increased size-at-age should be examined in relation to the increased yields per recruit obtained since regulation.

ASSESSMENT OF MESH REQUIREMENTS

The group discussed procedures to be followed in assisting the assessment task force in their assignment for the year. It was decided that the members of the task force present should meet together during these sessions to plan and schedule the data compilation and analyses required for their studies. A general partitioning of work among laboratories in the region was agreed upon and is tabulated below:

Woods Hole	- All species in Subarea 5; haddock in Subdivision 4X; redfish in Subdivisions 4V, 4W, 4X.
St. Andrews	- Cod in Subdivisions 4S, 4T, 4V, 4W, 4X; haddock in Subdivisions 4T, 4V, 4W; other groundfish (excl. redfish) in Subarea 4.
St. John's	- All species in Subarea 3; cod and haddock in Subdivision 4R; redfish in Subdivisions 4R, 4S, 4T.

The report of the assessment task force is attached as Appendix II.

The meeting expressed their appreciation for the participation in their discussions of Mr. Holt of FAO.

APPENDIX I : List of Participants

CANADA

St. Andrews:	John Hart, Chairman Neil Bourne Neil Campbell Lloyd Dickie Fabian Forgeron Yves Jean Carl Kohler Louis Lauzier Stuart MacPhail Robert Martin Frank McCracken Donald McLeese Carl Medcof Jyri Paloheimo Percival Powles Donald Wilder
St. John's:	Vincent Hodder
Dept. of Fisheries, Quebec:	Alexandre Marcotte

UNITED STATES

USFWS, Washington, D.C.:	Joseph King Ralph Silliman
Woods Hole:	Herbert Graham Allan Barker George Kelly Fred Lux Arthur Posgay Roland Wigley John Wise

ICNAF HEADQUARTERS:	Erik Poulsen Ronald Keir
FAO:	Sidney Holt
ICELAND (Observer):	Jakob Magnusson

APPENDIX II : REPORT OF MESH-ASSESSMENT COMMITTEE AT REGIONAL MEETING OF ICNAF SCIENTISTS ST. ANDREWS, N.B.

10-12 December, 1959.

Present: S. Holt (FAO, Convener); V. Hodder (Canada); J. Wise (U.S.); R. Silliman (U.S.); L. Dickie (Canada); J. Paloheimo (Canada); R. Keir (ICNAF).

The following plans were made for preparatory work for the meeting of the Assessment Group at Lowestoft in March 1960:

1. Subdivision of task by species, time, and place.

Responsibility is assigned as follows:

Woods Hole:	All species SA 5; haddock SD 4X; redfish SD 4V, W, X.
St. Andrews:	Cod SA 4 (except 4R); haddock SA 4 (except 4X); other species SA 4 (except redfish).
St. John's:	All species SA 3; cod and haddock SD 4R; redfish 4R, S, T.

Data will in general be worked up by years, countries, major gears and subareas. Where necessary, geographical breakdown will be taken to subdivision level, and notes on differential effects of possible mesh changes on fisheries by seasons (quarters) and more localized changes in particular fisheries will be appended to the general predictions.

2. Choice of mesh sizes for calculations.

Assessments will be made at least for mesh sizes of 4, 4 1/2, 5, 5 1/2, and 6 inches (manila codends or equivalent measures for other fibres) as follows:

a) 4-inch mesh for cod, haddock, redfish, and other species in all areas. This involves an increase in mesh at present used for redfish and a half-inch decrease in mesh used for cod and haddock in Subareas 4 and 5. In fact, the cod and haddock 4 1/2-inch mesh might continue to be used voluntarily even with a decrease in the legal minimum. Additional calculations using this assumption should be made for all cases where a mesh greater than 4 inches is at present used.

b) Meshes for all species in all subareas raised successively to 4 1/2, 5, 5 1/2, and 6 inches. Calculations will refer to the nets used by all types of otter trawlers and other bag-nets (e.g. Danish seines, pair trawls, etc.).

c) Smaller mesh sizes, approximating say the old 2 7/8 -inch mesh size, especially for those areas where the additional accumulation of data gives opportunity to review the previous calculations leading to mesh regulations or where the yield calculations indicate that the present mesh sizes may be above those mesh sizes which give maximum yield per recruit.

3. All calculations will be made in terms of weights of catches. Where absolute values are required they will be given in metric units (tons). Body weights of fish will be given in grams (to nearest gram).

Approximate relative values of the various species will be compiled where there are substantial differences, so that their effect on relative total value may be appraised at a later stage.

4. Calculations of immediate effects of mesh changes.

It was agreed that the present selectivity of many types of gear is insufficiently known to permit appraisal of the immediate effects of changes in them (trap mesh, hook size, etc.) which would cause their selectivity to be equivalent to that of 4 to 6 inch manila codend meshes. Calculation of immediate effects would therefore be confined to trawls and other towed bag-nets.

Length frequencies of catches and landings are entered on a per-mille basis. Size groupings follow ICNAF Sampling Yearbook standards except that flounders are treated in 2-cm instead of 1-cm groups.

It is thought that average length frequencies for about 3 recent years will be suitable in many cases for calculation of average percentage loss of landings in the first year after introduction of new mesh size. Where length-frequency composition varies greatly from year to year, an appraisal, by calculation for separate years, would need to be made of the expected range of per cent loss or its probability distribution. Changes in quantities which would be discarded will also be computed.

Calculation of immediate effects of introducing a certain mesh size depends on knowledge of the effective selectivity of currently used meshes. This is often not known, and in such cases the best estimate should be made, based on whatever mesh measurements are available, and appraisal made, by trial calculations, of the extent to which the first results are affected by erroneous choice of this. The extreme case is an assumption that the present gears are unselective; their catches would then represent the size composition of the accessible population, and calculation on this basis gives an estimate of maximum possible initial loss.

The effective mesh size of a fleet for which measurements are not available might in some cases be deduced by comparing the frequency distribution of its catches with that of another fleet fishing in the same area, and for which mesh measurements are available.

Selection curves used will be based on information summarized in ICNAF Ann. Proc. Vol. 8, 4, III. By plotting quartiles on arith-probability paper, selection curves having form of normal ogives can be derived; these are considered to be satisfactory for the present purpose. Where selection experiments have not been carried out for the largest or smallest meshes, the 50% point for these will be estimated by linear extrapolation of the graph of each 50% point against mesh size (thus not assuming invariability of "selection factor" with mesh size).

To facilitate uniformity, St. Andrews (McCracken via Dickie) will draw up a table of curves for the 4- to 6-inch meshes (all species except redfish) and send copies directly to other members of the group, and two to the ICNAF Secretariat, one of which to be sent to Beverton for his information. St. John's (Templeman via Hodder) will be asked to prepare and distribute a similar set of curves for redfish. These tables should be accompanied by the graph of quartiles against mesh size so that each participant can derive selection curves for the various estimates of meshes at present in use.

For species for which no selection curves are available the 50% selection points will be estimated as well as possible from consideration of:

a) Measurements of maximum girth;

b) Body weight/length ratios, compared with fish fairly similar in shape for which these ratios are known and also either girth or the measured selection point;

c) Selection curves of other species having body form nearest to that of the unknown one.

Upper and lower quartiles (25-75% points) should be estimated roughly from shapes of selection curves for similar species. On each work sheet should be indicated the way in which the selection curve has been derived including the values of the ratios, etc., used. For industrial fisheries the immediate effect of mesh change will be calculated separately for each species in the catches and the results summed.

Other groups of work sheets for species caught together should be identified as such.

Each participant will use the best available data for the relation of body weight (round, fresh) to length for each species in each area. Where measurements are not available for, say, a particular area for trawler-caught fish, it will be necessary to use data for an adjacent area, or catches by another gear or fleet of another country.

In the case of fast developing fisheries, it is recognized that the relative contribution of large fish to the catch is likely to decrease, then the relative immediate losses from increase in mesh size would be greater.

5. Long-term effects of mesh changes.

Estimation of these is a research problem for which general rules cannot be laid down since the necessary parameters of mortality (due to fishing and to natural sources) and growth, or particular combined functions of them will be estimated in different ways in different situations. It was agreed, however, that in making the initial step in appraisal, calculations would be made along the following lines, and participants would, if possible in time available, begin investigation of the errors likely to be introduced by making the approximations noted.

From the current mesh selection curve the length frequency of the accessible stock can be computed. From the shape of the left-hand (ascending) part of this distribution, an approximate curve of recruitment as a function of fish length can be deduced. Thus, for each mesh size a mean length at entry to the exploited phase can be computed as the mean of the derivative of the ogive obtained by multiplying the recruitment curve by the mesh selection curve. For purposes of further calculation it is assumed that entry to the exploited phase is of "knife-edge" type at these mean lengths. The curve of average weight against age of fish is used to estimate the mean time-delay (Δt) of entry to the exploited phase caused by a particular increase in mesh size, corresponding with the calculated increase in mean length at entry. Fish of all sizes greater than the new entry length will be increased in number by the fraction $e^{+F\Delta t}$ where F is the average fishing mortality exacted by trawlers using the smaller mesh of fish between the current mean length at entry and the mean length at entry which would result from use of the larger mesh. The catch in weight of fish of these sizes will be increased in weight by the same fraction.

That value of F at which this weight increase equals the initial loss is the minimum value of F which would have to be observed before the particular increase in mesh would have a long-term beneficial effect.

In cases where F has been measured, or its order of magnitude can be estimated, the per cent benefit can be similarly calculated. Where F is not known but total mortality can be estimated, the maximum possible long-term benefit is calculated by assuming that there is no natural mortality.

If possible, an appraisal will be made of errors in the predictions caused by the use of:

a) curves of weight at age in catches, instead of true growth curves unbiased by gear selection or differential availability by size to different gears;

b) curves of average length at age which ignore the real variation or spread of length (and weight) at age;

c) the assumption of "knife-edge" entry to the exploited phase. If time permits, the errors due to this approximation and to the use of average and observed growth curves in place of the true growth may be investigated in detail.

Calculations can be made in the above manner for the assumption that fishing effort does not change. Parts of yield curves sufficient to show their general shape will also be calculated, especially near to the present situation (if this can be estimated), to indicate changes to be expected from both increases and decreases in effort. These curves will also permit appraisal of effects of possible changes in the efficiency of gear resulting from the mesh changes.

Attention of the responsible administrators will be drawn to the need to make available their prognostications of changes in sizes of fleets in coming years, if the results of such calculations are ever to be realistically applied to the fisheries.

The calculations outlined above relate to the trawler-caught fish. Their results therefore give estimates of minimum benefits (or maximum losses) to the entire fisheries. Estimates of maximum benefits (or minimum losses) might be obtained by calculations based on the assumption that the fish in catches by other gears, of sizes above the mean size of entry to trawler catches, will be increased or decreased in the same proportions as in the trawler catches. This is in effect based on an assumption that the trawler catches and catches by other gears all come from the same completely mixed stock, at least as far as the fish above the mean size at entry to trawler catches are concerned.

Calculations of long-term effects can be made for a range of values of mortality rates. It is then necessary to locate the point representing the present situation on these curves. Limits can be set by estimation of the total mortality from catch per unit effort at successive ages, and assuming alternatively that F is nearly zero or M is zero. These mortality estimates will be supplemented where possible by estimates from tagging experiments. Where survey data are available, catches per unit effort should be used to supplement estimates of apparent mortality from catches per unit effort by the commercial vessels.

