



REDBOOK 1964 PART I
STANDING COMMITTEE ON RESEARCH AND STATISTICS
PROCEEDINGS FROM THE
1964
ANNUAL MEETING

REDBOOK 1964 appears in 3 parts

- PART I Proceedings of the Standing Committee on
Research and Statistics
- PART II Reports on Researches in the ICNAF Area in 1963
- PART III Selected Papers from the 1964 Annual Meeting

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SECTION I.

REPORT OF STANDING COMMITTEE ON RESEARCH AND STATISTICS

by the Chairman, Mr. R. J. H. Beverton

INTRODUCTION

The 14th Annual Meeting of the Commission was held at Hamburg. The Standing Committee on Research and Statistics met during the week 25th-29th May, preceded by meetings of the Assessment Subcommittee and the Ad Hoc Group on Herring and Other Pelagic Fish.

Again, thanks to the excellent service provided by the Secretariat, it was possible to complete all the scientific work of the Committee by the end of the first week. This enabled me to present a provisional summary report (Proc. 1) to the first plenary session of the Commission, supplemented later during Commission week by two short Addenda dealing mainly with administrative matters. This summary report, into which the Addenda have been incorporated, appears here as Section II. Section III comprises the full reports of the Scientific Subcommittees (App. I-VIII). All recommendations, scientific and administrative, are contained either in Section II or III, and are numbered serially. Recommendations (1) to (9) appear only in Section II; a few of the most important recommendations from the scientific reports are also repeated in Section II under their proper serial numbers. As in the 1963 Redbook, recommendations involving expenditure or Commission policy are identified by a double asterisk (**).

As at the 1963 Meeting, time was set aside on the Friday morning of R&S week for a short informal scientific session. On this occasion we were privileged to hear two of our distinguished German colleagues; Dr. G. Hempel on intrinsic differences in the survival of herring larvae and Dr. H. Mohr on fish behaviour in relation to fishing gear. It was widely agreed that this session formed a welcome break towards the end of a strenuous week of Committee meetings and I would like to add my personal thanks to the appreciation which the meeting expressed to Dr. Hempel and Dr. Mohr.

The summary report of Section II is somewhat fuller than last year's, and I do not propose in this Introduction to do more than mention a few of what seem to me to be the more significant results which emerged from this year's meeting. On the scientific side, the conclusions reached by the Assessment Subcommittee (Section III, App. VII) are of vital significance to the Commission and to its member countries. Since the completion in 1961 of its work on Mesh Assessment, the Subcommittee has been turning its attention to assessing the effect of the increasing fishing activity on the stocks of the ICNAF area. Now, for the first time, it has come forward with a clear warning that the fishing intensity on many of the major stocks is approaching, and on some may have already exceeded, that giving the maximum sustainable yield. The report of the Assessment Subcommittee also demonstrates that the further increases in mesh size which are

less; on the contrary, the need to retain existing mesh sizes, or even to increase them still further in some fisheries, is even more urgent than before, in order to maintain total yields as far as possible. What mesh regulation cannot do by itself, is to reverse or even halt the decline in catch per unit effort which has become apparent in many ICNAF fisheries as fishing effort has increased in recent years, and is causing concern to many member countries.

Some readers of the report of the Assessment Subcommittee might possibly hope to find temporary comfort in the fact that certain of the detailed assessments, based unavoidably as they are at this stage on short and imperfect series of data, lack the precision which would be desired. I am sure that members of the Subcommittee would be the first to acknowledge the detailed limitations of some of their present findings, but it would be dangerously short-sighted to conclude from this that nothing need be done until the scientific evidence has been further refined. The broad effects of the build-up of fishing pressure in the ICNAF area as set out in App. VII, backed both by theoretical analysis and by direct statistics of catch and fishing activity, are already undeniable. If any justification of the Subcommittee's action was needed, the outcome of the recent meeting of the International Whaling Commission has shown that the Subcommittee was entirely right in putting forward its conclusions boldly and unambiguously at this juncture, unpalatable though they may be. Indeed, its warning is none too early if ICNAF is to avoid the catastrophe which has overtaken Antarctic whaling and its conservation, because it is bound to take time for a multi-national organization to respond effectively to the need to reduce, in one way or another, the impact of fishing on the stocks in the area for which it is responsible.

ICNAF is fortunate in having among the scientists of its member countries some of the world's leading experts in fishery dynamics, who will continue to do all in their power to advise the Commission, impartially and objectively, on the effects of fishing and proposed regulative measures on the stocks and catches. They can suggest various things that could be done, as indeed they have now been asked to do; and they can predict what the effects of these and other proposed courses of action are likely to be. But they cannot, and should not, be expected to recommend to the Commission what ought to be done. This is a matter of policy which only the Commission can decide; and to involve the scientists in such decisions is the surest way of destroying that essential objectivity of their work and advice, which is crucial to the proper functioning of the Commission. ICNAF, during the first decade and a half of its existence, has had a fine record of progress and achievement. Now that many of the fisheries have reached the point where expansion has to give way to rational and controlled exploitation, it is my fervent hope that the Commission will continue to set an example to the rest of the world.

The urgency of this matter should not be allowed to overshadow what have proved to be real achievements in other aspects of ICNAF science during the past decade. The Environmental Survey NORWESTLANT has been successfully completed, and the Environmental Symposium was held last January in Rome, thanks

diverse disciplines, and already their influence beyond the immediate confines of ICNAF is becoming apparent. The untiring efforts of Dr. C. E. Lucas, Mr. A. J. Lee, and many others, which went to make these two projects successful, will not be forgotten. The important task of preparing for publication a co-ordinated report of the NORWESTLANT survey still remains, and it is gratifying to see the way in which people have offered their help to Mr. Lee, who is continuing to be responsible for this project in its final stage.

Possibly less spectacular but none the less significant progress has been achieved by other Subcommittees, the main features of which are outlined in my summary report in Section II. Of particular interest at the present time is the report of the group concerned with Herring and other Pelagic Fish, which appears as Appendix I of Section III. This is a valuable compilation of the available information on the newest of the major ICNAF fisheries, and shows that even here despite its recent origin, there is reason to believe that the influence of fishing may already be profound.

The effective co-ordination and synthesis of national research, essential if a Commission such as ICNAF is to be properly advised, cannot however be continued indefinitely simply through the efforts of a few key people or during full meetings of scientists for a few days once a year. It needs, and ICNAF is fortunate in having, a keen and able Executive Secretary and staff. There must also be opportunity for the scientists to meet, work and think together on the more fundamental scientific aspects of their problems, as well as sufficient time for them to prepare their reports to the Commission. It is the considered view of ICNAF scientists that the present schedule of meetings does not always provide such opportunities, and the fact that during the last two or three years the proceedings of R&S have been speeded up so as to enable it to report at the beginning of Commission week has accentuated, rather than the reverse, the need for more flexible arrangements. The case for this is set out in paragraph 9 of Section II, where it is proposed that mid-term meetings of particular groups of experts, divorced from the inevitable rush and pressure of R&S week, will be needed in the future from time to time. It is encouraging that the Commission approved the arguments put forward here, but the co-operation of member countries when they are requested to send their experts to such mid-term meetings is no less important.

There is one other obligation falling upon a Commission such as ICNAF which has scientific as well as administrative responsibilities, namely to ensure that the results of scientific work promoted by it, or relevant to its functioning, are properly published. ICNAF has a valuable regular series of publications: its Annual Proceedings and Research Reports, statistics, and routine biological data to which was added, last year, the Research Bulletin. The case for publishing these is now accepted; but no less important is the need to publish the results of any special scientific meetings and research promoted by the Commission, current examples of which are the Environmental Symposium and the NORWESTLANT survey. The presentation of scientific papers and results of research in the form

no substitute for the proper publication, after critical refereeing and editing, such contributions as are worthy of permanent record. Fortunately, this year, though only after considerable difficulty, the Commission was able to ensure the publication of these two Environmental projects by drawing on its Reserve Fund, but I hope the situation will not again be allowed to arise when scientific projects sponsored by the Commission are prejudiced by lack of funds for their publication - at a cost which is only a tiny fraction of that spent by member countries in carrying them out.

As those who were present at the meeting will know, I have relinquished the Chairmanship of R&S after a period of three years. I have during this time, and during the two previous years when I served as Chairman of the Mesh Assessment group, enjoyed all the help and co-operation, from the members of R&S and from the Executive Secretary, Mr. L. R. Day, and his predecessor, Dr. Poulsen, I could have wished for, and more besides. To all these people I express my sincere thanks. In Dr. W. Templeman, who succeeds me as Chairman of R&S, the Commission is fortunate in having the services of one whose status and experience in ICNAF science is second to none. His officers, the members of the Steering Committee and the Chairmen of the Scientific Subcommittees, form an able and enthusiastic team drawn from nearly every member country. It is indeed reassuring to know that the scientific work of the Commission is in such capable hands, and I wish Dr. Templeman and his colleagues every success in the future.

SECTION II
SUMMARY REPORT OF THE PROCEEDINGS OF R & S

by the Chairman

1. R&S AGENDA

(1) Introduction

- (a) Adoption of Agenda
- (b) Planning of work of R&S, its Subcommittees, and Scientific Advisers to Panels

(2) Report from ICNAF observer to ICES

(3) Assessments (Chairman: L. M. Dickie)

- (a) Studies on variability of sampling data (Rec. 15)
- (b) Interpretation of effort statistics (Rec. 16)
- (c) Detailed effort statistics (Rec. 17)
- (d) Graphical presentation of fishery trends (Rec. 18)
- (e) New evidence on mesh assessments
- (f) Catch and effort assessments
- (g) Other matters, including item 11

NOTE: Items (a), (b) and (c) may require co-ordination with the Sampling and Statistics Subcommittees

(4) Ageing Techniques (Chairman: B. Rasmussen)

- (a) Review of Standard Terminology for redfish and halibut (Rec. 19)
- (b) Exchange of otolith photographs (Rec. 20)
- (c) Validation of Age-reading techniques (Rec. 21)
- (d) Redfish otolith exchange
- (e) Other matters

(5) Gear and Selectivity (Chairman: W. F. Templeman)

- (a) Selectivity of synthetic codend materials in relation to one another and to manila (Rec. 22)
- (b) Tabular summaries of selectivity data (Rec. 23)
- (c) Compilation of length, weight and girth data (Rec. 24)
- (d) Redfish meshing (Rec. 25)
- (e) Developments in gear and fishing methods (Rec. 26)
- (f) Variability of selection factors (Rec. 27)
- (g) Selectivity and catch size (Rec. 28)
- (h) Mesh gauges; experience of ICES gauge and gauge comparisons (Redbook 1963, Part I, p. 50)

(5) Gear and Selectivity (cont'd)

(iii) Precision gauge for Commission standards and legal gauge for ICNAF countries

- (i) Net materials (especially codend) in use by countries in ICNAF fleets
- (j) Topside chafing gear
- (k) Mesh sizes for use in fisheries for other than regulated species

(6) Tagging (Chairman: S. A. Horsted)

- (a) Review of reporting and propaganda systems by countries (Rec. 30)
- (b) Progress report on card-release system (Rec. 29)
- (c) Tagging programmes in the ICNAF area for the coming year (Rec. 31)
- (d) Other matters

(7) Environmental Studies (Chairman: C. E. Lucas)

- (a) Report on Environmental Symposium (Recs. 32-35)
- (b) Report on Environmental Survey NORWESTLANT (Rec. 36)
- (c) Possible research studies, national or international, arising from (a) and (b)
- (d) Sea-bed drifters (Rec. 37)
- (e) Other matters

(8) Statistics (Chairman: R. C. Hennemuth)

- (a) Review of format of Statistical Bulletin (Rec. 39)
- (b) Time limits of statistical reporting (Rec. 41)
- (c) Redfish statistics by depth zones (Rec. 42)
- (d) Subarea Effort Statistics (Rec. 45)
- (e) Sampling for discards - advice from Sampling Subcommittee (Rec. 46)
- (f) Common and scientific names of fishes (Rec. 55)
- (g) Common reporting; review of progress (Recs. 57 and 58)
- (h) Co-ordination of statistics among ICNAF, ICES and FAO (Rec. 59)
- (i) Geographic grid systems to cover subdivisions of existing divisions
- (j) Other matters, including report from ICNAF Statistician

(9) Sampling (Chairman: B. B. Parrish)

- (a) Sampling Yearbook; condensation and adequacy of data (Recs. 60 and 61)
- (b) Review of sampling methods (Rec. 62)
- (c) Variability of replicate haul data (Rec. 63)
- (d) Uniformity and/or conversion factors for length measurement (Rec. 64)
- (e) Sampling methods for discards (Rec. 46)

(10) Pelagic Fish (Chairman: B. E. Skud)

- (a) Herring; review of fishery and research in ICNAF area
 - (i) Status of fishery (reports by Canada, USSR and USA)
(Catch and effort data, age composition and length-weight data, maturity stages and other)
 - (ii) Research in Subareas 4 and 5 (reports by Canada, USSR and USA)
Recent results and planned studies
(Stock distribution and racial studies, plankton and hydrographic conditions, migrations and behaviour and other)
 - (iii) Bibliography of herring research in Northwest Atlantic
 - (iv) Standardization of measurements and techniques
 - (v) Environmental Symposium - herring section
 - (vi) Other matters
- (b) Relation between fisheries for herring and regulated species
 - (i) By-catches in herring fishery
 - (ii) Other interspecific relations - e. g. predation
- (c) Other pelagic fish
 - (i) Tuna and swordfish
 - (ii) Sharks and others
- (d) Discussion with assessment subcommittee and other matters

(11) Adequacy of ICNAF conservation measures

NOTE: This item stems from the memorandum submitted by the late G. R. Clark to the Meeting of Commissioners last year (Serial No. 1092), which was referred to R&S for advice. Mr. Clark's note was primarily concerned with the effect of the rapidly increasing amount of fishing in the ICNAF area and its economic implications. It raised also the question of interpretation of the ICNAF objective of "maintenance of a maximum sustained catch". Most of the points arising fall within the scope of the Assessment and the Gear and Selectivity Subcommittees, and are included in their agenda, but R&S will need to consider the full remit and decide on the form of its advice to the Commission. A further explanatory note will be circulated shortly.

(12) Organization and Function of R&S

There has been growing concern among some ICNAF scientists about the limited opportunity afforded to R&S to give proper attention to the scientific basis of its advisory functions during the one week each year immediately preceding the meeting of the Commission. This is further aggravated by the difficulty experienced by many member countries in sending a sufficient number of their working scientists, some of whom may be relatively junior in rank, to ICNAF meetings.

(12) Organization and Function of R&S (cont'd)

whether it wishes to take further action by making specific proposals or recommendations to the Commission.

It is suggested that this item could with advantage be considered in the first instance by the Steering and Publications Subcommittee, who will aim to submit a statement for the consideration of R&S outlining the nature of the problem and possible solutions.

(13) Publications

- (a) Review of preparation of Research Bulletin No. 1 (Rec. 10)
- (b) Publication of Environmental Symposium and NORWESTLANT Survey
- (c) Review of 1964 National Research Reports in relation to content and presentation as advised in 1963 (Recs. 13 and 65)
- (d) Summaries of National Research Reports for Annual Proceedings (Rec. 12)
- (e) Standards and timelimits of ICNAF publications
- (f) Other matters

NOTE: These items will be considered in the first instance by the Steering and Publications Subcommittee, who will report accordingly to R&S

(14) Other recommendations from Steering and Publications Subcommittee

(i. e. additional to matters arising under items 11 and 12).

(15) Co-ordination with other organizations

(16) Election of officers for the ensuing year

(17) Any other business

ASSESSMENTS (App. VII)

(a) Mesh assessments in particular fisheries

- (i) No major revision of assessments for the fisheries referred to in item 17 of the Plenary Agenda is offered, beyond those given in the 1963 Redbook (p. 37) for redfish in Divs. 3NO, and for redfish and other species in Subareas 4 and 5 given in the 1961 Mesh Assessment Report.
- (ii) There is now evidence of substantial discarding in the fishery for American plaice in Division 4T, which supports the earlier conclusion that increase of mesh size in this fishery up to about 6 inches would

- (iii) There has been a major expansion of the fishery for silver hake in Subarea 5 since 1962; it is not yet possible to say more about the effect of mesh increase in this fishery, other than that sizes up to 3 inches would not cause much immediate loss, but that meshes greater than 4 inches would cause very considerable immediate, and probably also long-term, losses.
- (iv) Although a higher age at recruitment in the scallop fishery in Subarea 5 would probably give long-term gains in yield, increase in ring size is not a practicable means of achieving this. It is not yet possible to suggest an alternative method of regulation which would be effective.

(b) Effect on mesh assessments of recent changes in ICNAF fisheries

Two important changes have occurred in many ICNAF fisheries since the period 1956-58 to which the 1961 Mesh Assessment Report refers. These are (i) an increase in the amount of fishing activity and (ii) a tendency for fishing to concentrate more on the smaller sizes of fish.

Increased fishing by itself is certain to result in greater long-term gains (and smaller long-term losses) for any particular mesh increase than was predicted before, though immediate losses will also be greater; but it is not yet possible to predict the simultaneous effect of these changes on the mesh assessments for any particular fishery. It can, however, be said that both these recent changes reinforce the prediction of long-term gains from the introduction of a 4 1/2-inch mesh wherever such gains are indicated in the 1961 Mesh Assessment Report.

(c) Recent trends in catches and fishing activity

Since 1961, the Assessment Subcommittee has begun to turn its attention to documenting and interpreting the effect of fishing on the ICNAF stocks. Its report this year contains the first attempt to do this on a comprehensive basis. Though the results are only provisional, certain clear conclusions emerge which it is thought will be of interest and importance to the Commission. The summary which follows here is intended only as a guide to the main conclusions reached, for a full account of which Appendix VII should be consulted.

Recent trends in landings and in fishing activity (measured as total days fished) are summarised and illustrated in Table 1 and Figs. 1 and 2 of Appendix VII. In the northern Subareas (1, 2 and 3) there has been a major increase in landings from 1957 to 1961 but also, significantly, a much larger increase in fishing activity. Landings in 1962 and 1963 declined.

In the southern Subareas 4 and 5, both landings and fishing activity re-

Further analysis shows that the increased landings in the northern Sub-areas came from stocks of cod and redfish which had previously been only lightly fished, particularly in Subarea 2. The recent increases in landings from Subareas 4 and 5 are due to a great expansion of the herring and silver hake fisheries.

(d) Long-term Relation between catch and fishing intensity

These general trends show clearly that landings in the northern sub-areas have not increased as much as the fishing activity and, as a consequence, the overall catch per unit fishing activity has dropped by about 40% since 1957. What these statistics do not show is whether the present landings could be maintained, or what would happen if fishing activity increased still further.

To answer these questions requires a detailed assessment of the long-term effect of fishing on the stocks. Enough research data are available for many of the cod and haddock stocks to make a rough appreciation possible, and this is summarised in Table 2 and Fig. 3 of Appendix VII. It is concluded that in most cod and haddock fisheries of the ICNAF area, the present fishing intensity would result in sustained yields (on a per recruit basis) not differing much from the maximum which the stocks could provide. In some fisheries, the present fishing intensity may already have exceeded that giving the maximum sustained yield.

Consequently, in all such fisheries, the main effect of further increases in fishing activity is likely to be a nearly proportional decrease in the catch per unit fishing activity. In most of these fisheries it appears that feasible changes in mesh size, while helping to keep up total yield, cannot do much to offset the expected sharp downward trend in catch per unit effort if fishing activity continues to increase.

It is not yet possible to draw any definite conclusions for redfish, beyond the fact that none of the exploited stocks appear at present to offer the possibility of major increases in yield, nor to predict the future course of the herring and silver hake fisheries in Subarea 5.

(e) Future work

R&S strongly endorsed the view that the Assessment Subcommittee should continue to develop its analyses and interpretation of trends in the ICNAF fisheries, and to improve assessments of the effects of mesh increase in the light of recent changes in the fishery. The Assessment Subcommittee drew attention to the importance of detecting the existence of hitherto unexploited resources in the ICNAF area and of measuring their abundance. It also emphasized the need for a better understanding of the biological inter-relationships between different species of fish and their

3

recommends (44)**

that ICNAF expresses formally to FAO its interest in the promotion of studies on the fish and fish-food phases of production chains in marine communities, and offers to co-operate in co-sponsoring a Symposium if required.

(f) Arrangements for meetings

The Assessment Subcommittee believes that it cannot continue fully to discharge its advisory responsibilities to R&S by meeting only during a short period immediately before the Annual Meeting of the Commission. It considers that to enable a proper study to be made of the scientific basis of the problems involved, as well as to prepare a considered and effective report, regular (though not necessarily annual) mid-year meetings such as those held in 1960 and 1961 by the Mesh Assessment Working Group, would be necessary, starting probably in 1965. The Subcommittee suggested that if these were held contiguously with the Annual ICES meeting, it would have the advantage of contact with ICES scientists who are working on fundamentally the same kind of problems, and in some instances on related stocks. This point was taken up later by R&S and is referred to in Section 10 of this report.

ENVIRONMENTAL STUDIES (App. VI)

(a) Environmental Symposium

(i) This was held last January in Rome, and it is

recommended (32)

that the Commission's appreciation be officially conveyed to the Director General of FAO, Dr. Sen, for the Organisation's generous and invaluable hospitality on this occasion, and especially for the help rendered by the staff of Biology Branch of Fisheries Division.

(ii) A wide range of topics was covered at the Symposium, which was attended by scientists from many ICNAF and ICES member countries, and others. The topics ranged from matters of direct relevance to practical fishing operations, such as the effect of water conditions and currents on fish distribution and migration, to long-range climatic changes in the North Atlantic and their effect on the abundance of the fish stocks. The underlying importance of fish behaviour and physiology was stressed. In view of the rapid expansion of general oceanographic research, the Symposium provided a timely and valuable orientation of ideas on how best to direct research, both national and

- (iii) A brief informal report on the Symposium is given in Annex I of App. VI by the Chairman, Dr. C. E. Lucas, whose help, together with that of his convenors, in preparing and running the Symposium is gratefully acknowledged. A further account is given in Doc. No. 15.
- (iv) Last year the Commission approved a request from R&S that contributions to and proceedings of the Environmental Symposium be published in the ICNAF Special Publications Series [1963 Redbook; Rec. (35), p. 58]. Since it was impossible to anticipate at that stage how many papers would be contributed, it was requested that a sum of \$7,500 be allocated in the first instance, for the year 1964-65. In the event, the response of contributors exceeded expectations. Having received and edited the contributions and proceedings it is now

recommended (1)**

that a further sum of \$5,000 be approved for the year 1965/66 to meet the cost of publishing the proceedings of and contributions to the 1964 Environmental Symposium.

In arriving at this estimate every possible economy has been made, both in the proposed method of printing and in the editing of the contributions.

(b) Environmental Survey NORWESTLANT

- (i) This was successfully concluded, and reports from all participating countries were available at this meeting. Even at this early stage some striking features have emerged, notably a marked lack of cod larvae at both South and West Greenland, despite an earlier abundance of eggs. Much new information on the basic productivity and current systems in this area has been obtained, which is directly relevant to the drift of the spawning products and probably also to their survival.
- (ii) The co-operation of all participants in their speedy analysis of the data from NORWESTLANT is gratefully acknowledged. Particular thanks are due to Mr. C. D. Sauer of the Canadian Oceanographic Data Centre and to Dr. M. Gillbricht for processing and distributing the hydrographic and phytoplankton data, respectively. Detailed planning and co-ordination of NORWESTLANT was the responsibility of Mr. A. J. Lee, to whom R&S expresses its sincere appreciation.
- (iii) Plans have been made to integrate the national reports into a composite form by May 1965 (see Annex 2 of Appendix VI). To co-ordinate this work, and to provide an opportunity for the underlying scientific problems to be adequately considered, R&S

recommends (41)**

that a meeting of those responsible for preparing the final report on NORWESTLANT be held at national expense in Copenhagen on September 25th and 26th, 1964 (i. e. immediately before the 1964 ICES meeting). ICNAF member countries are urged to send to this meeting as many as possible of their experts who have been concerned with the collection and analysis of NORWESTLANT material.

- (iv) Approval in principle was given last year for the publication of the NORWESTLANT Report in the ICNAF Special Publications Series, and a sum of \$8,000 for this appears in the forecast estimates for the financial year 1965/66. It is now thought that by using the most economical method of printing, the cost will be less than this. It is accordingly

recommended (2)**

that the sum of \$6,000 be allocated in the financial year 1965/66 to cover the cost of printing the NORWESTLANT Report in the ICNAF Special Publication Series.

- (v) It is understood that the American Geographical Society may wish to publish large-scale charts of the results of NORWESTLANT. Believing this to be in the interests of advancing knowledge of the marine environment, it is accordingly

recommended (3)

that the Executive Secretary, in conjunction with the Chairmen of R&S and its Environmental Subcommittee, be authorised to discuss with the appropriate representatives of the American Geographical Society their suggestion that charts of the results of NORWESTLANT be published in the Serial Atlas of the Marine Environment, and to make arrangements accordingly, provided no additional expense to ICNAF is thereby incurred.