Where data for discards are inadequate, assumption that there is in fact no discarding at present results in estimates of minimum long-term benefits.

Growth data present few problems in these fisheries. The redfish growth will be taken as the "slow" rate recommended by the Redfish Symposium to be provisionally accepted. It is pointed out, however, that even if this is in fact wrong it is not likely to lead to any considerable errors in the prediction of the effects of mesh change made by the methods described.

6. Other conservation measures

Changes in fishing effort are covered by the calculations outlined above, and their results will therefore indicate the possible benefits of regulation of fishing effort. Calculations cannot be made at present of the effects of closed seasons or areas.

Effects of minimum legal size limits, associated with minimum mesh sizes, can easily be calculated. As a first step, the losses (by discard) to be expected by setting size limits equal to the 50 per cent mesh selection lengths will be calculated.

PART II. SELECTED PAPERS

1. Scientific Papers

I. Selection of Georges Bank Scallops by Canadian Draggers

by Neil Bourne, Fisheries Research Board of Canada, St. Andrews, N.B.

(submitted to ICNAF, May 1960)

I Status of Canadian Scallop Fishery

In 1959 the Canadian scallop fishery continued to expand. This expansion was due to increased landings from Georges Bank which in 1959 amounted to 4.3 million pounds, a 64% increase over 1958 landings. Increased landings appear to be due mainly to increased effort.

The offshore fleet continues to use drags in which the bag is knit with steel rings having an inside diameter of 3 inches. Consequently, large quantities of small, non-commercial sized scallops continue to be landed on deck, but only the larger scallops are shucked by Canadian crews, the 50% cull size being scallops between 95 and 100 mm in shell diameter. From the results of four sea sampling trips made in 1959, it is evident that over 50% of the catch is composed of small scallops which are discarded.

In the latter part of 1959 a new fishing practice by Canadian scallop vessels developed, namely, loading the deck. Under present conditions, if the boats fish continuously, more scallops are caught than can be shucked. The boats fish until the deck is loaded with scallops and then lay to until the catch is shucked. Consequently, there is no incentive for the crews to lower their cull point since this great reserve of scallops remains on deck. There is also no need for the boats to fish harder since they are more than able to saturate the shucking power of the crew. At the present time most of the boats are taking on extra crew members in an attempt to make greater use of the boat's fishing power. It is evident then that landed catch cannot be taken as an accurate indication of catch per unit effort.

II Effect of Increased Ring Size on Offshore Scallop Catches

Several experiments have been carried out to determine the effect of different ring sizes on scallop catches. The St. Andrews Station investigated this problem for the inshore Digby fishery between 1948-52, inclusive. Portions of the results have been reported by Medcof (1952) and Dickie (1955) but most of the data are in unpublished manuscript reports of the Station. Posgay (1958) has published on similar work using different sized rings on offshore drags.

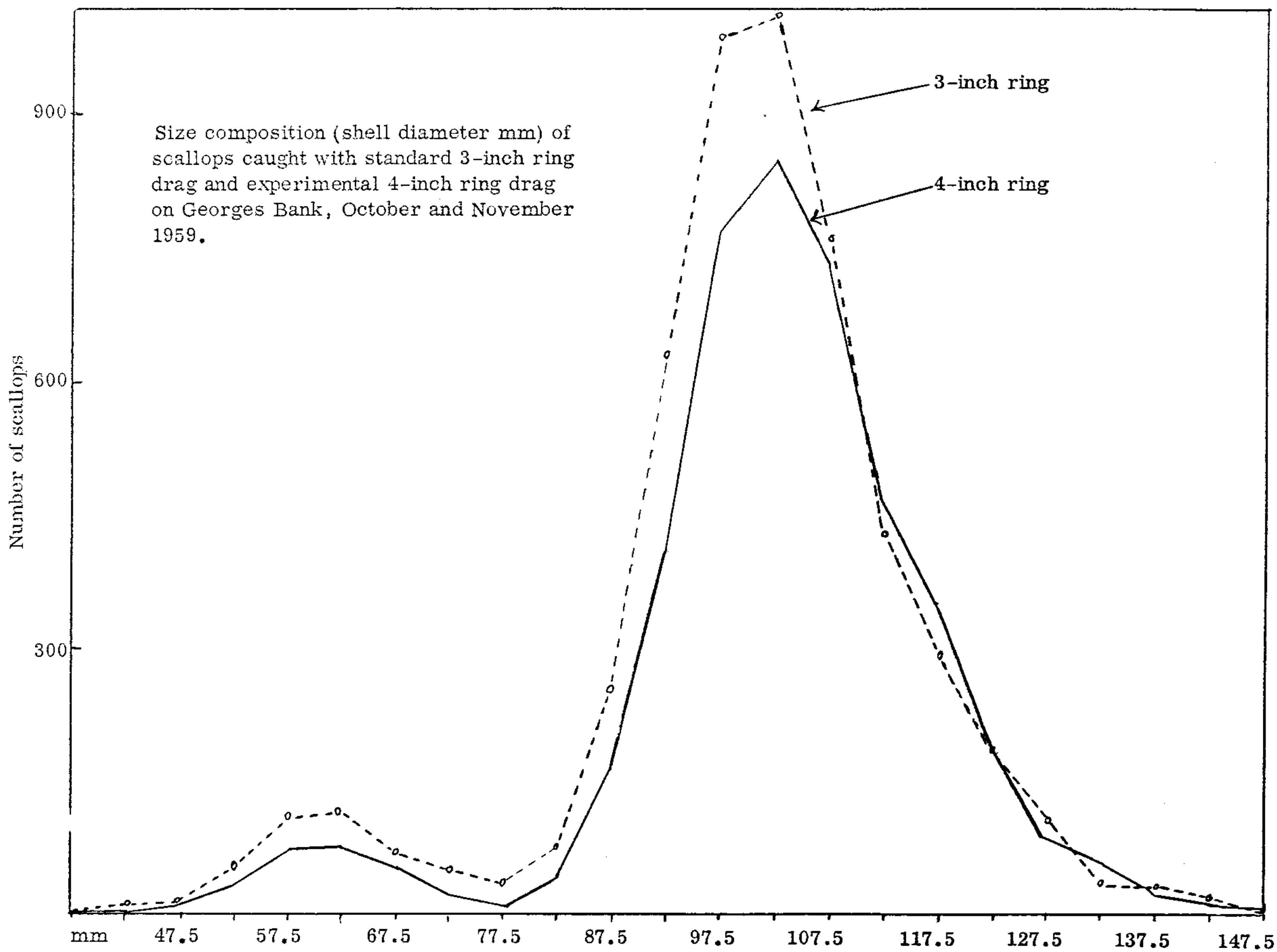
The results of these gear trials may not be entirely applicable to the Canadian offshore scallop fishery. Digby drags (MacPhail 1954) differ markedly from those used by the offshore fleet, described by Posgay (1957). Posgay (1958) in his gear research work used offshore drags in which the rings were all singly linked. This is rarely, if ever, the case with the Canadian offshore fleet, the rings often being joined with four or five links. Hence, internal ring diameter itself rather than the inter-ring space may be the factor determining size selection for scallops.

The present paper gives the results of two series of observations comparing the catches made with an offshore drag having rings of inside diameter 4 inches with a drag which had the standard 3-inch inside diameter rings. Trials were carried out on a commercial scallop boat, M. V. "Aegir" (George Crouse, skipper), in October and November 1959 while commercial fishing was in progress. The drag with 4-inch rings was fished on one side of the boat and the 3-inch ring drag on the other so that they fished the same bottom. Since our observer could not interfere with the commercial operations of the boat, we did not obtain all the samples that we would have liked but it is felt that sufficient data were obtained to make the results worth reporting.

The accompanying figure gives the combined results of two series of observations. The method used to plot the results was to equalize numerically all the data over 105 mm and then calculate the number of scallops caught by the 3-inch ring drag from this corrected value. The 105-mm point was selected since scallops larger than this would be retained by a 4-inch ring. Furthermore, even in a new 4-inch ring drag the linkage is such that no scallops larger than 105 mm would escape through the drag. This method for calculating the selection of the large ring drag may not be the best. It was hoped that we could compare the two drags on a catch-per-tow basis. However, the data will not permit this and the above method is the best available.

The figure shows that selection does take place by the larger ring drag and fewer small scallops were caught. Further indication of this result was reported by our observer and Captain Crouse, both of whom observed that fewer small scallops and less trash were brought up by the 4-inch ring drag. The results obtained agree fairly well with those for a 4-inch ring reported by Posgay (1958), although the apparent selectivity of our gear was somewhat lower. We believe two factors contributed to this discrepancy: (a) the overlap in selection range for the 4-inch and 3-inch rings would tend to reduce the apparent selectivity of the former; and (b) multiple linking of rings in the commercial gear would tend to reduce escapement through the inter-ring spaces. That the latter is a factor is indicated by the fact that the selection for the October trip agreed more closely with Posgay's data than the selection for the November trip. On the former trip the bag of the drag was new and few links were used to join the ring but on the latter trip the rings were joined with as many as four links. The inter-ring space on the November trip was much reduced and the entire selection was probably done by the rings. Apparently the selectivity of the drag was reduced with increased linkage.

It appears that the large-ring gear is approximately 10% more efficient than the standard gear at catching market size scallops (see following table). The data presented in this table resulted from accurate measurements of the contents of both drags from 11 tows. The observations were all made during the October trip. In these 11 tows the standard drag landed 86 bushels of markets and the large-ring drag 94 bushels, an increase of about 10%. The large-ring drag continued to catch as many and probably more markets as compared with the standard gear, but brought up less trash and small scallops, which made the catch easier to cull.


Size composition (shell diameter mm) of scallops caught with standard 3-inch ring drag and experimental 4-inch ring drag on Georges Bank, October and November 1959.
3-inch ring
4-inch ring
Number of scallops
900
600
300
mm
47.5
57.5
67.5
77.5
87.5
97.5
107.5
117.5
127.5
137.5
147.5

Number of bushels of market size scallops caught in 11 paired hauls by 4-inch and 3-inch ring drags on Georges Bank, October, 1959

	4-inch ring drag	3-inch ring drag
	12	12
	11	10
	10	9
	15	13
	5	5
	8	8
	4	5
	10	8
	10	7
	7*	11
	9	9
Total	94	86

*this tow is deleted from the results since the 4-inch ring drag was believed fouled during dragging.

It is unfortunate that the trials were not more extensive but several tentative conclusions can be made concerning the 4-inch ring size drag: (1) It brings up fewer small scallops which simplifies culling and possibly helps conserve the stock; (2) It appears to be more efficient at catching commercial-size scallops; (3) It brings up less trash which simplifies culling; (4) It is slightly cheaper to build; (5) The bag lasted for a normal length of time; (6) The rings which were made of the same gauge wire as standard rings showed no distortion during the course of the experiment. Perhaps the best indication of its superiority over the standard ring gear was the fact that Captain Crouse continued to use it after the trials were finished, since he felt it was advantageous to fish with it.

References

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Medcof, J.C. 1952. Modification of drags to protect small scallops. Fish. Res. Bd. Canada, Prog. Rept. Atl. Coast Sta., No.52, pp. 9-14.

Posgay, J.A. 1957. Sea scallop boats and gear. Fisheries Leaflet 442, U.S. Dept. Int., Fish and Wildlife Service.