4. GEAR AND SELECTIVITY (App. V)

- (a) The available evidence for the ICNAF area indicated that the selectivity of polyamide and polyester fibres (e. g. nylon, terylene) is some 5% to 15% higher than manila, while that of polyethylene (e. g. courlene) is roughly the same as manila.

- (b) Evidence reported by Canada, and previous experience, suggests that

made of both manila and synthetic fibres.

Canada also reported comparisons in which an ICNAF gauge, used at a pressure of 12 lb also gave readings in the region of 5% higher than those obtained by a parallel-sided enforcement-type gauge, used so as to "pass easily through" the mesh. It has to be recognised, however, that interpretation of the words "shall pass easily through" is inevitably to some degree subjective, and that the results obtained by a parallel-sided gauge may be correspondingly variable.

- (c) Further information has been requested on the selectivity of cod-ends fitted with a new topside chafer used by large Soviet and Polish trawlers.
- (d) Member countries are requested to provide, for scientific use, information on mesh size and types of gear used in their ICNAF fisheries, so that better assessments of the effect of mesh increase can be made. A form has been devised for this purpose.

SAMPLING (App. IV)

- (a) It has been decided to publish again age-length keys in the Sampling Yearbook, a procedure discontinued since 1962, because of their basic importance in fish population research. By omitting age-composition data from the Yearbook and by making other economies in presentation, it is not thought that this change will involve any substantial increase in the cost of the Sampling Yearbook.
- (b) It is understood that a recommendation from an ICES Working Group on Sampling will be put before the next meeting of ICES, advocating a joint meeting between ICES and ICNAF scientists. The purpose of this meeting would be (i) to consider ways and means of achieving the maximum degree of uniformity in the collection and presentation of fish sampling data, especially of length measurements, and (ii) to discuss the scientific basis of sampling techniques and their application to fisheries research. R&S wishes to indicate its interest in the possibility of co-operation with ICES in this matter, and accordingly

recommends (23)**

that ICNAF should inform ICES of its great interest in the subject of sampling and routine biological measurements, and of its keen desire for scientists from ICNAF member countries to participate in a meeting on this subject should one be organised by ICES.

6. STATISTICS (App. VII)

- (a) The recent innovations in the collection and reporting of ICNAF statistics, including the use of STANA common reporting forms, appear to be working satisfactorily. No further changes of substance are proposed for the time being...
- (b) A simplified form for reporting of discards and industrial fish catches has been devised.
- (c) It was noted that ICES, at its 1963 meeting, agreed that its future representation on the FAO Continuing Working Party on Fishery Statistics should be similar to that proposed by ICNAF last year for its own participation (1963 Redbook Rec. (59) p. 9-10). It is accordingly

recommended (49a)**

that ICNAF proceed with plans to be represented at the 1965 meeting of the CWP in accordance with recommendation (59) of the 1963 Redbook.

It should be recalled that under this arrangement ICNAF agreed to pay the expenses of its Statistician and the Chairman of the Statistical Subcommittee. ICES have made corresponding arrangements.

- (d) The Statistical Subcommittee were grateful to have for their use at this meeting the 1963 Report of the ICES Statistical Committee. In response to a request from ICES it is

recommended (49b)**

that henceforth the Report of the ICNAF Statistical Subcommittee be transmitted to ICES.

- (e) It is gratifying to report that, for the first time, complete catch statistics have been available at this meeting for the immediately preceding year (1963). This has been of great value to the scientific work of R&S. The services of the ICNAF Secretariat, and the help of Mr. D. Gertenbach of FAO, which have together made this possible, are much appreciated, as is the co-operation of member countries in speedy reporting.

7. AGEING TECHNIQUES AND TAGGING (Apps. III and II)

- (a) A new system of exchange of cod otolith photographs was started last year. The first results are encouraging and it is hoped that this system will materially improve the standard and comparability of age reading

- (b) The card system for summary reporting of tag release data will be continued. There was a useful exchange of ideas on methods of tag reporting and publicity in member countries.

HERRING AND OTHER PELAGIC FISH (App. I)

In view of the major importance of herring in the ICNAF landings, an ad hoc Group was set up last year to review the progress of herring fisheries and to co-ordinate the research on them. The report of this Group contains a valuable summary of information on this relatively new subject. It includes also an account of recent developments in fisheries for other pelagic fish, including tuna, in the ICNAF area.

ADEQUACY OF REGULATIONS (Commission agenda item 18)

- (a) This question was referred to R&S at the 1963 Annual Meeting, and appears as item 18 of the 1964 Commission agenda.
- (b) R&S respectfully submit that to judge whether or not regulations are "adequate" in the widest sense involves major questions of policy which are outside its competence. The attempt has, however, been made at this meeting to give the kind of scientific advice which the Commission would need to decide whether or not the existing regulations are adequate, and what other kinds of regulations, if any, might need to be considered.
- (c) The memorandum from the late G. R. Clark (Ser. No. 1092) which led to this matter being raised last year, was concerned particularly with the increased fishing activity in the ICNAF area in recent years, and its probable consequences. Such advice as can at present be given on this is contained in the attached report of the Assessments Subcommittee (App. VII). Notwithstanding the necessarily provisional and incomplete nature of some of its conclusions R&S believes this report constitutes a substantial advance.
- (d) R&S recognise that the Commission may in the future wish for other kinds of advice not included in the present report, nor even considered hitherto by ICNAF scientists. In that event, if specific advice is requested, R&S will take such action as is necessary to provide it as soon as possible.

FUNCTION OF R & S

- (a) There is growing concern among ICNAF scientists about the limited opportunity afforded to R&S to give proper attention to the scientific basis of its work, and to its reporting to the Commission, during the one week immediately preceding the Annual Meeting of the Commission. This is further aggravated by the difficulty experienced by many member coun-

- (b) The difficulty stems largely from attempting to combine both the advisory and the more basic scientific functions of R&S at one and the same time, though both are essential. Matters such as the co-ordination and planning of national research programmes and the monitoring of statistical collecting can be effectively undertaken with the present arrangements. On the other hand, proper consideration of the scientific basis of the work of R&S, on which the calibre of its advice to the Commission is crucially dependent, may be impossible without mid-year meetings from time to time of one or other of its specialist groups. Such meetings would enable scientists both to work together and to give due thought and reflection to their findings. As a consequence, R&S would be able to prepare more carefully its reports, and in this and other ways to improve its standard of advice to the Commission.
- (c) At this meeting, three Subcommittees have independently requested mid-year meetings for one purpose or another.
- (i) The Environmental Subcommittee, faced with the task of co-ordinating the preparation of the final NORWESTLANT Report before next May, and of giving proper consideration to its scientific content, has recommended that all those concerned should meet for two days next September immediately prior to the forthcoming ICES meeting.
 - (ii) The Sampling Subcommittee has foreseen the need for a special meeting with ICES scientists to deal not only with scientific problems of sampling but also with matters to do with the collection and reporting of sampling data, which are common to both organizations.
 - (iii) The Assessment Subcommittee has anticipated the need for mid-year meetings from time to time, not necessarily annually, again in order to deal more effectively with the scientific basis of its work.
- (d) R&S, having considered these requests and reviewed the problem generally, strongly endorse the need for one or other of its subcommittees or, where possible, smaller nominated Working Groups, to meet in mid-year when appropriate. To hold such meetings contiguously with the Annual Meeting of ICES has advantages of economy for many (though, admittedly, not all) countries, and of contact with other scientists, many of whom are engaged on fundamentally the same kind of problems. There may well be occasions, however, when quite separate meetings are required. In any event, when a mid-year meeting is held it should result in fewer scientists being required at the next Commission meeting.
- (e) R&S wishes to place its views on this matter before the Commission, and hopes that it will give them its sympathetic consideration, both in principle and in respect of the particular requests from the three subcommittees mentioned above. Should that be so, R&S suggests that the

offer of reciprocal facilities should the occasion arise.

OTHER MATTERS

(a) National Research Reports

- (i) It was agreed that the new format of National Research Reports (1963 Redbook, Rec. 65) was a substantial improvement, and greatly helped Chairmen of Panel Advisers in compiling their summaries of research. Countries are urged to adhere as closely as possible to this recommended format when preparing their reports, and it is

recommended (4)

that National Research Reports should carry the name(s) of those responsible for the researches and for compiling the report.

- (ii) R&S considered again the question of where the National Research Reports should be published, recalling that the present arrangement, whereby they appear in Part II of the Redbook, was required by the Commission in 1962 as an economy measure. R&S firmly believes that the up-to-date summaries of research, and reviews of the status of the fisheries, contained in these reports are of great interest and importance to the work of the Commission, and to its research programmes and those of member countries. R&S accordingly

recommends (5)

that the Commission should endeavour, at the earliest opportunity, to adopt again the arrangements for publication of National Research Reports which were effective prior to 1962; namely, that these Reports, condensed as far as possible in accordance with Rec. (12) of the 1963 Redbook, be published in the Annual Proceedings, and Summaries of Research by Subareas be printed in the Redbook.

(b) Atlantic Tuna Organisation

The Commission has been asked by FAO to comment on the Report of the FAO Working Party for Rational Utilisation of Tuna Resources in the Atlantic Ocean. Having considered those parts of the Report relevant to the work of R&S it was agreed to

recommend (6)

- (i) ICNAF is at the present time publishing statistics of tuna landings from the Convention area in its Statistical Bulletin, and reviewing and co-ordinating tuna research in the area.
- (ii) because the ICNAF area covers only the northern extremity of the wide-ranging distribution of Atlantic tuna, ICNAF has only a fringe research interest in these species.
- (iii) ICNAF would be willing to co-operate with any future Atlantic Tuna Organisation in working out a suitable arrangement for reporting and publishing tuna statistics, and for co-ordinating tuna research, in the ICNAF area.
- (iv) the Report of the Herring and other pelagic fish Subcommittee to the 1964 Annual Meeting (Proc. 1, App. I), which contains in some detail the present status of ICNAF's interest in tuna statistics and research, be sent to FAO for information

It is noted that if a second plenipotentiary conference for the purpose of setting up an Atlantic Tuna Organisation be convened at some future date, ICNAF, as an organisation with an interest in Atlantic tuna, might be invited to send an observer. In this event it is

recommended (7)

that if an invitation be received by ICNAF at some future date to send an observer to a plenipotentiary conference for setting up an Atlantic Tuna Organisation, the Executive Secretary, in consultation with the Chairman of R&S, should be empowered to appoint such an observer.

(c) ICES Liaison Committee Reports

It was agreed that these reports are of great value to R&S since the scientific basis of the work of the ICES Liaison Committee, and of ICNAF's R&S, has much in common. It is accordingly

recommended (8)

that the Commission request the North-East Atlantic Fisheries Commission to transmit each year the approved Report of the ICES Liaison Committee to ICNAF for use by its Standing Committee on Research and

OFFICERS OF R & S FOR THE COMING YEAR AND THE 1965 ANNUAL MEETING

(a) Dr. W. Templeman was elected Chairman of the Standing Committee on Research and Statistics.

(b) The following were nominated to serve on the Steering and Publications Subcommittee:

France, Portugal, Spain and Italy	Mr. R. Monteiro
Iceland, Norway, USSR	Dr. A. S. Bogdanov
Denmark, Germany, Poland and UK	Dr. C. E. Lucas
Canada	Dr. J. L. Hart
USA	Dr. H. W. Graham

(c) The following Subcommittee Chairmen were appointed:

Assessments	Mr. J. A. Gulland
Statistics	Mr. R. C. Hennemuth
Sampling	Mr. S. Horsted
Environmental	Mr. A. J. Lee
Gear and Selectivity	Dr. H. Bohl
Herring and other pelagic fish	Mr. B. E. Skud
Age-reading	Mr. E. Bratberg

(d) The following were requested to act as ICNAF's observers:

- (a) Mr. A. J. Lee at the forthcoming meetings of SCOR and IOC
- (b) Mr. S. Olsen at the forthcoming ICES meeting.

ARRANGEMENTS FOR THE 1965 ANNUAL MEETING

Having considered the probable programme of work for the 1965 meeting, and in order to ensure that as much as possible of the scientific work of R&S shall be completed by the end of R&S week, it is

recommended (9)

that the Assessment Subcommittee should meet on the Friday and Saturday, and the Herring and Other Pelagic Fish Subcommittee on the Saturday immediately preceding R&S week at the 1965 Annual Meeting.

SECTION III
REPORTS OF SCIENTIFIC SUBCOMMITTEES AND WORKING GROUPS

As approved, with some further minor amendments and with recommendations numbered serially starting at No. 10.

APPENDIX I
REPORT OF AD HOC GROUP ON HERRING AND OTHER PELAGIC SPECIES

May 21-22, 1964

Chairman, Mr. B. E. Skud; Rapporteur, Dr. J. C. Medcof

1. Agenda

The Chairman distributed copies of a proposed agenda which was adopted after amendment of the order in which various topics were to be treated. A joint session with the Assessment Subcommittee was held on May 22.