Posgay, J.A. 1958. Maximum yield in the sea scallop fishery. ICNAF Document 28, Serial No. 554.

II. Selectivity of Codends with Various Types of Topside Chafers

by F.D.McCracken, Fisheries Research Board of Canada, St.Andrews, N.B.

Various forms of topside chafers for otter-trawl codends have been suggested to replace the "full skirt" of old codend netting used commonly by larger Canadian trawlers. Two suggestions have been to use (a) chafing gear of extra large mesh, and (b) short overlapping flap chafers. The latter possibility was first suggested to us by Captain Michelet of France in the winter of 1957. It has since been reported that a few British distant-water trawlers currently use this method (Beverton 1959) and some tests of its effect on codend selectivity have been reported by the same author.

The following paper reports the results of tests on types of topside chafing gear which included those mentioned above. Two of these experiments were carried out with the 107 ton research vessel "Harengus" during portions of two cruises, in September 1959 to the Sable Island Bank region, and in late October 1959 to the southwestern Gulf of St. Lawrence. The third series of tests was carried out with the 750 ton research vessel "A.T.Cameron" in the Emerald-Sable Island Banks region during a cruise in March 1960.

Methods

The covered-codend method of measuring selectivity was used throughout the tests. Fishing from the "Harengus" was carried out with a #36 manila trawl (headrope 60 feet); from the "A.T.Cameron" with a 41 manila trawl (headrope 79 feet). Codends and chafing pieces were all of double-strand, 75 yard, 4 ply, manila twine. Single-piece chafers were attached at their forward end across the width of the codend four codend meshes ahead of the splitting strap. They were fastened along the laceage (selvedge) and terminated four codend meshes ahead of the codline mesh. The varying widths and mesh sizes tested are tabulated below. All mesh measurements were made with the ICNAF type wedge gauge with pressure handle.

The flap-type chafer pieces were about eight meshes deep and the width of the laceage wider than the codend. They were attached along their forward edge across the codend, overlapped each other by about one mesh and the aft flap extended back to about 8 inches from the codline mesh.

The following groups of hauls were made:

Series I: "Harengus", September 1959; predominant species haddock.

No. of tows	Codend mesh size		Topside chafer			Remarks
			Mesh size		Width	
	in.	mm.	in.	mm.		
4	4 1/2	114	--	--		No chafer
4	4 5/8	117	5 1/16	128	Laceage wider	(by 8 meshes)
5	4 5/8	117	5 3/16	132	50% wider	
6	4 3/4	121	--	--		No chafer
6	4 3/4	121	5 3/16	132	50% wider	
4	4 3/4	121	--	--		No chafer
6	4 3/4	121	--	--		No chafer
6	4 3/4	121	5 1/8	130	Laceage wider	(by 8 meshes)

Series II: "Harengus", October 1959; predominant species cod.

No. of tows	Codend mesh size in.	Codend mesh size mm.	Topside chafer Mesh size in	Topside chafer Mesh size mm.	Topside chafer Width	Remarks
5	4 1/2	115	--	--		No chafer
6	4 1/2	115	4 5/8	118	Laceage wider	(by 5 meshes)
4	4 1/2	115	--	--		No chafer
8	4 1/2	115	7	180	Laceage wider	(by 5 meshes)
Series III: "A.T.Cameron", March 1960; predominant species haddock.						
14	4 3/8	112	--	--		No chafer
4	4 3/8	112	4 1/4	108	Flap chafer	
7	4 3/8	111	6 1/2	165	Laceage wider	(by 6 meshes)

Results

Haddock: The results for haddock are summarized in Table I, Series I and III. They show that for the sizes of catches encountered:

(1) Codend mesh selection for haddock is similar to earlier covered-net experiments. Selection factors ranged from 3.0 to 3.5 with a mean selection factor about 3.2.

(2) Chafing gear of about 3/8 to 1/2 inches larger than the codend mesh (about 5 1/8-inch chafers -- 4 3/4-inch codend) reduced escapement markedly when applied tightly.

(3) Chafing gear similar to that in (2) applied loosely, about 50% wider than the codend, did not reduce escapement appreciably.

(4) Chafing gear of mesh size about 2 inches larger than the mesh of the codend (about 6 1/2-inch chafer -- 4 3/8-inch codend) applied tightly, reduced the selection factor by only about 0.1.

(5) Flap-type chafing gear of slightly smaller mesh size than the codend gave results almost identical to (4). In both (4) and (5) the reduction is within the usual range of experimental variation.

In one instance chafing gear tightly applied reduced the selection factor for cod but did not affect the shape of the selection ogive. In another instance, the selection factor was reduced only slightly, but the selection ogive was materially flattened as shown by the wide range between 25 and 50% retention lengths.

Cod: Selection results for cod are summarized in Table I, Series II. Only a few cod were taken during the other experiments. Selection factors for cod from codends without topside chafers were about 3.3. Tight application of chafing gear of about the same size mesh as the codend (4 5/8-inch chafer -- 4 9/16-inch codend) and tight application for large-mesh chafers about 2 1/2 inches larger mesh than the codend did not reduce the selection factor for cod nor alter the shape of the selection ogive.

Table I. Topside chafing gear experiments, 1959-60.

Series I. 4 1/2-4 3/4 inch (114-121 mm) mesh codend, haddock predominant.

No. of tows	Chafer	Catch: Approx. baskets all species	Catch: No. main species 30-50 cm	Retention length 25%	Retention length 50%	Retention length 75%	Selection factor
4	None	45	1400	31	34	36	3.0
4	5 1/16" mesh tight	90	3000	27	31	34	2.6
5	5 3/16" mesh loose	63	3500	32	36	40	3.1
6	None	85	5100	36	39	43	3.2
6	5 3/16" mesh loose	150	7800	35	39	43	3.2
4	None	35	2100	37	40	44	3.3
6	None	75	3700	40	42	46	3.5
6	5 1/8" mesh tight	70	3500	30	40	45	3.3

Series II. 4 1/2 inch (115 mm) mesh codend, cod predominant.

No. of tows	Chafer	Catch: Approx. baskets all species	Catch: No. main species 30-50 cm	Retention length 25%	Retention length 50%	Retention length 75%	Selection factor
5	None	15	700	35	38	42	3.3
6	4 5/8" mesh tight	40	1500	35	38	42	3.3
4	None	35	1100	35	38	41	3.3
8	7" mesh tight	50	1443	36	40	43	3.5

Series III. 4 3/8 inch (111 mm) mesh codend, haddock predominant.

No. of tows	Chafer	Catch: Approx. baskets all species	Catch: No. main species 30-50 cm	Retention length 25%	Retention length 50%	Retention length 75%	Selection factor
9	None	115	1300	34	37	39	3.3
4	4 1/4" mesh flap type	55	1100	33	36	38	3.2
7	6 1/2" mesh tight	82	2200	33	36	38	3.2

Discussion

It appears that at the size of catches encountered in these experiments, loose topside chafers, large-mesh topside chafers and flap-type topside chafers had little effect on selectivity of the codend. Based on these experiments there was little to choose between the three types in relation to effect on selectivity (the flap-type chafer was not used extensively).

Tightly-applied chafing gear, of mesh size slightly larger than the codend, had no effect when catches of cod were small. The same chafer reduced escapement of haddock when catches were somewhat greater. No really large catches were made at any time during these experiments with topside chafers. It may be that extra large catches would cause the loose topside chafer to alter escapement. Large catches would seem less likely to affect selectivity results with large-mesh chafers or with flap-type chafers. Beverton (1959) presents some evidence to show that this is so for large-mesh flap-type chafers.

Various experiments have shown that selectivity of the codend is related to material, duration of haul and size of catch as well as other factors. The addition of topside chafers adds yet another complicating factor. From the experiments to date, the chafer likely to have least effect on escapement appears to be the flap-type pieces of netting with mesh size considerably larger than the codend.

Reference

Beverton, R.J.H. 1959. The selectivity of a modified form of topside chafer. Int. Council for Exploration of the Sea, Compar. Fish. Comm., Paper 117.

2. Communications from Other Organizations

I. Collaboration between FAO and ICNAF 1959/60

by FAO Fisheries Division

The following notes report action taken by FAO Fisheries Division in response to recommendations in the report of the Ninth Annual Meeting of ICNAF and other aspects of the current work of the Division of interest to the Commission. The paragraph numbering follows that given in the previous Report in ICNAF Standing Committee on Research and Statistics Proceedings and Selected Reports 1959 Annual Meeting p.27-30.

1. Follow-up of Joint Scientific Meeting of ICNAF/ICES/FAO, Lisbon, 1957.

1. 1 Publication of Report and Contributions

This has been further delayed by a series of unfortunate events. Dr. Walford's illness in 1959 held up for some time the editing of the papers and the preparation of the Introduction to the Report. This was followed by the manuscript going astray in the post between Washington and Rome. Consequently it was not possible to print these documents during the FAO financial biennium 1958/59. We have again made budget provision in the biennium for 1960/61. The proceedings of the meeting will be produced in two volumes. The first volume, containing the Chairman's introduction and the reports by convenors of working groups, is in the press now. Volume 2 will appear later because staff changes in FAO have delayed the final editing of the contributed papers.

1. 2 Standard Notation and Terminology for Fishery Dynamics

A dictionary has been prepared in about 20 languages through the cooperation of scientists in many countries who are active in population dynamics research. This is at present in the press and will be issued in the FAO Fisheries Study series. A number of copies will be made available to ICNAF.

1. 3 An International Journal of Fishery Dynamics

There have been some discussions concerning the composition and function of an international Editorial Board and of a Panel of Referees. It is hoped during 1960 or early 1961, to convene a meeting of the provisional Board. The publishers are willing to go ahead with the Journal when the Current Bibliography is well established (see paragraph 6 below).

1. 4 Mathematical Tables for simplifying stock assessments.

Provision has been made for publishing these, but the Lowestoft Fisheries Laboratory has not yet been able to complete the draft.

1. 5 Comparative Population Studies

Publication of the paper by Beverton and Holt referred to last year (Ciba Foundation, Colloquia on Ageing - Volume 5 - the Life Span of Animals - 1959 - pages 142-180) has been followed by a study of the relations between parameters of growth and mortality and the size at maturity. A paper will be published by the British Ecological Society describing how knowledge of size at maturity might be used to permit stock assessments in the absence of age determination or when age determination is uncertain. Comparative growth rate, mortality and maturity studies have also been made for sardines and related species (see 4.3 below) and will now be undertaken for the marine perches.

2. Methodological Manuals

2. 1 Sampling Methods

Mr. Gulland has completed the draft of the first section of the Sampling Manual. Unfortunately he has been fully occupied with North Atlantic assessment work in recent months, but if he can prepare the remainder of the draft the manual will be published by FAO this year.

2. 2 Stock Assessment Methods

Provision has been made for publication during 1960/61.

2. 3 Field and Laboratory Methods.

The Field Methods Manual is at present in the press in English, French and Spanish versions. Revision of the Laboratory Methods Manual first draft is nearly completed and provision made for publication in 1960/61.

2. 4 Gear Selectivity

Mr. Akyuz, who is now on the FAO permanent staff, participated as planned in the International Comparative Fishing experiment in the North East Atlantic in 1959. Provision has been made for publishing a gear selectivity manual in three languages.

2. 5 Fish Marking

The International Association for Limnology has not yet completed the review of fresh water fish marking. Meanwhile, material has been collected by FAO for the preparation of a section on marine fish marking and provision made for publication. It is hoped to complete the draft before the ICNAF Tagging Meeting.

2. 6 Fishery Science

The manuscript of this general introductory manual is now ready for publication.

3. Co-ordination of fisheries statistics

The joint ICES, ICNAF and FAO Meeting was held as planned in Edinburgh in 1959. Agreement was reached on several matters including the preparation of a common standard reporting form for North Atlantic statistics. A continuing working party was set up, the first meeting of which will take place during the 1960 ICNAF meeting.

4. Other Meetings

4. 1 FAO is convening a Technical Meeting on the Economy Effects of Fishery Regulations. This will probably be convened in Ottawa just after the ICNAF meeting in Washington, D.C., in 1961. Professor Antony Scott has drafted a review paper on the Economics of Regulating Fisheries, and Biology Branch has invited Dr. Dickie to prepare a review of the biological bases to regulation.

4. 2 The paper on "Measurement of Fishing Power", published in the ICNAF Annual Proceedings Volume 9 has been distributed widely outside the North Atlantic area. Reprints of it have been in great demand, and it has been republished in the Indo-Pacific Fisheries Council Current Affairs Bulletin No. 27 for April 1960.

4. 3 The FAO World Meeting on the Biology of Sardines and Related Species was held in Rome in September 1959. Reports and contributed papers have been edited and will be published this year. The success of this meeting led to a request to FAO to convene a similar meeting on tunas. The FAO Conference in November 1959 accepted this proposal, but it was suggested that the tuna meeting should deal with the economics and technology of tuna fishing industries as well as with biology. The meeting will be held in 1962, probably in the United States. A panel of consultants for preparing the biological section of the meeting has been set up. The prospectus is being drafted and will be distributed together with specific requests for contributed papers during the next few months.

Some regional meetings dealing with tunas will be a valuable preliminary for the world meeting. The General Fisheries Council for the Mediterranean is holding a special discussion on tuna biology at its next meeting. The Commission for Technical Collaboration in Africa south of the Sahara is convening in 1961 a special symposium on African tuna fisheries and we understand that there is likely to be a symposium on Pacific tunas during the next Pacific Science Congress in Honolulu.

4. 4 Collaboration between FAO Fisheries Biology Branch and SCOR continues, particularly with regard to the Indian Ocean project. Biology Branch is preparing an oceanographic bibliography pertaining to that area.

4. 5 FAO Fisheries Division has held discussions with representatives of UNESCO and WMO with a view to establishing a joint programme for the promotion of international oceanographic work. Following these discussions the Division participated in the Preparatory Meeting in Paris for the Intergovernmental Conference on Marine Sciences being convened by UNESCO. The Division will be represented at this conference at Copenhagen in July 1960 and has put forward proposals for cooperation in oceanographic matters between the various interested agencies of the U.N. The Biology Branch

has prepared two documents for this meeting. One of these, prepared in collaboration with regional fisheries commissions and councils, including ICNAF, describes the oceanographic programmes of various international organizations. The other document describes in detail the intelligence service being built up by the FAO Fisheries Biology Branch including the preparation and publication of the Current Bibliography (see paragraph 6 below).

4. 6 An assessment of uniform mesh regulation in the North West Atlantic.

The Division has been very pleased to cooperate with ICNAF by the participation of one of its staff in the Meeting of Scientific Advisers to Panels at St. Andrews in December 1959 and in the ICNAF Working Group on Uniform Mesh Assessment which met in Lowestoft in March 1960 and again at Bergen immediately before the 9th Annual Meeting.

4. 7 Symposium of the Indo-Pacific Fisheries Council on Fish Behaviour, Colombo, 1958.

The Report and papers from this symposium, some of which were contributed by workers in North Atlantic countries, have been edited for publication in the proceedings of the IPFC.

5. The preparation of synopses on the biology of various commercial fish species and groups has continued. Synopses on sardines and related species will be contained in the proceedings of the meeting referred to in paragraph 4.3 above. A draft synopsis on cod has been prepared by Mr. J. Wise and copies distributed to other experts in the North Atlantic area for review. In 1960/61 priority will be given to preparing synopses on tunas and on fresh water species used in intensive fish culture. Synopses already prepared in draft and distributed in mimeographed form will be revised and provision has been made for their publication in a loose-leaf series. Consultants will be employed for revision of the material received from the U.S. National Research Council.

6. Current Bibliography for Aquatic Sciences and Fisheries

The Bibliography is being published by Messrs. Taylor and Francis of London on a subscription basis. A copy of each issue will be made available by FAO to the ICNAF Secretariat. There has been some delay in issuing the printed version, but the first two parts of the 1960 volume will be issued soon, and it should be up to date by the end of this year. The Bibliography had grown greatly in size, but we hope to maintain it as a comprehensive list. As well as the taxonomic, geographic and author indexes which were in the mimeographed version, the printed version will contain subject and citation indexes. The subject indexes are prepared by Mr. A.R. Margetts through an arrangement with ICES. The classification used at present is a slightly modified form of the arrangement used by ICES for the "Current Bibliography" in its Journal, now discontinued. Meanwhile, the draft FAO Decimal Classification for Fisheries Science is being revised and at an appropriate time, the subject indexes to the Bibliography will be adapted to that classification. The citation index provides a means of tracing cross references between the various documents listed, so that it is possible to find the publications which have subsequently cited any particular previous publication.

The current Bibliography now contains annotated references to fisheries legislation prepared by the FAO Rural Legislation Branch, and announcements, reports of meetings, especially international ones of interest to fisheries biologists.

7. Intelligence Service

The basis to an Intelligence Service dealing with fisheries research having been laid in the establishment of the Current Bibliography, the Branch is now preparing the next stage to establish a series of reports on the status of research. A necessary preliminary to this is to complete a register of research institutions. This is cross-indexed with the Current Bibliography, the register of fisheries research workers and oceanographers, and with the World List of Periodicals for Fisheries Science. A revision of the latter document will be published in the present biennium. In preparing a register of research institutions FAO is collaborating with UNESCO and also with the Committee for the International Directory of Marine and Fresh Water Biogeography and Research Institutions of the World, the secretary of which is Prof. Hiatt.

8. Bio-geography of Marine Organisms and World Fisheries Atlas

For some years Biology Branch has been considering the publication of a World Atlas summarizing oceanographic features related to the distribution and abundance of fish, geographic aspects of fishing activities and of climatic conditions which affect them. Collaboration is being sought with the sponsors of the "Journal of North Atlantic Marine Bio-geography". It is proposed to convene during the present biennium a small meeting of consultants to develop the final plans. It is proposed that the Atlas be issued in fascicules as groups of charts are completed. These charts will be based on the illustrations to regional fisheries and oceanographic synopses prepared by the branch, together with some special world summary charts. Several regional synopses have been drafted during the past few years and the branch has recently had the benefit of the advice of Prof. Hela (Finland) concerning the arrangement of each synopsis. Following the plan he outlined, synopses on the oceanography of the North Sea and of East African waters are now being drafted. They will be submitted to consultants for review in the same manner as the species synopses, and for advice on the publication of the revised versions.

9. Vessel Characteristics Related to Fishing Power

In response to the request from ICNAF for suggestions, Technology Branch (Mr. Traung) has proposed to the ICNAF Secretariat that if details of the propellers of a small selected group of trawlers, for which reasonably good estimates of relative fishing power could be obtained, were assembled, the Branch would undertake a study to devise a single index for each propeller to be related to the fishing power. If a useful relation were found, it might be possible to prepare a simple chart from which fishing power might be predicted from limited information about the propeller. It was also suggested that an examination be made of the relation between fishing power and length between gallows.

II. Address from the World Meteorological Organization, by Finn Spinnangr to Plenary Session of Commission, 1960 Annual Meeting

Mr. Chairman,

As representative of WMO, I ask your permission to say a few words in connection with the following two items considered by your Standing Committee on Research and Statistics (Report of Environmental Committee, 1960 Proceedings No.4, App.V):

1. Fisheries Hydrography, page 3.

In addition to what is said there, I can mention that observations of sea surface temperatures have been made since about 1920 on the Norwegian America Line's ships plying the North Atlantic route. These observations are taken every six hours and included in the meteorological telegrams. For many years such observations are also made on some other Norwegian cargo liners on the same route. All observations are taken with tested instruments. The observations from all years are filed in our Institute, and we should be glad if this material might be utilized by some of you.

2. Liaison with WMO, etc.

As to what is said on page 5 under item (1), WMO will be very pleased by the statement of ICNAF's willingness to collaborate on projects of interest to both organizations. The Secretary-General of WMO has asked me to stress the Organization's willingness to examine thoroughly and expeditiously any meteorological problem referred to it.

In this connection I can inform you, that a year ago a Working Group on the Relations with the International Fisheries Organizations was established with Dr. Terada, Japan, as chairman. We have been working by correspondence, and agreed upon a number of recommendations which, although without official status as yet, will be examined by the Commission for Maritime Meteorology, which is going to meet in Utrecht in the middle of August this year. We will probably not have time to read all these recommendations here today, but there is one fundamental thing which I would like to mention. The meteorological services in maritime countries have long ago established a forecasting service for fishermen and seamen, and we are constantly working on the improving of this service. As you certainly know, an increasing number of merchant ships have, since about 1920, been equipped with instruments and have been sending weather telegrams to the meteorological services every six hours. Today a number of about 3500 so-called selected ships are taking part in this programme and are sending us weather messages in full code. But, as you know, the world's shipping is taking place mainly along special belts, and there are vast areas of the sea, without regular shipping, and some areas where ordinary merchant ships probably will never come. The only way to get weather information from these areas is by means of fishing skippers operating there. It is of basic importance to the weather service for such areas and for the weather services on the whole, that we get as many good weather observations as possible. This basic and valuable help to the weather services of all countries will pay to the fishing industry, because we will be able to give more reliable and adequate forecasts in return.

We already receive several such observations, f.i. from British and German fishing vessels in the West European waters, sent in an abbreviated weather code, and they are of a great value. I am sorry to say that Norway is somewhat behind in this respect, but we are steadily working on getting more observations. Of course, all the research vessels of the Norwegian Directorate of Fisheries are sending weather telegrams in full code when on cruise.

As an old weather forecaster, I would like to use this opportunity to ask all members of this Commission to do their best in encouraging the fishing skippers of their countries to collaborate in this world-wide weather reporting programme.

3. Bibliography

I. Halibut Bibliography

prepared by F.D.McCracken

Following Commission's request in the 1959 Annual Meeting, lists of papers on halibut from the N. Atlantic area were solicited by the Secretariat. The following is a compilation of these lists.[1] Papers distributed as documents for ICNAF meetings are not included. Papers concerned with the Pacific halibut, *Hippoglossus stenolopis*, are not considered.

Bigelow, H.B. and W.C.Schroeder. 1953. Fishes of the Gulf of Maine. Bull. U.S. Fish and Wildlife Serv.,53: 249-258.

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Dahl, K. 1898. Beretning om Fiskeriundersøkelser i og om Trondhjemsfjorden 1898. Vidensk. Selsk. Skrifter. No.10, pp.55-57.