Documents referring to pelagic species

The Chairman cited the following documents as being of interest to the group:

4. A bibliography of herring in the Northwest Atlantic
6. Standard graphical presentation of pertinent data for use by the Assessment Group
7. A summary of the fishery in the Convention Area, 1952-1962
15. ICNAF Environmental Symposium
18. United States Research Report, 1963
36. Canadian Research Report, 1963
56. Catch/effort assessment in some ICNAF fisheries
58. Polish Research Report, 1963
59. Soviet Research Report, 1963
62. Plankton investigations in the areas of Georges and Browns Bank in 1963
64. Preliminary statement on ICNAF NORWESTLANT 2. Canadian zooplankton collections

Review of Canadian fishery and research on large pelagic fish in the ICNAF area in 1963

Annual catches in the Northwest Atlantic (ICNAF statistical area) 1963

Herring: Outcome of previous meetings

The Chairman reviewed Document 4 which was an up-to-date compilation of references provided by member countries to literature on herring in Subareas 4 and 5, in accordance with recommendations of the 1963 meeting.

The Chairman reviewed efforts being made at standardization of methods of recording and reporting basic data on herring. Appreciating the importance and need for uniformity, the Group

recommends (10)

that the methods of measuring, recording and reporting basic data on herring agreed by the 1962 ICES Herring Committee* be adopted by ICNAF.

These include reporting the measurements of natural total length and eight stages of maturity. Certain member countries will continue making length measurements in mm for describing length composition, but will report their results in half-centimetre groupings. A paper by Schubert and Schumacher, "Some investigations concerning changes in length measurements of herring", was cited to point out the changes in measurements due to storage and the Group

recommends (11)

that member countries conduct experiments on changes in length and weight of herring due to storage and report their results to the next Annual Meeting.

The USA reported that such tests had been initiated on samples held in frozen storage.

Environmental Symposium

The ICNAF Environmental Symposium held in Rome on January 27-February 1, 1964 included a section (E) on herring which was convened by B. E. (USA). The Chairman referred to the eight herring papers and the Conference's Report, which are to be published with other papers of the Symposium.

Recommendations adopted by the Herring Committee concerning routine methods and the reporting of herring biological data in the ICES area" being Appendix I to Report of Herring Committee, ICES Proc -Verh 1962, pp 71-73

There was a discussion of the use of scales and otoliths for determining age and stock separation (spring- or autumn-spawned). Methods for otolith storage were also reviewed, Germany and USA reporting some recent innovations.

With reference to the paper by Lauzier and Tibbo (Environmental Symposium No. E-3), Schubert reported that the pre-spawning concentrations of North Sea herring were influenced by the cold winter of 1962-63. It was observed that temperature spawning requirements of North Sea herring were similar to those of Georges Bank while those of the Atlanto-Scandian stocks were comparable to those of the Gulf of St. Lawrence.

The timing of the formation of the first winter scale ring was also discussed.

3. Relation between fisheries for herring and regulated species (by-catches)

Review of available information in the USSR herring and silver hake fisheries indicated that catches included some of the regulated species. In Subarea 5, the by-catch of haddock from the 1963 USSR statistics was 5,350 tons and the cod by-catches amounted to 2,361 tons. These combined by-catches of haddock and cod were about 3% of the combined herring and silver hake catch. The total catch of haddock in Subarea 5 by all countries in 1963 was 59,610 tons, so that the haddock by-catch of the USSR accounted for 9% of the haddock total. The total cod catch in the subarea was 29,687, so the USSR by-catch was about 8% of the total.

4. Large pelagic fish

(a) Swordfish. The meeting reviewed Documents 36 and 74 and other information provided by the Chairman on the fishery by the U.S.A. Only Canada and the U.S.A. are exploiting this species and fishermen in both countries utilize longline gear. As a result the fishery is now active day and night in all months of the year. Harpooning, a method formerly used, was carried out only by day in the summer months. Preliminary figures indicate a substantial increase in landings, as follows:-

	1962 (Stat. Bull.)	1963 (Document 84)
Canada	2380 metric tons	8623 metric tons
USA	349 " "	934 " "
Total	2729 " "	9557 " "

The catches were made at the edge of the continental shelf in Subareas 3, 4, 5 and south of the ICNAF area. The average size of the fish has decreased, as the catch now includes many juveniles and males as well as large females which were the principal catch of harpoons. Log-book records covering over 200 trips by Canadian boats showed that their catch averaged a ton per boat per day.

continue these in 1964.

) Tuna. The meeting reviewed Documents 18, 36, 74 and data on the USA fishery supplied by the Chairman. Catches of tuna in the ICNAF area are expanding as shown by the following figures, including bonito (Sarda) and skipjack (Thunnus):

	1962 (Stat. Bull.)	1963 (Preliminary)
Canada	116 metric tons	366 metric tons
USA	<u>3241</u> " "	<u>6228</u> " "
Total	<u>3357</u> " "	<u>6594</u> " "

The 1962 Canadian catch came from fish traps in Subarea 4, and in 1963 from traps and two small (30 m long) purse-seine boats which began operations in the summer partly in Division 5Z and farther south. The vessels in the U. S. A. fishery included several purse-seiners from the Pacific tuna fleet. The areas of operation for these boats was in Subarea 5 and in more southerly areas. The Canadian catch was largely bluefin (Thunnus) but 45 metric tons of skipjack were also landed by the purse-seiners. Bluefin also dominated the U. S. A. catch.

Both countries did some tagging and made biological observations of samples of catches. The seined fish were smaller than those taken in the Subarea traps. It is planned to expand these studies in 1964. The Chairman reviewed the past U. S. A. research on Atlantic tuna and listed the agencies and investigators concerned.

The Norwegian and German tuna fisheries in the Eastern Atlantic were very poor in 1963 and Germany expressed concern because there is some evidence that these fisheries depend partly on the same stocks fished by Canada and the U. S. A. (This has been evidenced by U. S. A. tagging experiments.) The Group therefore

recommends (12)

that efforts be made to establish the degree of mixing of tuna stocks in the Eastern and Western Atlantic.

The FAO expert panel on tuna research will meet in June in Rome; this was called to the attention of the Group.

) Sharks (Porbeagles). At last year's Research and Statistics Committee meeting, Norway reported on its porbeagle fishery. As listed in Document 84, the catch amounted to 4,433 metric tons during 1963, as compared with 2,216 in 1962. Norway has published some biological information and plans to continue its research.

this species have been on the increase. The importance of interspecific relationships of pelagic and groundfish species was also reiterated.

5. Herring: Review of fishery and research

(a) Status of fishery. The meeting reviewed Documents 18, 36, 58, 59, 73 and 84. Comparisons of available data on ICNAF area landings were as follows (metric tons):

	1962	1963 (Document 84)
Canada	111,649 metric tons	105,911 metric tons
Poland	277 " "	256 " "
USSR	160,404 " "	100,036 " "
USA	71,779 " "	70,090 " "
Totals	<u>344,109</u> " "	<u>276,293</u> " "

The Canadian and U.S. A. catch came largely from inshore waters of Subareas 4 and 5 taken by weirs, stop-seines, purse-seines and gill nets. They included immatures (sardine) and adults. Polish and USSR catches were made offshore in Subareas 4 and 5 using trawls and drift nets.

Medcof reported on the distribution of Canadian catches, all of which were made in Subarea 4. The Gulf of St. Lawrence catch increased from approximately 35,000 metric tons in 1962 to 40,000 tons in 1963. The catch from eastern Nova Scotia increased from 8,000 to 9,000 tons and the Bay of Fundy catch decreased from 62,000 to 57,000 metric tons. He also indicated growing interest in possibly increasing exploitation of stocks in the Gulf of St. Lawrence and Nova Scotia.

Studenetsky reported on the USSR herring catches. The total in 1962 was 160,000 metric tons and in 1963 100,000 tons, of which 97,000 tons were taken in Subarea 5. In this subarea, the decrease occurred in the drift net fishery, whereas the trawl catches remained at the level achieved in previous years. Changes in the size and age composition of the catches were noted. Until August, 1963 the catches were dominated by herring of the 1951 and 1958 year classes (25 to 29 cm long). After August, smaller fish (20-24 cm long) from the 1960 year class dominated the fishery and this heavy recruitment suggested that this year class would be an abundant one. Younger herring were poorly represented in 1961 and 1962, when the catches were dominated by the 1956 year class. The change noted in 1963 was explained by the fact that natural and fishing mortality had reduced the abundance of the older year classes. The total mortality, based on age composition and fishing effort, for fish of age 5 and older was reported as 80%. The instantaneous mortality coefficient in the drift net catches from 1961-1963 was 1.17, and was 1.25 according to data collected from the BMRT (large) trawlers. It was anticipated that the catches in 1964 would be dependent on the 1960 year class and that the level would not exceed that of 1963. Studenetsky also reported the catch per hour of the trawlers and drift nets (see page 7) which

hery.

In the discussion that followed, Hempel pointed out that in the North Sea herring fishery, catch per trawl had decreased but that catch per drift net had not changed. He suggested that the sudden disappearance of the 1956 year class on Georges Bank might be due to causes other than fishing and wondered if there had been any change in fishing methods or locality. Studenetsky indicated that there had been no change in these, and that both drift nets and trawlers had taken fishes of the same ages, but that drift nets are not used in the autumn. The Group

recommends (13)

that detailed information on the size and number of herring sampled from Georges Bank, and monthly data on age-composition by vessel types are needed. The USSR agreed to provide this information.

The Chairman reported on the status of the US herring fishery which is concentrated on immature fish, utilized as "sardines". The catch in the State of Maine accounts for the major portion of U.S. landings and in 1963 was 66,000 metric tons as compared to 69,000 in 1962. Only 46,000 tons were processed as sardines in 1963, a 12,000 ton decrease from 1962. This change was thought to reflect a marketing condition due to the large holdover of the previous year's inventories and the fact that most of the canneries ceased operation earlier than usual. The total units of gear decreased from 278 in 1962 to 224 units in 1963. This decrease was evident in the three types of gear: weirs, stop-seines and purse-seines. The age composition of the 1963 catch was dominated, as usual, by fish in their second year of life, but a relatively greater proportion of three year old fish were taken during the summer months.

Herring: Research in Subareas 4 and 5

Medcof reported on Canadian herring research which was presented in Document No. 73. In support of commitments made to ICNAF, a study of the size composition of herring was carried out in the Bay of Fundy, in southwest Nova Scotia and on Georges and Browns Banks. In addition studies of the abundance and distribution of herring larvae were continued in the Bay of Fundy and in the Gulf of St. Lawrence. The only studies in Subarea 5 involved 14 samples of herring obtained from bottom-trawl catches by the A. T. CAMERON on Georges Bank in August. Some additional research may be initiated next year in the Gulf of St. Lawrence and on studies to determine the origin of the larvae found in the Bay of Fundy.

Studenetsky reported on the catch-effort studies and the estimates of mortality carried out by the USSR (see para. 5(a)). He also mentioned that 1760 herring had been tagged but there had been no returns so far. Special research studies - hydrography and plankton - were summarized in Document No. 59.

Skud reported on the U. S. research and pointed out that the age composition data from Georges Bank samples corroborated the results obtained by the USSR. Inshore larval distribution in the estuaries was discussed and mention made of the special gears utilized to sample larvae at or near the bottom. Hydrographic and plankton data have been collected during the inshore cruises which cover the area from Cape Ann, Massachusetts to Grand Manan. Larval sampling will continue in 1964 at the same level of effort. Tagging (inshore) will be restricted to a local area to study the behaviour in response to environmental conditions. A cruise on the ALBATROSS is planned during the month of June. Efforts to identify herring stocks will be increased, with greater emphasis on biochemical techniques. Studies of recruitment to the herring stocks making up the Northwest Atlantic inshore fishery were mentioned and the need for comparing these data with recruitment data from the North East Atlantic herring stocks was pointed out.

The Group, recognizing the lack of knowledge about the relationship of the stocks providing the inshore and offshore fisheries,

recommends (14)

that increased research effort be made to determine the identity of the herring stocks in the Gulf of Maine and on Georges Bank.

7. Joint meeting with Assessment Subcommittee

Lloyd Dickie chaired this session and called on the Chairman of the ad hoc group on pelagic species to open the discussion. Skud cited two general areas of interest, one, the inshore fishery for immature herring by Canada and USA and the other, the USSR offshore fishery of adult herring.