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Goode, G.B. 1884. The food fishes of the United States. Fisheries and Fishery Industries of the U.S., Sect.1, pp. 189-197.

Goode, G.B. and J.W.Collins. 1887. The fresh halibut fishery. Fisheries and Fishery Industries of the U.S., Sect.5, 1: 3-89.

Hjort, J. 1905. Norges Fiskerier: Fiskeforsøk og Fangstfelter.

Hjort, J. and J.T.Ruud. 1929. Whaling and Fishing in the North Atlantic. ICES Rapp. Proc. Verb. 56: 104-115.

Jensen, Ad. S. 1925. On the fishing of the Greenlanders. Medd. Komm. Havundersøg. Serie: Fiskeri, 7(7): 17-29. Copenhagen.

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[1] The list of USSR papers on halibut is not yet available; when submitted it will be distributed separately.

Jespersen, P. 1917. Contributions to the life-history of the North Atlantic halibut (Hippoglossus vulgaris Fleming). Medd. Komm. Havundersøg. Serie. Fiskeri, 5(5): 1-34. Copenhagen.

Jespersen, P. 1926. On the halibut in Icelandic waters. ICES, Rapp. Proc. Verb. 39: 101-113.

Jespersen, P. 1936. Investigations on the stocks of halibut in the North Atlantic.ICES Rapp. Proc. Verb., 99, 1-27.

Jespersen, P. 1938. Statistical survey of the halibut fishery in the waters round the Faroes, Iceland and Greenland. Medd. Komm. Havundersøg., Serie. Fiskeri, 10(5): 1-37. Copenhagen.

Joensen, J.S. 1954. On the life-history of halibut in Faroe waters. Medd. Komm. Havundersøg., Ny Ser. 1(5): 1-25. Copenhagen.

Martin, W.R. and F.D.McCracken. 1950. Movements of Halibut on the Canadian Atlantic Coast. Fish. Res. Bd. Canada, Prog. Repts. Atlantic Coast Sta., No. 50, pp.3-8.

McCracken, F.D. and W.R.Martin. 1955. Recent Recoveries of tagged halibut. Fish. Res. Bd. Canada, Prog. Repts. Atlantic Coast Sta., No.61, pp.3-4.

McCracken, F.D. 1958. On the biology and fishery of the Canadian Atlantic halibut, Hippoglossus hippoglossus L. J. Fish. Res. Bd. Canada, 15: 1269-1311.

McIntosh, W.C. 1892. Contributions to the life-stories and development of the food and other fishes. 4. On the eggs of halibut. Rep.Fish.Res.Bd.Scot., 10 (1891), pt.3, 285-287.

McIntosh, W.C. 1893. Further remarks on the eggs of the halibut. Rept.Fish.Bd.Scot. 11(1892), pt.3, 244.

McIntyre, A.D. 1950. Scottish contributions - Halibut. ICES, Ann. Biol. 6(1949) pp.37-38.

McIntyre, A.D. 1951. Scottish contributions - Halibut. ICES, Ann. Biol. 7(1950),p.33

McIntyre, A.D. 1952. Statistics of the Scottish halibut fishery. Mar.Res.Scot.

McIntyre, A.D. 1953. A note on market sampling of halibut. ICES, Journ. du Cons. 19(1): 69-71.

McIntyre, A.D. 1958. Scottish halibut investigations. ICES, Ann.Biol. 14(1957), pp.31-33.

McIntyre, A.D. 1953. The food of halibut from North Atlantic fishing grounds. Mar. Res.Scot., 1952, No.3, pp. 1-20.

McIntyre, A.D. 1955. How the Aberdeen great liners fish. World Fishing, 4(6).

McIntyre, A.D. 1956. Halibut line fishery at Faroe. World Fishing, 5(5): 50-52.

McKenzie, R.A. 1946. The Canadian Atlantic halibut fishery. Bull.Fish.Res.Bd. Canada, No.71, 29 pp.

Prince, E.E. 1915. Notes on the eggs and larval stages of the halibut. Contr. Canadian Biol. 1914-15, pp. 19-33.

Rae, B.B. 1958. The occurrence of Pleroercoid larvae of Gyilotia erinaceus (van Beneden) in halibut. Mar.Res.Scot. 1958 No.4, 30 pp.

Rae, B.B. 1959. Halibut - observations on its size at first maturity, sex ratio and length/weight relationship. Mar.Res.Scot. 1959. No.4. 19 pp.

Rollefsen, G. 1934. The eggs and larvae of the halibut Hippoglossus vulgaris. Kgl. Norske Vidensk. Selsk. Forh, 7(7): 20-23.

Saemundsson, Bjarni. 1909. Oversigt over Islands Fiske. Skr. Komm. Havunders., No.5, pp.69-71. Copenhagen.

Saemundsson, Bjarni. 1926. Islenzk dyr. I. Fiskarnir (Pisces Islandiae), pp.298-306. Reykjavik.

Saemundsson, Bjarni. 1949. Marine Pisces. Zool. Iceland, Part 72, pp.77-79.

Saemundsson, Bjarni. 1927. Synopsis of the Fishes of Iceland. Rit Visindafelags Islendinga II. p.34. Reykjavik.

Schmidt, Johs. 1904. On pelagic post-larval halibut. Medd. Komm. Havunders. Serie. Fiskeri, 1(3), 12 pp. Copenhagen.

Scudder, N.P. 1887. The salt halibut fishery, with especial reference to that of Davis Straits. Fisheries and Fishery Industries of the U.S., Sect.5(1):90-119.

Sigurdsson, A. and A. Fridriksson. 1952. On the Icelandic fishery in the Denmark Strait in 1950. ICES, Ann. Biol. 8: 45-46.

Sigurdsson, A. 1956. Contribution to the life story of the halibut at the west of Iceland in recent years (1936-50). Medd.Komm.Havundersøg.,Ny.Ser.,1(16): 1-24. Copenhagen.

Tåning, Å. Vedel 1936. On the eggs and young stages of the halibut. Med. Komm. Havundersøg. Serie Fiskeri, 10(4): 1-23. Copenhagen.

Tåning, Å. Vedel 1938. Migration of small halibut marked in Faroese waters. ICES, Journ. du Cons. 13(3): 370-375.

Tåning, Å. Vedel 1947. Marking experiments on 3-5 years old halibut in Faroese waters. ICES. Ann. Biol. 2: 24.

Walford, L.A. 1946. New southern record for Atlantic halibut, Copeia, No.2, p.100.

Wise, J.P. and A.C.Jensen. 1959. Movement of tagged halibut off New England. Trans. Amer. Fish. Soc., 88(4): 357-358.

II. Annotated List of Papers on Fisheries Research in the ICNAF Area, 1959

prepared in the Secretariat

The annotations are in general prepared by the author or by the institution responsible for the paper. Some annotations - marked "FAO" - are from the FAO "Current Bibliography"; others - marked "Secr." - are prepared in the ICNAF Secretariat.

I. HYDROGRAPHY

Bumpus, Dean F. 1959. Investigations of climate and oceanographic factors influencing the environment of fish. Woods Hole Ocean. Inst. unpublished ms. No.59-2, 7 pp.

Hydrography of Gulf of Maine and Georges Bank.

Böhnecke, G. and A. Bückmann. 1959. Die Expeditionen von F.F.S. "Anton Dohrn" und V.F.S. "Gauss" im Intern. Geoph. Jahr 1957/58. Dtsch. Hydr. Zeitschr. B, 4 (3): 1-107.

After a report on the cruises in the N. Atlantic and on hydrographic sections made follow 17 special papers on the results; of these papers the following three appear to deal especially with the ICNAF area.

Koopman, G. Thermo-haline Schichtung im jahreszeitlichen Wechsel zwischen Kap Farvel und der Flämischen Kappe. (Seasonal changes in the thermo-haline stratification between Kap Farvel and Flemish Cap.)

Beck, B.; K. Kalle; E. Rogalla. Die Schichtung im Sauerstoffgehalt im jahreszeitlichen Wechsel zwischen Kap Farvel und der Flämischen Kappe. (Seasonal changes in stratification of oxygen content between Kap Farvel and Flemish Cap.)

Krey, J.; D. Hantschmann; St. Wellershaus. Der Sestongegehalt entlang eines Schnittes von Kap Farvel bis zur Flämischen Kappe im April und September 1958. (Content of seston along a section Kap Farvel-Flemish Cap in April and September 1958.) (Secr.)

Campbell, N. J. 1959. An International Geophysical Year Project. Prog. Rep. Atl. Coast St. Fish. Res. Bd. Canada. 72: 33-36.

As a contribution to the studies of the International Geophysical Year, this Oceanographic Group took part in IGY project known as "Project Deep Water Circulation". The area covered for this project extended from Bermuda to Baffin Bay with oceanographic sections extending seaward from the continent. A preliminary study of the data on the longitudinal section has revealed some rather interesting distributions of properties between subtropical and polar waters.

Day, C. G. 1959. Oceanic observations, 1958, east coast of the United States. Woods Hole Ocean. Inst. U.S. Fish and Wildlife Service; Spec. Sc. Rep. Fish. 318: 1-119.

Daily water temperature and salinity observations for 1958 from 17 localities along the Atlantic coast are tabulated, plotted and discussed. Ill. by large numbers of sections and tables. (Secr.)

Hermann, F. 1959. Hydrographic conditions in the eastern part of the Labrador Sea and Davis Strait in 1957. ICES; Ann. Biol. 14: 24-6.

Ice conditions in West Greenland waters; temperature and salinity sections off West Greenland; temperature at fixed station, mouth of Godthaab Fjord through the year. (Secr.)

Lauzier, L. M. and N. J. Campbell. 1959. Comparison of some oceanographic features in the Labrador Sea and Davis Strait regions 1928-1935 and 1950-1955. Preprints, Intern. Ocean. Congress, 1959: 103-104, A.A.A.S., Washington.

A study of the July and August water conditions of the upper strata in the Labrador Sea and Davis Strait has been made for two periods, 1928-1935 and 1950-1955. The salinity and temperature observations for both periods of study were averaged by degree squares for three depths: surface, 100 m and 200 m. The decreases of temperature and salinity that have taken place in these waters appear to be the result of a number of interrelated phenomena, variations in the intensity of the currents, the distribution of Arctic ice, and atmospheric conditions.

Smed, J. 1959. Monthly anomalies of the surface temperature of the sea west of South Greenland 1876-1956. ICES; Ann. Biol. 14: 11.

(as per title)

Young, E. Gordon and D. G. Smith. 1959. The chemical composition of sea water in the vicinity of the Atlantic Provinces of Canada. J. Fish. Res. Bd. Canada. 16 (1): 7-12.

Samples of sea water from eight locations at the surface around the coast of the Atlantic Provinces of Canada have been analyzed for their content of major and minor chemical constituents. The salt water in the Bras d'Or Lakes of Cape Breton Island, N.S., was different from that in the contiguous Atlantic Ocean and showed evidence of much dilution. The seven other samples examined averaged 17.17 °/oo for chlorinity and 31.03 °/oo for salinity. These averages are low for open oceanic waters. The average composition of sea water for this area was as follows in grams per kilogram: Na, 9.55; K, 0.34; Ca, 0.37; Mg, 1.15; SO_4, 2.36; B as H_3BO_3, 0.0243. Concentrations of the trace elements in micrograms per litre varied within the following limits: As as As_2O_3, 1.4 to 2.0; Co, 0.33 to 0.67; Cu, 13 to 22; F, 860 to 1200; I, 6 to 53; Mo, 6.3 to 14.0; PO_4, 5 to 69; Si, 44 to 95; Zn, 6.5 to 10.9. Nickel was also present in all samples but vanadium was not detected. The various ratios of the mineral elements, especially to chlorine, have been calculated, and show only slight divergence from those for open ocean water.

Zaitsev, G. N. 1959. "Newfoundland Bank", booklet published by "Rhybnoe Khozjaistvo".

The booklet summarizes the data of the hydrometeorological regime of the Grand Newfoundland Bank.

II. PLANKTON

Brunel, Pierre 1959. Le zooplancton de la baie des Chaleurs en 1955: distribution horizontale quantitative et correlations hydroclimatiques. Contr. 73: Dep. Pêcheries, Quebec, 1-65.

Based on vertical hauls with Hensen Net and on hydrographic observations, volume and number of individuals of the main zooplankton groups were determined in the Gulf of St. Lawrence, May-Sept. 1955. Largest volumes were found offshore in spring and summer, smaller volumes in fall. (Secr.)

Steele, J. H. 1959. The quantitative ecology of marine phytoplankton. Biol. Rev. 34: 129-158.

A description and review of mathematical studies of organic production with special consideration of the information used to set up the postulates and to test the conclusions; consideration is also given to the information which is ignored.

Yentsch, Charles S. and John H. Ryther. 1959. Relative significance of the net phytoplankton and nanoplankton in the waters of Vineyard Sound. ICES. J. du.Cons. 24 (2): 231-238.

III. FISHES

A. Cod Group

Bratberg, E. 1959. Rapport fra tokt med "Johan Hjort" til Vest Grønland april 1959. (Rep. on a cruise with "Johan Hjort" to West Greenland, in April 1959). Fiskets Gang, 27. Bergen.

The paper gives in graphs the temperature on the W. Greenland banks and the length and age of cod caught with lines and trawl. The 1947 year-class of cod is declining, the 1950 is still important, and the 1953 is promising. (Secr.)

Clark, John R. 1959. Sexual maturity of haddock. Trans. Am. Fish. Soc. 88(3): 212-213.

Age and length at maturity for Georges and Browns Bank haddock.

Clark, John R. and Eli L. Dietsch. 1959. Length-weight samples for Northwest Atlantic haddock. ICNAF Sampling Yearbook, 2: 25-37.

(As per title)

Cohen, Daniel M. 1959. The scientific name of the common cod. ICES, J. du Cons. 25 (1): 50-52.

Confusion between Gadus morhua and G. callarias has been resolved and G. morhua is only valid name.

Fritz, Raymond L. 1959. Hake tagging in Europe and the United States, 1931-1958. ICES, J. du. Cons. 24 (3): 480-485.

A review of past experiments on Merluccius and a new method.

Hansen, P. M. 1959. Cod fry and small cod in coastal waters and on the offshore banks of W. Greenland, 1957. ICES; Ann. Biol. 14: 103-105.

Hansen, P. M. 1959. Danish investigations in coastal waters and on offshore banks of W. Greenland, 1957. ICES, Ann. Biol. 14: 107-114.

Jónsson, J. 1959. Greenland stock - Icelandic cod investigations in SW and SE Greenland waters, 1957. ICES, Ann. Biol. 14: 115-118.

Most of the samples considered are collected in E. Greenland waters, a few are from Subarea 1 (Godthaab-Frederikshaab). Data on age, length, age at first maturity, growth and abundance are given. (Secr.)

Kohler, A. C. 1959. Growth and parasites of cod during a year in captivity. Prog. Rep. Atl. Coast St. Fish. Res. Bd. Canada, 72: 3-7.

Cod (Gadus morhua L.) of 29 to 42 cm initial length were kept in tanks for 54 weeks and were fed frozen herring at maximum, intermediate and maintenance rates. Small fish of the group feeding at a maximum rate increased 157% in weight in a year while large ones feeding at this rate increased 98% in weight during the same interval. The conversion factor for weight of food used for growth to weight of cod ranged between 2.1 and 2.4 for cod making intermediate to fast growth. At the end of the experiment the fish were examined for the presence of larval nematodes (Porrocaecum decipiens Krabbe). An unusually large percentage of those found (33%) were on the skin side of the fillet. This observation together with earlier observations by D.M.Scott indicate that they move from stomach to body cavity, through the musculature to the epidermis.

McCracken, F. D. 1959. Cod tagging off northern New Brunswick in 1955 and 1956. Prog. Rep. Atl. Coast St. Fish. Res. Bd. Canada, 72: 8-19.

The distribution of recaptured tagged cod from tagging in the Gulf of St. Lawrence off northern New Brunswick shows a major migration of cod out of the Gulf in winter. Recaptures in December to May were mainly from along the western side of the Laurentian Channel, off the east coast of Cape Breton. In this area this stock is important to the winter fishery by European vessels along the 100-fathom contour. Recaptures between June and November come mainly from the tagging region off northern New Brunswick, although some recaptures were scattered throughout the western Gult. Very few tagged cod were retaken off Newfoundland, across the Laurentian Channel.
Disk tags have produced higher returns than hydrostatic tags and by the end of 1957 about 30% of the 1955 disk-tagged cod had been returned. The somewhat lower returns than for cod tagging in inshore waters off Nova Scotia are consistent with the differences in the fisheries and the age composition of the commercial catches in these different regions.

Marcotte, Alexandre. 1959. Distribution de la Morue dans la baie des Chaleurs en 1958. Actualités Marines, 3(1): 3-9.

Monthly patterns of distribution and their relation with temperature. (FAO)

Meyer, A. 1959. Greenland stock - German investigations on Greenland cod, 1957. ICES, Ann. Biol. 14: 118-121.

Describes for the East and West Greenland regions the German trawl fisheries for cod, and reports age and length distribution for cod fished from commercial trawlers as well as from the research vessel "Anton Dohrn". (Secr.)

Meyer, A. 1959. Schwierige, aber erfolgversprechende Fischerei auf Laichkabeljau vor Westgrønland. (Difficult, but promising fishery for spawning cod off W. Greenland). Hansa, Jg. 96, 8/9. Hamburg.

Describes the fishery for spawning cod in Feb.-March in the area of Fiskenaes, Fylla and Banana Banks, and reports age and length distribution of the cod fished. A spawning area is delimited down to a depth of 250 m off the coast between Godthaab and Frederikshaab. (Secr.)

Miller, D. and R. R. Marak. 1959. The early larval stages of the red hake, Urophycis chuss. Copeia 1959 (3): 248-250.

A radical change in pigmentation between 22 and 38 hours of development has caused confusion in the literature. Figures.

Rasmussen, B. 1959. Greenland stock. On the migration pattern of the West Greenland stock of cod. ICES, Ann. Biol. 14: 123-124.

A total of 3263 cod were tagged 1953/57 in the Holsteinsborg Deep. Of these 13.3% have been recaptured. Recaptures made during the same season show a decided northward migration in late summer and autumn. In winter the cod migrate to the southern banks in order to spawn. In the southern localities recently spent fish are recaptured in May and June. Later in summer and autumn recaptures are made further north. The tagging experiments show a seasonal movement, with a southward spawning migration to about 62°N. lat. in winter and a northward feeding migration to 68° or 70° N. lat. in summer.
Only 7 specimens migrated to Iceland and one to Newfoundland. The results indicate that the West Greenland area north of 62° is dominated by an almost separate population with a more or less closed migration pattern. Only very few specimens of this true West Greenland stock migrate out of the area. In the opinion of the author there are at least two stocks to be found in West Greenland waters, one with a northern distribution as shown by the tagging results, the other a southern population around Cape Farewell-Julianehaab which may partly belong to the Icelandic or perhaps a mixed east Greenland stock. Further taggings are necessary off Cape Farewell and East Greenland in order to elucidate this latter problem.

Schaefer, R. H. 1959. A study of the growth and feeding habits of the whiting or silver hake, Merluccius bilinearis (Mitchill), of the New York Bight. Thesis, Rutgers Univ.

Age and growth. (FAO)

Scott, D. M. and W. R. Martin. 1959. The incidence of nematodes in the fillets of small cod from Lockeport, Nova Scotia, and the southwestern Gulf of St. Lawrence. J. Fish. Res. Bd. Canada, 16(2): 213-221.

The incidence of nematodes in fillets of Atlantic cod (Gadus callarias) was determined in 1957 in four areas within 10 miles of Lockeport, N.S., and six areas in the southwestern Gulf of St. Lawrence. About 1,500 cod, mostly between 1 and 6 years of age, were examined. All nematodes examined (517) were larvae. About 97% belonged to the genus Porrocaecum; the remainder appeared to belong to the genus Anisakis. In all areas was a progressive increase in incidence with increasing age of cod. In Gr.IV and V over 70% were infected. Local variation in incidence was observed in the Lockeport region. Cod were more heavily infected in inshore than in offshore waters. The samples from the Gulf of St. Lawrence showed less geographic variation in incidence than the Lockeport samples. The incidence in cod from the Magdalen Islands was noticeably lower than in cod from the New Brunswick shore. Cod in the Gulf of St. Lawrence were infected to about the same extent as those from the offshore areas near Lockeport. The relation between local variations in incidence and the distribution of seals is briefly discussed.

Yergeau, René — 1959. La morue du Bas-Saguenay. Actualités Marines, 3(2): 3-10.

A sample of 1,974 cod fished with hooks, trawl and in traps in 1956 in Bas-Saguenay (Gulf of St. Lawrence) was treated statistically. Mean length and weight were determined, and the relation weight-length was calculated. Conversion factors were calculated for various size groups for gutted, headed fish to round fresh fish. (Secr.)

B. Flat Fishes

Lux, Fred E. — 1959. A case of partial albinism in the four-spotted flounder, *Hippoglossina oblonga*. Copeia 1959 (3): 253.

(As per title)

Lux, Fred E. — 1959. Riddle of the N. E. yellowtail flounder. Maine Coast Fisherman 13 (8): 10.

Semi-popular account of tagging and migration.

McCracken, F. D. — 1958. On the biology and fishery of the Canadian Atlantic halibut, *Hippoglossus hippoglossus* L. J. Fish. Res. Bd. Can., 15: 1269-1311.

Location of fishing grounds, movements of fish, comparisons of populations, analysis of the fisheries and discussion of prediction of future yields. (FAO)

Rae, B. B. — 1959. Halibut - observations on its size at first maturity, sex ratio and length/weight relationship. Mar. Res. Scot. 1959, 4: 19.

Observations made on commercial and research catches taken over the North Atlantic, with information on sex ratios, and some consideration of the results in relation to halibut fisheries.

Ronald, Keith — 1959. A check list of the Metazoan Parasites of the Heterosomata. Dep. of Fish., Quebec, Contr. 67: 1-152.

(As per title)

C. Redfish

Hansen, P. M. — 1959. Danish catches of redfish (*Sebastes marinus*) in West Greenland fjords. ICES, Ann. Biol. 14: 39.

Measurements of small redfish. (Secr.)

Kelly, G. F. and R. S. Wolf. 1959. Age and growth of the redfish (Sebastes marinus) in the Gulf of Maine. Fish. Bull. Fish and Wildl. Serv. 60: 1-31 (Fish. Bull. 156).