A major problem in the inshore fishery is concerned with the means of evaluating effort. Three gear types are used, the weir (trap), stop-seine and purse-seine. The weirs are immobile and the stop-seines are limited in operation to coves and small bays along the coast. An estimate of the relative fishing power of these gears is being attempted by the USA but the limitations of mobility pose severe problems, particularly with reference to the varying availability of fish. There is reason to believe that any measure of catch per unit of effort will be especially sensitive to availability change and possibly independent of stock abundance. Gulland suggested the use of aerial surveys as a possible method of obtaining a better index of relative stock abundance. This approach or any other which is not dependent on commercial fishing success has considerable merit, both from the standpoint of evaluating effort and of eliminating effects of a selection bias for fish of a certain size by the canning industry. Dickie acknowledged the difficulties concerned with assessment in the inshore fishery.

Skud reviewed the history of the offshore fishery and the discussions of the ad hoc Group on this fishery. The striking change in age composition in 1963 was

ularly, the USA determines ages from otoliths and obtains relatively few samples on a sporadic basis. Studenetsky provided information on the catch per hour for the various vessel types of the USSR:

	1961	1962	1963
Large stern trawlers	2.4 metric tons	2.4 metric tons	3.66 metric tons
Medium trawlers	-	1.16 " "	0.81 " "
Lift nets	150 kg	75 kg	76 kg

Length frequencies, age composition and instantaneous mortality rates presented in Figures 4, 5, 6 and 7 of the USSR report (Document 59) were discussed and comparisons were made with the herring fishery in the North Sea. The group recognized the value of USSR data on the stocks of Georges Bank herring and the observed changes were of sufficient interest to warrant further attention. Data on age composition by vessel type are needed to ensure that the sampling is representative of the stock and the USSR agreed to provide monthly data on effort and catch by vessel types and area to provide a means of more thorough examination of the changes noted in the offshore fishery. Attention was called to the strong representation of the 1960 year-class during the late fall of the 1963 fishery, a period when most of the catch was taken by the large stern trawlers. The 1956 year-class which dominated the 1962 catch was of only minor proportions in the late 1963 catch. The committee considered it important to determine whether this change was due to fishing or to a change in availability. An examination of monthly records for the 1961-1963 period might clarify this point. Emigration was also suggested as a possible explanation of the change. The difficulties of assessing year-class strength in the inshore fishery precluded the possibility of comparing year-class representation with the offshore data.

Dickie expressed the interest of the Assessment Subcommittee in pelagic fishery problems and emphasized the need for monthly summaries of age and effort data.

APPENDIX III - REPORT OF THE SUBCOMMITTEE ON AGEING TECHNIQUES

Chairman, Mr. E. Bratberg; Rapporteur, Mr. E. J. Sandeman

1. The results of the questionnaire sent by the ICNAF Secretariat to halibut and redfish experts (Document No. 19) were discussed. The Subcommittee

recommends (16)

that the standard terminology and notation for otolith age readers proposed by A. C. Jensen (1963 Redbook, Pt. III, p. 131-134) be adopted for halibut and redfish with the provision that Mr. Jensen would incorporate any small changes which he might think necessary in the light of the comments raised in Document No. 19.

2. The Subcommittee considered Document No. 78 prepared by R. W. Blacker and indicated their appreciation to him and the Lowestoft Laboratory for preparing the excellent photographs. The Subcommittee considered the cod otolith photograph exchange well worthwhile and

recommends (17)

that the cod otolith photograph exchange program should be continued and expanded to include other areas. In addition the otolith photographs discussed in Document No. 78 should be re-circulated together with the otoliths themselves and the comments of the different age readers. A list of countries and experts (with addresses) among whom exchange should be made for each of the ICNAF subareas is given in Annex 1 to this Report.

3. It was noted that while the halibut otolith exchange program, discussed in Document No. 8, had been both useful and interesting, it was no longer needed.

4. Document No. 9 on the Redfish otolith exchange program was considered and it was agreed that Mr. Blacker and Dr. Messtorff should be asked to investigate the possibilities of photographing redfish otoliths for exchange purposes.

5. Documents Nos. 45 and 86 concerning validation of otolith ages of cod were considered. The Subcommittee agreed that further studies of the type would be valuable and

recommends (18)

that studies of validation of otolith age reading methods in all species of fish be vigorously pursued by all member countries. This is especially necessary in areas where there are disagreements or difficulties in age determination.

The Subcommittee further

recommends (19)

that when otolith studies have been successful in a particular stock that type specimens of the otoliths in question be photographed and distributed to all member countries. It was agreed that this procedure should be adopted for Subarea 3 cod otoliths referred to in Document No. 45

Dr. Meyer described (Document No. 83) and demonstrated the excellent otolith cutting machine which has been developed by his laboratory. It was indicated by some members of the Subcommittee that photographs and plans would be useful.

Subcommittee on Ageing Techniques

Annex 1. List of member countries to contact in cod otolith photograph exchange scheme

<u>Subarea 1</u>	<u>Subarea 2</u>	<u>Subarea 3</u>	<u>Subarea 4</u>
Denmark	Canada	Canada	Canada
Germany	Iceland	Germany	Germany
Iceland	Germany	Iceland	Portugal
Norway	Portugal	Portugal	UK
Portugal	UK	USSR	USA
UK	USSR		USSR
USSR			

- Canada Kohler, Biological Station, St. Andrews, N. B. (Subarea 4)
Fleming, Biological Station, St. John's, Newfoundland (Subareas 2-3)
- Denmark Horsted, Greenland Fisheries Investigation, Charlottenlund, Denmark
- Germany Meyer, Institut für Seefischerei, Hamburg (Subarea 1)
Messtorff, Institut für Seefischerei, Bremerhaven (Subareas 2-4)
- Iceland Jonsson, University Research Institute, Reykjavik
- Norway Bratberg, Institute of Marine Research, Bergen
- Portugal M. Lima Dias, Instituto de Biologia Maritima, Lisbon
- UK Blacker, (Co-ordinator), Fisheries Laboratory, Lowestoft
- USA Jensen, U.S. Bureau of Commercial Fisheries, Woods Hole
- USSR Bogdanov, Central Research Institute of Marine Fisheries and Oceanography, Moscow. (VNIRO)

APPENDIX IV - REPORT OF THE SUBCOMMITTEE ON SAMPLING

Chairman, Mr. B. B. Parrish; Rapporteur, Mr. E. J. Sandeman

The Subcommittee met on Wednesday, 27th, and Thursday, 28th May. Representatives from most member countries attended both sessions.

The following main items of subject matter were discussed:

- A. Publication of data in Sampling Yearbook
- B. Sampling methods and uniformity of length measurements
- C. Variability of sampling data
- D. Sampling of discarded fish

Publication of data in Sampling Yearbook

The Subcommittee considered in detail the need for changes in the type of length and age sampling data to be reported by countries and the form of their publication in the Sampling Yearbook. It examined the results of analyses, presented in Document Nos. 31 and 49, of the variations of length and age sampling data in space and time for Canadian haddock and cod fisheries in Divisions 4W and 4T respectively and for the USA haddock fishery in Subarea 5. These analyses indicated that the homogeneity of age-length key data, in space and time, was substantially greater than that for length. Note was also taken of views expressed at this and earlier meetings that the publication of age data in the form of age-length keys, rather than as direct age-compositions, has definite advantages.

The Subcommittee therefore

recommends (20)

(a) that countries be requested to continue to report length composition data as numbers per mille on the same time (month), area (statistical division) gear and vessel category basis as in previous years, and that for redfish and species of flounder and halibut (but not other species) they should also be broken down by sex, and for redfish by 50-fathom depth zones also. Other items of relevant information should also be reported and published in accordance with earlier recommendations (see "Report of Working Group on Sampling Yearbook"; Redbook 1962, Part 1, pp. 39-41). The importance of continuing to supply information on the number and weight of fish measured and the number and weight of fish caught or landed in the sampled fishery is particularly stressed.

(b) that age data for cod and haddock should, in future, be

category. For all other species age data should continue to be reported as direct age-compositions as in the past

(c) that when both length and age data are available for cod and haddock for the same fishery, they should be reported and published in a composite, tabular form as specified in Annex 1 to this Report.

The Subcommittee considers that the reintroduction of age-length keys into the Sampling Yearbook can, with these changes in the form and layout of the tables and with other economies of presentation, be achieved without a large increase in its size and cost.

The Subcommittee further

recommends (21)

that the question of publication of the age-length keys for the year 1961 and 1962, which have been deposited with the Secretariat, be considered at the 1965 Annual Meeting in the light of experience gained following implementation of recommendation (20) above

It was also noted that for assessment purposes the length compositions of the total catches or landings, combined on a seasonal or annual basis, in terms of number of fish rather than per mille, are often the form in which the data are required. Therefore the Subcommittee also

recommends (22)

that the Assessments Subcommittee be asked at the next Annual Meeting to propose for which fisheries, and for what time intervals, length-composition data should be combined in the Sampling Yearbook.

2. Sampling methods and uniformity of length measurements

Information supplied by member countries during the past year shows that a wide range of sampling methods is used by member countries in collecting the routine length and age data published in the Sampling Yearbook. Further, it is evident that there are still some differences in the units of length measurement used by member countries.

The Subcommittee considers that all possible steps should be taken to achieve the greatest possible degree of uniformity in length measurement among member countries, and the maximum possible efficiency in sampling. In this

with approval that the provisional report of this ICES Working Group proposes that a meeting of ICES and ICNAF scientists be held in the near future to consider the problem of sampling methods and their application in fisheries work, and also to discuss ways of achieving in the North Atlantic greater uniformity in routine biological measurements, especially of length. Accordingly the Subcommittee

recommends (23)

that ICNAF should inform ICES of its great interest in the subject of sampling and routine biological measurements and of its keen desire for scientists from ICNAF member countries to participate in a meeting on this subject should one be organized by ICES, with a view to discussing problems of mutual interest.

Variability of sampling data

Information on the variability of sampling data for sea scallop in Subarea (Document No. 65) and of estimates of selectivity (Document Nos. 44 and 98) was noted by the Subcommittee. It endorsed the views expressed at the 1963 Annual Meeting that in all fisheries research appropriate statistical techniques should be used wherever possible to determine the variability of numerical data and estimates derived therefrom. It therefore urges all scientific workers in the ICNAF area to supply, wherever possible, in meeting documents, the results of analyses of variability in their sampling estimates.

It also requests that this subject receive attention at the meeting referred to in Recommendation (23).

Sampling of discarded fish

A request from the Statistics Subcommittee for advice on sampling procedures for estimating discards was considered. Although no meeting documents on this subject were available, note was taken of recent published work [Jean, Y. Fish. Res. Bd. Canada 20(2), 1963] on discarding in the Canadian trawl fisheries in Subarea 4; this showed good agreement between the discard estimates obtained from different sources, including the observations of scientific observers at sea and log book records completed by skippers. The importance of obtaining accurate estimates of the quantities of discards by species and their age and size composition, especially for assessment work, was stressed by the Subcommittee which accordingly

recommends (24)

that scientists in all member countries report before the next Annual Meeting on their methods of estimating the

consideration be given at that meeting to the appropriate
ness and efficiency of different sampling methods.

5. The Subcommittee noted with approval the publication of Sampling Year-
book Vol. 7 for 1962, and wishes to express its appreciation of the work of the
Statistician in compiling it so promptly.

Subcommittee on Sampling

Annex 1. Recommended Tabular Presentation of Length Composition and Age-
Length Keys for the Sampling Yearbook

Gear - - -
Catches/Landings
Quarter
Country
Tonnage class

Months

Age Length Group (cm)	1	2	3	4	5	--- etc.	No. of ages read	Length composition per mille		
								Jan.	Feb.	Mar.
length groups as specified for the species in question	Figures in age-length key to be the actual numbers of ages read, <u>not</u> percentages									
Age comp. per mille	Jan.									
	Feb.									
	Mar.									

Serial numbers

Number of samples			
Number of fish measured per month	(1) - -	(2) - -	(3) - -
Mean length of individual fish (cm) per month	(1) - -	(2) - -	(3) - -
Mean weight of individual fish (kg) per month	(1) - -	(2) - -	(3) - -
Total weight caught or landed in sampled fishery per month	(1) - -	(2) - -	(3) - -

APPENDIX V - REPORT OF SUBCOMMITTEE ON GEAR AND SELECTIVITY

Chairman, Dr. W. Templeman; Rapporteur, Mr. B. B. Parrish

The Subcommittee met on Monday, 25th and Thursday, 28th May. Representatives from most member countries attended both sessions.

Selectivity of Cod-end Materials

Further information on the differences in selectivity between codends of different materials was presented in Documents No. 48 and 72. The results in Document No. 72 of an estimation of the mesh size differentials for different materials to give the same selectivity were considered. The Subcommittee agreed that, from the data available from experiments carried out in both the North-West and North-East Atlantic, the selectivity of double and single braided codends made from polyamide and polyester fibres was, on average, about 10% higher than double manila codends. On the other hand, polyethylene codends have about the same selectivity as manila ones. At present, too few data on the selectivity of polypropylene (e. g. Ulstron) codends are available for its relative selectivity to be determined. It was therefore agreed that should the Commission wish to introduce trawl mesh size differentials for synthetic materials based on equivalence of selectivity, the appropriate values would be as follows:-

Polyethylene (e. g. courlene) - same mesh size as manila;

Polyamide (e. g. nylon, perlon) and polyester (e. g. terylene) - mesh size 5-15% smaller than manila.