Validity of the otolith, which accrues one opaque and one hyaline band per year.

Magnússon, J. 1959. Fiskileit 1958 (Redfish Cruises in 1958). Aegir, 52 (4-5). Reykjavik. Icelandic text with English summary.

Magnússon, J. 1959. On the sex ratio of redfish in East Greenland and Icelandic waters in 1957. ICES, Ann. Biol. 14: 35-39.

The paper deals with a number of samples of redfish (Sebastes marinus) from off the East Greenland coast between Kap Farvel and Angmagsalik and off West Iceland. It shows that the sex ratio varies considerably both with area and depth and possibly also with season. (Secr.)

Templeman, W. 1959. Redfish distribution in the North Atlantic. Bull. Fish. Res. Bd. Canada, 120: 1-173.

The distribution of Sebastes marinus and to a much lesser degree that of Sebastes viviparus is described. Though Sebastes marinus may be divided in Sebastes marinus marinus, the ordinary redfish, and Sebastes marinus mentella, the deep-water redfish, these two subspecies were usually not differentiated in the available data. Therefore, mostly, it is possible to consider only the distribution of Sebastes marinus including both subspecies.

Templeman, W. and E. J. Sandeman. 1958. Red flesh in redfish, Sebastes marinus (L.). J. Fish. Res. Bd. Canada, 15(4): 695-700.

Occasional fillets of redfish, salmon red in colour, have been found in the Newfoundland area. A portion of a minced pair of the red fillets was extracted with acetone and the absorption spectrum of the solution measured at various wavelengths from 350 to 700 mμ. Maximum absorption was obtained at 475 mμ, which is similar to that of astaxanthin in acetone. An acetone extract of normal whitish-coloured redfish fillets showed no appreciable absorption over this range of wavelengths. Instances of red coloration of the flesh are also noted in haddock, cod and saithe.

Templeman, W. and E. J. Sandeman. 1959. Variations in caudal pigmentation in late-stage pre-extrusion larvae from marinus-mentella-type female redfish from the Newfoundland area. J. Fish. Res. Bd. Canada, 16(6): 763-789.

Late stage pre-extrusion larvae have been examined from 37 marinus-type and 44 mentella-type redfish, obtained from three localities in

the Newfoundland area. Examination of 120 larvae from each fish has revealed that a difference exists between the two types, in the relative presence or absence of caudal melanophores in their larvae. The caudal melanophores, when present, are situated near the base of the caudal fin and ventral to the vertebral column. Caudal melanophores were absent in only 2.3% of the larvae from mentella-type parents in contrast to the absence of caudal melanophores in 76.1% of the larvae from marinus-type parents. When only those larvae having caudal melanophores are considered, larvae from marinus-type parents usually have but a single melanophore whereas those from mentella-type parents usually have two caudal melanophores.
This difference between larval samples provides evidence of the existence of a real genetic difference between mentella and marinus types of redfish in the Northwest Atlantic.

D. Various

Boulanger, J-M. 1959. Morue, Sébaste et Capelan. Actualités Marines, 3 (3): 11-15.

Summary of research carried out at the Marine Biological Station de la Tabatière concerning cod, redfish and capelin. (Secr.)

Colton, John B. Jr. 1959. A Field Observation of Mortality of Marine Fish Larvae due to Warming. Limnol. and Ocean. 4(2): 219-222.

Dead and decomposing larvae of northern forms found in intrusion of warm water on Georges Bank, while southern and oceanic forms were taken alive.

Hansen, P. M. 1959. Spotted wolffish (Anarchichas minor). ICES; Ann. Biol. 14: 40.

Length distribution of samples from various West Greenland coastal areas. (Secr.)

McKenzie, R. A. 1959. Marine and freshwater fishes of the Miramichi River and Estuary, New Brunswick. J. Fish. Res. Bd. Canada, 16(6): 807-833.

The Miramichi is the largest river in northeastern New Brunswick. The watershed covers an area of about 3,500,000 acres. Its waters support commercial fisheries valued at about $1,250,000 in 1952 and 1953. The commercial fisheries are located in the tidal waters which extend inland about 50 miles. The fresh waters extend inland about another 100 miles. Water temperatures range from -1.6°C in winter to 25°C in summer and salinities from 0 °/oo to 30 °/oo.
Thirty-eight families represented by at least 78 species have been found in the waters of the Miramichi system. Of the species, 53 are marine, 7 anadromous, 1 catadromous, and 17 freshwater.

Sindermann, Carl J. and D. F. Mairs. 1959. A major blood group system in Atlantic sea herring. Copeia 1959 (3): 228-232.

An erythrocyte antigen found in different amounts in geographical groups of immature herring in the Gulf of Maine.

IV. SHELLFISH

Dickie, L. M. 1959. Water temperature and survival of giant scallop. Trans. Amer. Fish. Soc. 88 (1): 73.

A summary of papers published in J. Fish. Res. Bd. Canada.

Merrill, Arthur S. 1959. A comparison of Cyclopecten nanus Verrill and Bush and Placopecten magellanicus (Gmelin). Occ. Pap. Mill, M.C.Z. 2(25): 209-228.

Descriptions of genera and species.

Schroeder, W. C. 1959. The lobster, Homarus americanus, and the red crab, Geryon quinquedens, in the offshore waters of the western North Atlantic. Deep Sea Research, 5 (4).

A population of lobster from deep water (110-450 m) off the east of Georges Bank to off the offing of Delaware Bay is described. The percentage of larger individuals is considerably higher in this deep-water population than closer to the coast. (Secr.)

Squires, H. J. 1959. Squid inshore in Newfoundland and on the Grand Bank, 1953 to 1958. Prog. Rep. Atl. Coast. St. Fish. Res. Bd. Canada, 72: 23-26.

The abundance of squid (Illex illecebrosus) inshore in Newfoundland may apparently be forecast from the catches of research vessels on the Grand Banks in May and June of any year. Evidence of this is considered for the years 1953 to 1958. Squid and pilot whale populations are for the most part oceanic, and it is suggested that in some years when food of squid is abundant offshore, migration into inshore areas may be less than in other years. Offshore catches by the Investigator II in the years 1946 to 1958 and A. T. Cameron in 1958 as well as sight records by the Sackville, 1958, are used to indicate general occurrence annually.

V. OTHER MARINE ORGANISMS

Meyers, Betty J. 1959. The stomach contents of harp seals (Phoca gronlandica Erxleben) from the Magdalen Islands, Quebec. Can. J. Zool. 37: 378.

From March to May 1956 I examined the stomach contents of 195 adult harp seals (75 females, 120 males) whelping in the Magdalen Islands area. The stomachs of 107 (55%) contained food, the remaining (mostly of seals taken in March and April) 88 (45%) being empty. The stomach contents consisted of: herring (Clupea harengus Linnaeus, 1758) in 58%; flatfish sp. in 15%; redfish (Sebastes marinus (Linnaeus, 1758)), in 4%; witch (Glyptocephalus cynoglossus (Linnaeus, 1758)), in 1%; plaice (Hippoglossoides platessoides (Fabricius, 1780)), in 1%; and sea mouse (Aphrodite Linnaeus) in one stomach which contained no other food. One stomach contained the remains of crustacea which had probably been released from the digested stomach contents of larger organisms.

VI. FISHERIES AND FISHING INDUSTRY

Anon. 1959. Atlantic States Marine Fisheries Commission. Seventeenth Ann. Rep.

Berube, Zephirin 1959. Statistiques des pêches - 1958. Actualités Marines, 3(3): 27-32.

Quantity and value of catch by spp. and regions; utilization; fishing boats and gears, ice-plants etc.; fishermen of each region engaged in each unit fishery and on each kind of boat.

Blanke, W. 1959. Seefischerei und Fischereipolitik im nordatlantischen Raum (Sea fishery and fishery policy in the N. Atlantic region). Forschungsstelle für Fischerei-wirtschaft, Bremen, Hamburg. p.1-230.

After a summary introduction (p.17-118) each of the countries fishing in the N. Atlantic area are considered separately as to landings, fishing areas, vessels, fishing plants and trade. (Secr.)

Botelho, A. T. 1959. Aspectos technologicos da preparação de bacalhau desde a captura a secagem. (Technological aspects of the treatment of cod from the capture until the drying.) Boletim da Pesca, 12(63): 11-89.

Describes artificial drying methods and the plants and methods for the drying of salt cod in Portugal. (Secr.)

Castell, C. H., J. Dale and M. F. Greenough. 1959. Spoilage of fish in the vessels at sea: 6. Variations in the landed quality of trawler-caught Atlantic cod and haddock during a period of 13 months. J. Fish. Res. Bd. Canada, 16(2): 223-233.

A study has been made of the landed quality (i.e., the quality at the time of discharge from the vessels) of trawler-caught, gutted and iced market cod and large haddock. The rate of deterioration, as indicated by the rise in TMA values, varies with the time of the year. Poorer quality fish are landed during the colder months of November and December and also during the warmer summer months of June, July and August. The best quality fish are landed during the months of February, March, April, May and September. This seasonal spoilage pattern is similar for cod and haddock and has been observed in the landed quality of the fish from eight individual trawlers over a period of 13 months. Some of the probable factors that bring about this seasonal pattern in the spoilage rate of these fish are discussed.

Freund, K. 1958. Zur Fischerei an der Labradorküste (On the fisheries off the coast of Labrador). Fischereiforschung, 1(5): 18-20.

Reviews fishing possibilities, describes composition of catch and compares redfish populations with those of other fishing grounds. (FAO)

Leite, A. D. M. 1959. Da evolução das instalações frigorificas nos arrostoes portugueses de pesca do alto. (On the development of refrigeration plants in the Portuguese high sea trawlers). Boletim da Pesca, 12(63): 91-115.

Describes the different systems in use, and presents conclusions as to their effectiveness. (Secr.)

Lundbeck, J. 1959. Biologisch-statistische Untersuchungen über die deutsche Hochseefischerei - IV. Die Entwicklung der Hochseefischerei in fangtechnicher, räumlicher und biologischer Hinsicht - 4. Leistungsfähigkeit und Fangerträge der deutschen Fischdampferflotte 1885 bis 1955. (Biological-statistical investigations of the German high sea fishery - IV. Development of the high-sea fishery with regard to catching techniques, spacial and biological aspects - 4. Capacity and catch yield of the German fish steamer fleet 1885-1955). Ber.dtsch.Komm.Meeresforsch., 15:159-237.

(As per title)

McHugh, J. L. 1959. Can we manage our Atlantic coastal fishery resources? Trans. Amer. Fish. Soc., 88: 105-110.

Methods designed to foster management for optimum sustained yields for each important sp., holds little promise for management of migratory fishes in inshore waters of the Atlantic coast. More consideration should be given to management of the biomass of the entire resource. Some statistics of the Atlantic coast fisheries are given and promising approaches for bettering management discussed. (FAO)

McKernan, D. L. 1959. Present status of commercial fisheries in the United States. Trans. Amer. Fish. Soc., 88: 169-175.

Relation of 1957 catches to those of preceding year; economic difficulties of the industry; increased imports maintain steady per capita consumption. (FAO)

Meyer, A. 1959. Die deutsche Salzfisch-Fischerei, 1958 (German Salt Fish Fishery, 1958). Jahresber. ü. die deutsche Fischwirtschaft 1958: 120-150.