The Subcommittee also noted that although no selectivity data are available for Danish seine-nets fished in the ICNAF Area, results of past experiments with this gear in the North-East Atlantic have shown it to have a greater selectivity than trawls for roundfish species.

Tabular Summaries of Selectivity Data

Further results of routine selectivity experiments were presented for cod,addock, redfish and American plaice in Documents No. 30, 48, 66 and 88.

The importance of maintaining the tabular summaries of selectivity data, recommended at the 1963 Annual Meeting (Recommendation 23, Redbook 1963, C. I, p. 49) was emphasised, and the Subcommittee

recommends (25)

that the collection of tabular summaries be continued. In this connection the importance of supplying all items of data needed for the completion of these summaries is

3. Standard Reference System for Net Materials

The desirability of adopting a standard reference system when reporting information on netting twine sizes was stressed. It was agreed that the Tex numbering system, as recently recommended by the International Standards Organization (I. S. O), is the most appropriate for this purpose. It was further agreed that, to assist ICNAF scientists in this respect, Dr. von Brandt in collaboration with Mr. Carruthers (Canada) should prepare a list of the Tex numbers for materials used in the ICNAF fisheries for presentation as a meeting document at the 1965 Annual Meeting.

4. Compilation of length, weight and girth data

In accordance with Recommendation No. 24 (Redbook 1963) made at the 1963 Annual Meeting, data were presented by a number of workers on length, weight and girth measurements of fish (Documents No. 30, 47, 51, 90).

The usefulness of such data in Assessment work for gauging likely time or area changes in codend selectivity was emphasised, especially in the northern subareas, where large seasonal and annual changes in girth-length and condition factor take place. The Subcommittee therefore

recommends (26)

that countries should continue to collect girth, weight and length data in their fisheries, especially in the northern subareas, and submit their results to the Secretariat or present them in meeting documents. It agreed that an appropriate method of presentation is in the form of regression equations and diagrams, as illustrated in Documents No. 30 and 47.

5. Meshing of Redfish

Further observations on the meshing of redfish in trawls fished in Subareas 2, 3 and 5 respectively were presented in Documents No. 48 and 88, and Templeman reported verbally on the results of Newfoundland experiments in Subarea 3. These observations suggest that the effect of meshing on the overall selectivity of the codend is small, and that the extent of meshing varies with the net material, and its hanging. The Russian observations showed that meshing is greatest when the mode of the size composition of the catch coincides with 50% selection point of the mesh in use.

The importance of further information on redfish meshing in the ICNAF fisheries was stressed and the Subcommittee therefore

recommends (27)

that workers should continue to report in meeting documents the results of experiments on the meshing of redfish.

Developments in Gear and Fishing Methods

Information on developments and changes in the gear used in the ICNAF fisheries was presented in Documents No. 72 and 93 and in verbal communications. These reports indicated that significant changes in gears, especially in the materials used in their construction, are taking place continuously in the ICNAF fisheries. The Subcommittee agreed that regular and comprehensive information on such developments, especially on the materials and mesh sizes used in the trawl fisheries for both regulated and non-regulated species, is of major importance in the scientific work of the Commission. It is therefore

recommended (28)

that summary data of codend mesh size by country, sub-area, main species fished, type and material of trawl, and other relevant information should be reported annually to the Secretariat on the form prescribed in Annex 1 to this Report. The data should be summarised annually by the Secretariat in a meeting document, and should be published every three years in the List of Vessels summary.

The Subcommittee also

recommends (29)

that descriptions of major developments in gear used in the fisheries in the ICNAF Area should continue to be reported as documents to Annual Meetings.

Variability of Selection Data

The results of analyses of the variability of data from past selectivity experiments in the ICNAF and ICES areas were presented in Documents No. 44 and 45. The importance of such analyses in assessments of differences in selectivity between nets made of different materials, as outlined in para. 1, above, was stressed.

Selectivity and Catch Size

Further evidence of a decrease in codend selectivity with increase in catch was reported by Dr. Templeman for haddock in Subarea 3, Dr. Bohl for re-

erman experiments, no decrease in selectivity with catch size was observed for
erring.

Mesh Measuring Gauges

Mr. Beverton reported that, as requested at the 1963 Annual Meeting, he had consulted the manufacturers of the ICES gauge about its unsuitability for measuring meshes larger than 120 mm (4 3/4") and that they had agreed to make the necessary modifications to the gauge so that larger meshes can be measured by it.

Evidence reported by Canada, and previous experience, suggests that under average working conditions the ICNAF gauge, used at a pressure of 12 lbs, gives readings 4% to 7% higher than that of the ICES gauge at a pressure of 4 kg. This range of difference includes results obtained with nets made of both manila and synthetic fibres.

Canada also reported comparisons in which an ICNAF gauge, used at a pressure of 12 lbs, also gave readings in the region of 5% higher than those obtained by a parallel-sided enforcement-type gauge, used so as to "pass easily through" the mesh. It has to be recognised, however, that interpretation of the words "shall pass easily through" is inevitably to some degree subjective, and that the results obtained by a parallel-sided gauge may be correspondingly variable.

0. Topside Chafing Gear

Reports were presented on the effects on codend selectivity of a British multiple flap-type chafer (Document No. 67) already accepted by the Commission and a new Russian cover-type chafer (Document No. 88) used by large Russian and Polish trawlers. The latter chafer is of the same material and mesh size as the codend and attached to the rear part of the codend and laced, mesh for mesh, along the fore and side selvages, and also joined to the codend along the trailing edge.

The experimental results obtained with the Russian chafer during trawling experiments on redfish in Subarea 3 showed no effect on the 50% selection length but a decrease in selection range. No data were presented on the effect of this chafer on selectivity for species other than redfish.

The Subcommittee

recommends (30)

that the results of further experiments, especially on cod and haddock, with the Russian type of chafer described in Document No. 88 should be reported to the 1965 Annual

It further

recommends (31)

that in reporting the results of the experiments referred to in Recommendation 30 and of other selectivity experiments, the catches by length groups should be presented on a haul-by-haul basis (as in Document No. 67) so as to show the variability of the data.

APPENDIX VI

REPORT OF THE SUBCOMMITTEE ON ENVIRONMENTAL STUDIES

Chairman: Dr. C. E. Lucas

All member countries except Spain were represented at one or other of the meetings. The principal discussions concerned the results of the Environmental Symposium, the ICNAF Survey (NORWESTLANT I-III) and the environmental aspects of the various national programmes. The detailed consideration of the results of the survey were considered and reported upon by a coordinating group under the chairmanship of the Survey Leader, Mr. A. Lee (Annex 2)

In opening the meeting the Chairman welcomed all those attending and in particular thanked the many workers, present and absent, who during the course of the year had helped in one or other of the committee's activities.

Environmental Symposium

This was held, by courtesy of the Food and Agriculture Organization of the United Nations, in Rome, over the period 27th January-1st February, 1964, and the Subcommittee unanimously

recommends (32)

that the Commission's appreciation be officially conveyed to the Director General of FAO, Dr. Sen, for the Organization's generous and invaluable hospitality on this occasion, and especially for the help rendered by the staff of Biology Branch of Fisheries Division.

The Chairman reminded members that the reports of the Chairman and conveners of the Symposium had been circulated and were now available to the Commission; in due course a copy of the transcript of the discussion, which took place at the last session, would be available for all contributors and participants. The response to the request for contributions had been extremely good, so that the costs of publication, as budgeted tentatively in 1963, would be greater than expected. The possibility of keeping these to a minimum, by printing by the offset process, was therefore being considered. By this means it was hoped to publish all the contributions and special lectures, together with the introductory reports, during the forthcoming year. Most of the papers had been prepared for the press and only the final editing remained to be completed; it was agreed that this should be left to a group, comprising the Chairman, the Executive Secretary and Mr. Lee, to submit final proposals for editing to the Steering and Publications Committee. [see Recommendation (1)**].

a note briefly reviewing a number of the principal points raised in discussion; this is attached as Annex 1 to this Report, with numbered paragraphs to which the following recommendations, agreed by the Subcommittee, refer.

(a) On Monitoring (para. 3) the Subcommittee

recommends (33)

that the observations of environmental factors at coastal stations and offshore points, including weather ships and moored buoys, and making the fullest use of automatic recording apparatus, be continued and encouraged with special reference to temperature and current measurements: with the objective, first, of monitoring the hydrographic conditions and, second, of finding ways and means for predicting long-term trends which may be of significance for the fisheries.

It is hoped that Dr. L. M. Lauzier, and others who were associated in suggesting such a resolution, will assist in its implementation, and that members of ICNAF attending forthcoming meetings of I. O. C. will try to ensure that the interests of ICNAF are borne in mind whenever arrangements for monitoring are discussed.

(b) On other environmental factors (para. 4) the Subcommittee

recommends (34)

- (i) that the attention of hydrographers be drawn to the value in fisheries investigations of information concerning a range of environmental factors additional to the conventional ones, particularly direct current measurements and measurements of the intensity and quality of submarine light and their rates of change.
- (ii) that, as the environment is naturally a complex of factors, and the real effects of any one factor may not be found by studying it alone, attention must also be paid to the inter-relationship of factors.

(c) On behaviour and physiology (paras. 4 and 5), the Subcommittee

recommends (35)

- (i) that studies of the behaviour of fish in relation to the environment should be encouraged.

(ii) that for the reactions of the fish to be understood fully, associated studies of the internal processes (neural and hormonal) governing these reactions, in relation to the environmental "triggers" stimulating them, are needed.

(d) On young stages of the life history (para. 6), the Subcommittee recommends (36)

that, because of (1) the need to understand the causes behind "fluctuations" and (2) the possibility (see Report of Assessment Subcommittee) that thereby preliminary assessments may be made of fish stocks which are not yet, or not yet adequately, sampled commercially, improved methods of surveying the abundance and distribution of the young stages of fish are required.

There are two principal stages during which fluctuations in year-class strength may be determined:- (1) during the early pelagic stage and (2) after settlement. Special efforts must therefore be devoted to the ecology of both stages, if an understanding is to be obtained of the timing and causation of mortality. For such studies to be successful special attention must be paid to (1) the methods of sampling during the pelagic stage and after settlement, and especially the comparability of resulting samples, and (2) the planning of surveys, especially to secure the intensity of sampling in time and space, probably by cooperative effort, which alone will ensure significant results in relation to the problem under investigation. In order to further our knowledge of the causes of fluctuations, there is need for an intensification of the study of inter-specific relationships as, for example, revealed by predation (see also Report of Assessment Subcommittee).

(e) On trophic interrelationships, another subject which attracted discussion at the Symposium, the need was expressed for a better understanding of the communities within which fish live and especially the organisms which provide their food. Knowledge is needed of production at the principal ecological levels; from the phytoplankton, through the zooplankton and bottom fauna to the smaller and larger fish in the community. In particular, information is needed concerning the efficiency with which energy is transmitted between and within these levels. The Subcommittee commended the interest shown by the ACMRR of FAO on this subject, and noted the views expressed by the Assessment Subcommittee in the last part of their present report. The Environmental Subcommittee commends the pioneer work already being done in this field and

recommends (37)

levels, and should cooperate in any way possible with the promotion of other activities, such as the Symposium being considered by FAO, in this connection.

Other matters raised in the note on the Symposium are dealt with elsewhere.

2. ICNAF Environmental Survey

In accepting the report of the Coordinating Group on the survey and on the arrangements proposed for completing and publishing the results of NORWESTLANT (attached as A-F in Annex 2), the Subcommittee joined the Chairman in expressing his sincere appreciation of Mr. Lee's leadership and guidance throughout the planning and execution of this extensive programme. It

recommends (38)

that the proposals and recommendations of the coordinating group concerning the NORWESTLANT Survey contained in paras. A-F in Annex 2 of this report be adopted.

The possibility of repeating the ICNAF cooperative survey in appropriate form has been raised in various quarters, and it is recognised that a repeat of this survey would contribute towards the requirements of recommendation (36) above. Such a proposal, however, requires very careful consideration, and the Subcommittee

recommends (39)

that the course of action concerning the possibility of future ICNAF environmental surveys, as outlined in paragraph G of Annex 2 to this Report be adopted, with a view to considering the possibility of repeating the survey, in the light of information which should be available at the 1965 meeting.

Noting the ready assistance given by ICES scientists to both the ICNAF Survey and the Symposium, as well as periodical hospitality to ICNAF meetings in Copenhagen, the Subcommittee propose that a message of appreciation should accordingly be sent to ICES.

3. Other environmental studies

(a) National Reports

, 59, 61, 62, 74, 79, 94 and 99. Developments of special interest concerned the U. S. program of herring hydrography in Subareas 4 and 5 (18); the Canadian and U. S. programs of benthos sampling (18 and 36); the German observations on the increase in the small haddock population off south-west and south-east Greenland and its relatively high growth rate (29); the Canadian records of warming and cooling cycles over the Scotian Banks during the period 1880 to date and preliminary forecasts of conditions a few months ahead (36); their studies of water transparency, sea-bed types, fish-feeding in relation to temperature and energy losses in relation to muscular effort (36); the work of the Edinburgh Oceanographic Laboratory on the distribution of different groups of redfish (42); the work of USSR scientists on the movements of hake in relation to environmental conditions (59 and 61), and on plankton condition in Subareas 4 and 5 (62); the USSR studies of cod migrations around Greenland (94) and the Danish information on the recent failure of the inshore pound-net fishery for cod by Greenland fishermen (99).

The Subcommittee heard with appreciation the information provided by Mrs. H. W. Graham about the new R. V. ALBATROSS IV commissioned by the U. S. Bureau, with a program centred on groundfish, scallops, benthos, hydrography and other environmental objectives, and wished her every success.

(b) Continuous Plankton Recorder Survey

The Subcommittee noted the rapid development of this survey over the eastern part of the North Atlantic Ocean during the last few years and especially the network of routes now being operated within the ICNAF area and adjacent to it. Valuable information on the occurrence of redfish larvae over the banks and deep oceanic areas (and adults) had already been obtained, and Document No. 43 gave promise of further valuable information as the survey developed. The Subcommittee recognised the importance of such information for the ICNAF programme and expressed the hope that the survey would not only be maintained but that it would develop further.

Sea-bed Drifters (Document No. 35)

Referring to Recommendation 37 1963, Mr. Lee drew attention to Document No. 35, providing an account of the various kinds of sea-bed drifters in use. The Subcommittee noted the information and

recommends (40)

that the representatives of member countries be urged to make arrangements for publishing similar accounts of these "drifters" in their own countries in a form suitable for securing the interest of fishermen, and others who may find them, in returning them to the scientists concerned.

5. F. A. O.

Mr. S. J. Holt reported two items of direct interest to ICNAF: (a) the proposal from the ACMRR of FAO to IOC that the 2nd International Oceanographic Congress should include a session devoted to "Fisheries Oceanography" and (b) that representatives of ACMRR had been invited to join SCOR representatives, under the Chairmanship of Dr. G. Hempel, to discuss problems involved in proposals for the organised exchange of biological data.

Environmental Subcommittee

Annex 1. Informal Report on the Environmental Symposium

1. Humans are seldom left unaware for long of the effects of the ever changing environment, but in many ways cold-blooded animals are even more immediately subject to these variations, perhaps particularly those living in intimate contact with the marine environment. Situated as they are, along a relatively narrow Continental Shelf extending over some 30° of latitude, the fisheries of the ICNAF area may be regarded as particularly exposed to changes in their aquatic environment, ranging from water movements that may carry fish eggs and larvae and their food off the Shelf to major climatic changes in the North which may permit or make impossible the continued existence of stocks of commercial fish. ICNAF has made considerable progress in assessing the stocks of fish at present available, and is beginning to tackle the problems of the effects of fishing on them but it was the recognition that such assessments are always subject to environmental qualifications that resulted in the environmental programme of 1961. This comprised three main parts, (a) the general programme from which results are now emerging each year, (b) the environmental survey on which Mr. Lee will be reporting and (c) the Environmental Symposium which was held this year in Rome.

2. The circulated reports of the Conveners, and introduction by the Chairman, provide a general account of what was a well attended and valuable series of meetings. In addition to bringing together masses of data hitherto unavailable it provided opportunities for scientists to meet and exchange ideas, and indeed confront each other with different interpretations of the available data. Two important points which were immediately evident were (a), despite their bulk, the relatively limited nature of the environmental data being collected (principally concerning temperatures) and, to some extent consequentially (b) the tendency to produce over-simplified and possibly at times fallacious associations between, say, temperature variations and variations in fish numbers etc.

3. For all that the need was recognised and strongly urged for an increase in the monitoring of both temperature and salinity data, for different regions over the whole North Atlantic, so as to understand better how these may be linked and

fisheries) of meteorological data, because of the significance for the aquatic environment of exchanges across the air/water interface. In deputising for Dr. Parry, Mr. Parrish in his report also touches on such matters when drawing attention to the importance for fisheries and fishermen of environmental factors ranging from weather to the nature of the sea bed.

It was repeatedly stressed, however, that insufficient environmental factors are being investigated in detail. Those being neglected include possibly some of whose significance we are as yet unaware, but among those with which we are familiar, nutrients, the planktonic and other food organisms, the strength and direction of ocean currents and the intensity and quality of submarine light are evidently of great significance. It was also stressed that the environment is naturally a complex of factors, so that the real effect of any one may not necessarily be found by studying it alone; consideration should be given to the effects of the inter-relationships of factors and, as laboratory work in this and other fields has shown, to the rates of change of environmental factors and possible threshold values that may serve as triggers to influence responsive elements, neural or hormonal, in the internal environment of the fish.

It is reflections such as these that convinced most if not all of those present of the urgent need for studies, in integrated detail, of both the environment and of the fish (and their fellows in the marine community) themselves. In order to understand the environmental picture it is necessary not only to understand it in detail, but to understand in corresponding detail the reactions of the fish to different aspects of the environment (including fishing gear), and the internal processes governing them. This conclusion points strongly to the need for much more experimental work, not only in the laboratory but also in small scale "semi natural" environmental situations, such as those envisaged by ICES in the experimental herring programme it is at present considering.

In one fishery or another there have already been a number of investigations of the well known fluctuations in the abundance of year classes, and their relationships to the even greater fluctuations in the abundance of eggs, larvae and young fish. But great difficulties have been met in assessing such fluctuations with the requisite accuracy for comparison with commercial data, and many speakers stressed the need for greater facilities and for more careful planning of such investigations. It is necessary also to understand more than we do at present about spawning processes and the factors influencing them. There is a dearth of information about young fish in the first year or two of their lives at a stage of life history which is very difficult to sample but which must be studied if we are to understand the causes of fluctuations in the strengths of year classes.

It was considerations of the environmental aspects of such fluctuations that led to the planning of the NORWESTLANT survey. While this was remark-

particular, there was a general feeling among those attending the Symposium that the value of the results would be greatly increased if the survey could be repeated if possible even more intensively, based on the analysis of the results in 1963 and the experience gained in this first large scale cooperation under ICNAF auspices.

8. There is no need here to stress the rapidly developing interest in the off-shore stocks of herring in the ICNAF area, and an additional section of the Symposium was planned to bring together information already available. Perhaps the chief conclusion was that much more work is needed in the important task of identifying the different stocks and components concerned in these important herring fisheries.

9. Perhaps the last of the important points arising, now being experienced fully in all aspects of the Commission's work, is the essential part to be played by cooperation between laboratories, between countries and between workers in different disciplines, if real success is to be achieved. Not only is cooperation needed, however, but in many instances greater research facilities will be essential if results which are applicable, and on which complete reliance can be based are to be obtained. Perhaps a moment's reflection on the tremendous size of the oceans, and the tremendous distances over which fish stocks, and individual fish range, will show that this is not unreasonable.

C. E. Lucas
21st May, 1964

Environmental Subcommittee

Annex 2. Report on the NORWESTLANT Surveys
and arrangements for publication of the results

Surveys NORWESTLANT 1-3 were successfully completed by the end of y 1963. Bad weather and ice caused the omission of a small number of planned tions, but these were fewer than expected. At the time of the ICES meeting in drid in October a meeting of the group responsible for the coordination of the rveys was held. It was then agreed that in accordance with the recommenda- ns of the Environmental Subcommittee made at the 1963 meeting of the R&S mmittee (see Redbook 1963, Part I, p. 59):-

1. Each participating country should endeavour to work up its material and report upon it to the present R&S Committee Meeting. The preparation of these reports should be made on certain approved guide-lines.
2. Discussions should take place at this present meeting on how to integrate these national reports into a single volume to be published in the ICNAF Special Publication series. This integration should be completed by the date of the meeting of the R&S Committee in 1965.
3. Countries if they so wished could publish their own national reports in their own journals prior to the publication of the ICNAF Special Publication, but that these reports would nevertheless be incorporated in the integrated report.
4. The question of repeating the surveys be considered at this present R&S Committee Meeting.

The national reports have been completed and form Documents 20-27, 53- and 63-64 of this meeting. Other reports on the surveys form documents 38- 95 and 97. The hydrographic and the phytoplankton data were all processed d circulated to participants in the surveys by April 1964 thanks to the great orts of Mr. C. D. Sauer at the Canadian Oceanographic Data Centre and Dr. M. lbricht respectively.

The documents submitted to this meeting show:-

- (1) that although large numbers of cod eggs were found around South Greenland, only a small number of cod larvae were taken off West Green- land. Other cod larvae were found between Iceland and East Greenland and an area of cod spawning was found off North Labrador. The number of cod larvae found off West Greenland was very low when compared with Danish results in previous years and likewise the number of redfish larvae found in the Irminger Sea was lower than in previous years. Both cod lar-

stages of *Calanus* became abundant about a month later than usual: the importance of this in relation to the heavy larval mortality which was found has to be examined.

(2) the water mass structure over a wide area during the period April-July and in particular the existence of an upwelling area along the eastern boundary of the Irminger Current. They also demonstrate the complexities of the circulation and the need for many more direct current measurements. The documents contain a wealth of chemical data which have yet to be linked to the phytoplankton results, but it is clear already that production was at a peak in April off West Greenland and then declined, and that it followed the opposite course off East Greenland.

(3) that fishing by line from weather ships and research vessels in the Irminger Sea led to the capture of a number of pelagic redfish. This seems to indicate that these fish concentrate there in the month or so after extrusion of larvae has taken place.

(4) the need for (a) more intercalibration of the gear and methods used in both hydrographic and plankton work, (b) more precise standard instructions about the form of national reports etc. in any future similar surveys

C. At the present meeting discussion of the steps to be taken in order to fill the few gaps apparent in the national reports have indicated that:-

(1) NODC, Washington could make available the BT and surface temperature data from Ocean Weather Station BRAVO for the period of the survey

(2) U.K. would be prepared to complete the analysis of the German zooplankton samples.

(3) the agreed list of priorities must be followed when working up the zooplankton, if the final report is to be ready by May 1965.

(4) all participants had received the provisional CODC Hydrographic Data books, but that some had not yet been able to acknowledge receipt.

(5) CODC should be asked to compute the oxygen saturation values using Truesdale's formula when it issues the databooks in their final form in June, 1964.

D. Further, as far as the plan to integrate the national reports into a final report by May 1965 is concerned, the Co-ordinating Group for the NORWESTLAN Surveys agreed that this integration should be done on the basis of subjects, and that for each subject there should be a subject co-ordinator with a team of

1. Introduction to the Surveys C. E. Lucas
2. Eggs and larvae
 2. 1. Cod P. Hansen
 2. 2. Redfish J. Magnusson
 2. 3. Others
 2. 3. 1. Wolffish P. Hansen
 2. 3. 2. Greenland halibut E. Smidt
 2. 3. 3. Halibut E. Smidt
 2. 3. 4. American plaice R. Wells
 2. 3. 5. Capelin Mrs. J. Magnusson
 2. 4. Feeding V. Bainbridge
3. Zooplankton R. S. Glover/J. Corlett
4. Phytoplankton M. Gilbricht
5. Adult fish
6. Hydrography
 6. 1. Physical A. J. Lee
 6. 2. Chemical R. Platford
 6. 3. Ice H. Thomsen
 6. 4. Meteorology Gruenewald
7. Whales D. Sergeant
8. Scattering Layers A. J. Lee
9. Summary chapter A. J. Lee

The list of national correspondents is shown in Table 1 at pages 13 and 14.

Mr. Lee will send out a circular explaining the above scheme for the segregation of the reports to all the above correspondents, the subject co-ordinators, all participants in the surveys, and any interested institutions.