Statistical data on the German fishery for salt fish in the northern seas, mainly Greenland, 1953-1958, special information on the activity of common trawlers, trawlers with fish-meal plants and factory ships. Description of the fishery and the yields. (Secr.)

Meyer, A. 1959. Die erste Suchreise 1959 to Newfoundland und Labrador. (The first search trip 1959 to Newfoundland and Labrador). Hansa, Jg.96: 2511-2512. (Also publ. in Inf. f. die Fischwirtsch. Jg. 6). Hamburg.

The area from N. of Hamilton Bank to Flemish Cap was searched from 26 Aug.-2 Oct. Large catches of redfish and cod were made around Flemish Cap, but individual size of both species was small. (Redfish 33, cod 55 cm m.1.). On the N and NE slopes of the Grand Bank catches were smaller, but individual size larger. Further N. (Ritu Bank and off Labrador) catches were small, considerably lower than in 1958. Based on the search trip German trawlers started fishery N. and NE of the Grand Bank. (Secr.)

Meyer, A. 1959. Die Suchreisen deutscher Trawler 1958 und ihre Ergebnisse. (The search trips of German trawlers 1958 and their results). Hansa, Jg. 96: 228. (Also publ. in Inf. f. die Fischwirtsch. Jg. 6.)Hamburg

Off S. Greenland the fishery for cod was not promising, an improvement is to be expected in 1960, due to the rich 1953 year-class. A similar improvement is to be expected in the Store Hellefiske Bank area. Possibility of satisfactory trawling for redfish is recorded for the slope region between Julianehaab and Lille Hellefiske Bank. (Secr.)

Meyer, A. 1959. Zur Fischerei vor Labrador und Newfoundland (On the fishery off L. and N.) Hansa, Jg. 96, 19/20: 995-996. Hamburg.

Summary of the results of the Icelandic searching cruises in 1958, and a description of the ice conditions in the Labrador area. (Secr.)

Meyer, A. 1959. Zur neuen deutschen Fischerei vor Labrador. (On the new German fishery off Labrador). Hansa, Jg. 96, 5: 257-260. Hamburg.

A summary of the German fishery in the Labrador region, the ice conditions, and the hydrography. The possibility of extending the fishery to the south-east, towards Flemish Cap. (Secr.)

VII. GEAR

Boulanger, J-M. 1959. Une nouvelle planche à mesurer le poisson. Actualités Marines, 3(1): 25-28.

Description of the board which has a hole in each measurement interval opening into a container; measurements are recorded by dropping a ball or other marker through the appropriate hole. (FAO).

Brandt, v. A. 1959. Vorschau auf die künftige Entwicklung der Fangtechnik. (Prediction of future development of the techniques of fishing). Inf. f. d. Fischwirtschaft, 6(2). Hamburg.

Transfer at sea of catch from trawler to factory ship. Pelagic trawling. Knotless nets and trawls. (Secr.)

Colton, John B. Jr. 1959. The multiplane kite--otter as a depressor for high-speed plankton samplers. ICES, J. du Cons. 25(1): 29-35.

The multiplane kite-otter is described. Depth and wire profile calibrations are given.

Freyberg, B. 1959. Technisch bedingte Aktionsgrenzen der heutigen deutschen Fischereiflotte und ihre künftige technische Entwicklung. (Technically caused limits of action of the present German fishing fleet, and its future technical development). Inf. f. die Fischwirtschaft. 6(2). Hamburg.

(As per title)

Hempel, G. and D. Sahrhage. 1959. Zur Berechnung der Anteile nicht angelandeter und untermassiger Fische im Gesammtfang. (On the calculation of the proportion of discarded and undersized fish in total catches). Arch f. Fischereiwiss. 10 (1/2): 58-68.

(As per title)

Livingstone, Robert Jr. 1959. Television observation of the behaviour of marine fish in a trawl net. (Abstract). Anat. Rec. 134(3): 602. Also Bull. Ecol. Soc. Amer. 40(3): 86.

Film showing escape behaviour of sand launce and haddock.

Livingstone, Robert Jr. 1959. The use of underwater television for studying the behaviour of marine fish in trawl nets. (Motion picture, 15 min.) (Abstract) Anat. Rec. 134(3): 601-602. Also Bull. Ecol. Soc. Amer. 40(3): 94.

Description of film and of underwater television studies.

Martin, W. R. 1959. Spanish pair-trawler operations. Dept. Fish. Canada, Trade News, 12(6): 3-6.

A report on a Canadian sea trip in September 1959 to observe Spanish pair trawler operations on the southeast shoal of the Grand Bank.

Nedelec, C. and Libert, L. 1959. Etude du chalut. I. Coupe et montage du chalut - Rev. Trav. Inst. Pêches marit., Paris, 23 (2).

The paper gives a detailed description of the nets and ropes used in the construction of trawls, of the ways of cutting and joining the various parts of the trawl, and of how this procedure may influence the opening of meshes and the behaviour of the trawl during hauling. (Secr.)

Nedelec, C. and Libert, L. 1959. Etude du chalut. II. Adaptation du chalut et de son gréement aux differentes pêches. Rev. Trav. Inst. Pêches marit. Paris, 23 (3).

The paper describes the various types of trawls in use in North Atlantic region: Otter trawls, pelagic trawls, and pair trawls. It is illustrated by numerous figures showing the form and the measurements of the various parts of the trawls. (Secr.)

Olsen, S. J. 1959. Mesh selection in herring gill nets. J. Fish. Res. Bd. Canada 16(3): 339-349.

A method described by Holt (1957) to determine the effect of mesh selection in gill nets, has been applied to a material of herring collected in Newfoundland waters in 1957-58. The method requires simultaneous operation of two or more nets, differing slightly in mesh size, but identical in every other respect. The selection curve for herring nets was found to be fairly sharply peaked and slightly skewed to the right. Simultaneous samples of catches taken by three different mesh sizes and adjusted accordingly for the effect of mesh selection did not, in general, differ significantly in length composition over the main range of length distribution.

Parrish, B. B. 1959. Midwater trawls and their operation. FAO Modern Fishing Gear of the World, London, 333-343.

A survey of midwater trawls known in 1957, when the Conference was held, dealing with the main biological factors concerned in the use of midwater trawls and the general principles of their design.

VIII. MISCELLANEOUS

Anon. 1959. A new research trawler for Canada - A.T.Cameron - for East Coast service. World Fish. 8(1): 46-48.

Ill. descr. of new 177 ft. vessel and equipment operated by Fish. Res. Bd. of Canada. (FAO)

Anon. 1959. Undersøgelser i havet ved Faerøerne og i de nordlige havomraader. (Investigations in the seas around the Faroes and in the northern sea areas). Dansk. Fiskerit. 77: 229-230.

Rev. of Danish hydrographical and fisheries investigations during 1958 and notes on international herring investigations. (FAO)

Bertelsen, E. and P. M. Hansen. 1959. Fiskeriundersøgelser i 1958 ved Danmark, Faerøerne og Grønland. (Fishery researches in 1958 around Denmark, the Faeroes and Greenland). Danmarks Fiskeri- og Havundersøgelser. 19.

A summary of research operations and their main results. (See Danish Research Report, 1958. ICNAF, Ann. Proc. 9: 31.)

Bishop, Yvonne M. M. 1959. Errors in estimates of mortality obtained from virtual populations. J. Fish. Res. Bd. Canada, 16(1): 73-90.

The bias in individual estimates of the natural mortality coefficient derived from the ratio of successive virtual populations is defined algebraically and is shown to be unchanged whether one or more year-classes is considered, if the mortality coefficients are assumed to be constant for all exploitable fish. Limiting and probable values of this bias are shown graphically for a coefficient of fishing mortality ranging from 0 to -2.0 in the year for which the estimate is obtained. These values are drawn for true natural mortality of -0.2 and -0.4 and for both an increasing and a decreasing fishing effort. Bias in individual estimates of natural mortality is greatest when there are large fluctuations in fishing effort, particularly when fishing mortality is low relative to natural mortality, and it increases with increased natural mortality. A linear regression of a series of virtual population ratios would in general give an intercept value which underestimated the coefficiency of fishing mortality, in situations where F has tended to increase and also where it has had no trend (the "steady state" of Table I). Both these errors would be in the opposite direction during a period when there was a decline in fishing effort.

Gulland, J. A. and S. J. Holt. 1959. Estimation of growth parameters for data at unequal time intervals. ICES, J. du Cons., 25(1): 47-49.

Theory of method of determining coefficients of von Bertalanffy equation from data of tagging experiments etc., with a table to aid computation. (FAO)

Hart, J. L. 1958. Fisheries Research Board of Canada Biological Station, St. Andrews, N.B., 1908-1958. Fifty years of research in aquatic biology. J. Fish. Res. Bd. Canada, 15(6): 1127-1161.

The year 1958 marks the Fiftieth Anniversary of the founding of the two oldest research stations of the Fisheries Research Board of Canada, at St. Andrews, N.B., and Nanaimo, B.C. In commemoration of the occasion, one issue of the Board's Journal is devoted to the St. Andrews Station and one to the Nanaimo Station. The first article . he St. Andrews issue is an illustrated account of the history and resent activities of the Station, prepared by its Director. This has also been published in booklet form.

Holt, S. J., J. A. Gulland, C. C. Taylor and S. Kurita. 1959. A standard terminology and notation for fishing dynamics. ICES, J. du Cons. 24(2):239-242.

Per title with terminology in English, Japanese and German.

McHugh, J. L. 1959. Recent advances in marine fishery research along the Atlantic coast. Rep. Atl. States Mar. Fish. Comm. 17: 60-61.

Introduction to progress reports.

Marty, J. J. 1959. The development of fisheries in the North Atlantic. Published by "Rhybnoe Khozjaistvo" N 4.

Problems of efficiency of fisheries in the Northwest and Northeast Atlantic are considered.

Mikheev, A. V. 1959. The perspectives of the Soviet fisheries development in the Atlantic. Published by "Rhybnoe Khozjaistvo" N 11.

Some data characterizing the state of fisheries in the ICNAF area and the future of this region are given here.

Perlmutter, A. 1959. Application of behavioral investigations to fisheries problems. Bull. Ecol. Soc. Amer. 40: 95.

(As per title)

Petshenik, L. N. 1959. Fish resources in Davis Strait. Published by "Rhybnoe Khozjaistvo" N 5.

The paper gives some information on catches off Greenland, hydrological features of the Davis Strait, information on the research work carried out.

Rass, T. S. 1959. Biogeographical fishery complexes of the Atlantic and Pacific oceans and their comparison. ICES, J. du Cons. 24: 243-254.

Comparative study of quantities and taxonomic composition of catches, and explanations of differences in terms of climatic history. Suggestions for enriching the poorer Atlantic fauna. (FAO).

"A"

The following information on USSR papers on Halibut was received after the binding of this volume of the Red Book:

Milinsky, G.I.	Materials on biology and fishery of the Greenland halibut of the Barents Sea. Proceedings of the Knipovitch Polar Institute of Marine Fisheries and Oceanography, 8, 1944, Murmansk.
" "	Biology and fishery of the halibut - Hippoglossus vulgaris (L) - of the Barents and Norwegian Seas. Proceedings of the Knipovitch Polar Institute of Marine Fisheries and Oceanography, 8, 1944, Murmansk.

Please consider this as an addition to Part II, 3, (I), of the Red Book.