- (1) while the general report should be published in as full a form as is possible in the ICNAF Special Publication series, in view of the approach made to ICNAF on behalf of the American Geographical Society, the Steering and Publications Subcommittee should be asked to examine the possibility of the charts and diagrams being published in addition on a large-scale in atlas form in the Serial Atlas of the Marine Environment. It is provisionally estimated that the ICNAF Special Publication will amount to 300 pages, including text and diagrams. [see Recs. (2)** and (3)]
- (2) the Steering and Publications Committee should be asked to look into the question of providing sufficient reprints for all scientists concerned with the production of the final report.
- (3) there is no need to publish data lists, either hydrographic or biological. The corrected CODC hydrographic data books be distributed to participants in the surveys, World Data Centres A & B, ICES and the ICNAF Secretariat. Tables of plankton and of egg and larval data should be sent by each participating country to the ICNAF Secretariat who would thus eventually hold a complete set of the biological data. This they would copy and they would then send one copy of the whole of the biological data to each participant.

F. In order to make subject coordination easier and to extract as much scientific benefit as possible from the results of the surveys at an early date, the group

recommends (41)**

that a meeting of those responsible for preparing the final report of NORWESTLANT be held at national expense in Copenhagen on 25 and 26 September (i. e. immediately before the 1964 ICES Council Meeting). At this meeting the results of the surveys to date would be discussed, and the Co-ordinating Group urged strongly that member countries of ICNAF should be asked to send as many as possible of their experts who have been concerned with the collection and analysis of NOR WESTLANT material.

The group agreed that the typescripts of the final reports on each subject should be sent to the ICNAF Secretariat for duplication as they become available. Copies would then be sent to all subject co-ordinators.

G. There is a general desire among the group for the 1963 surveys to be re-

require new techniques, e. g. of current measurement, plankton collection etc. and that the development of these should therefore be hastened as much as possible over the next year or two. There is also a need for intercalibration and standardization of methods over this period and the setting up under ICES and SCOR of international working groups on this subject has been noted. It is felt that ICNAF scientists should collaborate in every way possible with these groups and should take every possible early opportunity to carry out intercalibration and standardization exercises.

Table 1.

National CorrespondentsSubject No.

<u>Country</u>	2. 1	2. 2	2. 3	2. 4	3
Canada	Wells	Wells	Wells	Wells	Grainger
Denmark	Hansen	Hansen	Smidt	Hansen	Vagn Hansen
France	Beaudouin	Beaudouin	Beaudouin	Beaudouin	Beaudouin
Germany	Kotthaus	Kotthaus	Kotthaus	Kotthaus	Kotthaus
Iceland	Mrs. Magnusson	Magnusson	Magnusson	Magnusson	Hallgrímsson
Norway	Bratberg	Bratberg	Bratberg	Bratberg	Bratberg
UK	Corlett	Corlett	Corlett	Bainbridge	Glover
USSR	Alekseev	Alekseev	Alekseev	Alekseev	Alekseev

Table 1. (cont'd)

National Correspondents

<u>Subject No.</u>	4	5	6.1	6.2	8
<u>Country</u>					
Canada	Grainger		Campbell	Platford	
Denmark	Steeman Nielsen		Hermann	Hermann	Smidt
France	Beaudouin	Dardignac	Allain	Dardignac	Dardignac
Germany	Gillbricht	Kotthaus	Grasshoff	Grasshoff	Kinzer
Iceland	Thorarsdottir	Magnusson	Malmberg	Malmberg	Magnusson
Norway	Bratberg	Bratberg	Blindheim	Blindheim	Bratberg
UK	Steele	Corlett	Lee	Lee	Lee
USSR	Alekseev	Alekseev	Alekseev	Alekseev	Alekseev

APPENDIX VII - REPORT OF THE SUBCOMMITTEE ON ASSESSMENTS

Chairman, Dr. L. M. Dickie; Rapporteur, Mr. J. Gulland

The Subcommittee met May 21 to 23 and on later occasions during the week following and considered the following topics:-

- (1) Mesh assessments
- (2) Recent trends in catches and fishing activity
- (3) Long term assessments of relation between catch and fishing activity
- (4) Productivity of ICNAF fisheries
- (5) Future work

1. Mesh Assessments

1.1 Particular assessments requested by Commission (Plenary Agenda item 17)

Assessments for certain stocks were re-examined, as detailed below:

- (i) Redfish in Divisions 3NO. The assessments presented at the 1963 meeting (Redbook p. 37) still represent the best available estimates. They show an immediate loss for any mesh above 3", (considerable above 4-4 1/2").
- (ii) Redfish in Subarea 4. The assessments made in the 1961 report (Tables 7H and 8D) are the best estimates. They show immediate and probably also long-term losses for any mesh greater than 4". This fishery also catches some cod and haddock. The effect on the cod and haddock stocks of this fishery with small-meshed nets is believed not to be serious because the fish caught are thought to be few and large; there is however need for data on the size composition of cod and haddock caught in the redfish fishery.
- (iii) Flounder in Subarea 5. The present (unregulated) mesh in use in the yellowtail flounder fishery is 4 1/2-5". The 1961 assessment report (Table 8E) shows little or no long-term gain for mesh sizes greater than 5".
- (iv) American plaice in 4T. Discards of small fish in this fishery are very large - more than 50% by number (Document No. 66). As stated in the 1961 Mesh Assessment Report, an increase of mesh up to about 6" would release small unmarketed fish and would certainly give long-term gains, possibly substantial ones.

- (v) Silver hake in Subarea 5. This fishery has expanded very greatly since the period studied in the 1961 report. There is a big difference between the 1961 estimates of total mortality ($Z=0.45$) and that derived from more recent Russian catch data ($Z=1.5$). Further work is urgently needed to establish the relation between fishing effort and mortality and the Subcommittee commends the intention of Soviet and US scientists to continue such work. Length-composition data suggest that mesh sizes up to 3" would not cause much immediate loss, but that meshes greater than 4" would cause very considerable immediate, and probably also long-term losses.
- (vi) Scallops in Subarea 5. The status of our knowledge on this fishery was reported in 1961, 1962 (Redbook Part I) and 1963 (1963 Redbook Part II, pages 20 and 120). Mortality rates are moderately high and increases in age at first capture are thought likely to lead to long-term gains in yield per recruit. The gear in use has a ring size of about 3", and to increase the age at recruitment to the desired level a ring size of about 5" would be necessary. However, because rings of this size tend to stretch, and because also the selection curve under commercial fishing conditions is very flat, an increase of ring size would not be practicable. A minimum size limit was discussed, but no firm advice can yet be given on its suitability as a regulation measure.

1.2 General effects on mesh assessments of recent changes in fisheries

There have been two important changes since the period 1956-58 on which the original mesh assessments were based (1961 Mesh Assessment Report). These are a general increase in the amount of fishing activity (see section 2.1), and a tendency (partly as a result of the increased fishing) for fishing to be concentrated more on the smaller sizes of fish.

The effect on mesh assessments of increased fishing has already been mentioned in previous reports: for any given stock the size of the optimum mesh is increased, and the long-term gain in terms of yield per recruit of using a larger mesh is also increased; on the other hand the immediate loss in changing to a larger mesh will also be increased.

The first effect on the mesh assessments of a greater concentration on smaller fish is that the number of fish which would be released by a larger mesh is increased. With fishing more concentrated on the sizes of fish just above the selection size, the proportion, E , of the released fish which will be recaptured is increased, though their average weight when recaptured, \bar{w} , will be less. These effects act in opposite directions and the result is that the return in terms of weight ($E \times \bar{w}$) per individual fish will not be altered very much. Because more fish are released the effect of the change in fishing practice on the assessments previously reported is that the numerical values of both immediate and long-term effects, whether gains or losses, should be increased. The effect of these two changes, i. e., increased fishing and a greater concen-

Change in the fishery	Effect on mesh assessments		
	Immediate change	Long-term change	
		Where 1961 Ass. Rept. predicts:-	
		Gain	Loss
Increased fishing effort	Bigger loss	Bigger gain	Smaller loss, or even a gain
Greater preference for smaller fish	Bigger loss	Bigger gain	Bigger loss

This table shows that the direction of the resultant effect of these two changes, though not its magnitude, can be predicted with some confidence where previous assessments showed that an increase of mesh size would result in a long-term gain. In such cases both changes result in bigger long-term gains and bigger immediate losses. On the other hand, where previous assessments predicted a long-term loss, the two changes act in opposite directions on the long-term effect, and their resultant effect cannot yet be predicted.

Recent trends in catches and fishing activity

2.1 Total catches and fishing activity

Table 1 and Figs. 1 and 2 show the total catches in recent years by species and subareas. Also shown are estimates of the total fishing activity in each subarea. These have been calculated as the sum of the days fished recorded in the Statistical Bulletin, plus a correction for the landings for which no effort in terms of days fished was recorded. No correction has been made for changes in size or efficiency of the ships, or in fishing practice.

There has been an increase in total landings since 1957 of over 30%. The main increases have been in the cod of Subareas 1 and 2, redfish (up to 1960) of Subarea 2 and herring and silver hake in Subareas 4 and 5. Except for Subarea 1 cod these are all stocks which were little fished, and the catches from the long-established fisheries - e. g. cod in Subarea 3 - have not increased appreciably, or have even decreased. In the northern areas particularly, the fishing activity has increased very greatly (more than doubled between 1957 and 1961, Fig. 1C), and the catch per day fished has declined.

2.2 Changes in stock abundance

The catch per fishing day, for a given class of vessel, is a good measure of the success of the fishery and of the return to the fisherman. It may not be as good a measure of the stock abundance, though in the past, and probably also in the future, catch per unit fishing intensity is the most commonly used index. For biological purposes the crude measure of fishing activity has

and also a detailed knowledge of fishing practice. This latter requirement, in particular, is a matter for study by individuals, rather than the Assessment Subcommittee as a whole. The Subcommittee therefore welcomes the presentation in documents to this meeting of detailed individual analyses of certain stocks [cod in 2, 3K, and L, - Document No. 76, and cod in 4V and W, and 4T and haddock in 4V and W and in 5 - Documents No. 6 and 49]. A major difficulty in using catch and effort data occurs when more than one species may be caught, and there can be changes in the degree to which the ships concentrate on one species or another. The Subcommittee wish to encourage further research on this problem and asks the Statistical Committee to clarify and if possible standardize the use of the term 'species sought' as tabulated in the Statistical Bulletin.

Long-term assessments of relation between catch and fishing intensity

Given the theoretical situation of one stock of fish, a given pattern of fishing and fish distribution, the yield per recruit may be calculated for a given fishing intensity (the fishing effort expressed in standardized units, to be proportional to the fishing mortality), and from it a curve obtained relating yield to fishing intensity. The shape of this theoretical curve depends essentially on two ratios, l_c/L_{∞} , the ratio of the size of the smallest fish caught to the maximum size a fish could attain, and M/K , the ratio of the natural mortality rate to the rate at which the fish approaches its maximum size. If the smallest fish caught could potentially increase in weight several times (low l_c/L_{∞}) and if they have a good chance of doing so without dying naturally (low M/K), then the yield taken with a moderate fishing intensity, allowing the fish to grow to a reasonable size, will be appreciably larger than that taken with intense fishing, which does not allow the fish to grow to any large size before being caught. On the other hand, if the fish cannot greatly increase in size (high l_c/L_{∞}), and it is more probable that they will die before approaching their maximum size (high M/K), then the greatest yield could be taken with a fairly high fishing intensity. In this case the fish would be caught quickly before many die naturally, even though they may not have a chance to grow much beyond their initial size at recruitment. If one ratio is small and the other large the situation would be intermediate.

A typical curve relating equilibrium yield per recruit and fishing intensity for cod, haddock and redfish stocks is shown in Figure 3 (top panel) as the full line. Also shown as dotted lines are the two extreme situations possibly applicable to particular stocks of these species in the ICNAF area. One is the curve with the most pronounced peak (low values of l_c/L_{∞} and M/K) and the other is the flattest curve (high l_c/L_{∞} and M/K); for all three curves the yield has been expressed as a percentage of the maximum yield per recruit. In Figure 3 (bottom panel) the corresponding curves of catch per unit fishing intensity have been drawn

All three curves have certain features in common. At very low fishing intensities (between the origin and points A on the curves, where the catch is less than 30% of the maximum catch), the yield is nearly proportional to the fishing intensity, and the catch per unit fishing intensity is not much less than in the vir-

At slightly higher intensities (between A and B on the curves, with a yield between 30 and 80% of the maximum) the yield still increases quite appreciably with increasing intensity, but the catch per unit fishing intensity has decreased substantially. For further increases in fishing intensity, the catch per unit intensity decreases still further, but the total yield increases only slowly until it reaches its maximum (C). Thereafter yield (at least for most stocks) actually decreases at yet higher fishing intensities.

For most ICNAF stocks the information available on growth, mortality etc. does not yet permit us to draw a precise yield curve for particular fisheries or stocks, or to establish the present level of fishing intensity with accuracy. However, by taking a representative range of values of growth, mortality etc., present relative levels of fishing intensity for the various fisheries may be classified in general terms according to the zone on the yield per recruit curves (Fig. 3). These zones can be defined in terms of the present yield per recruit (as a percentage of the maximum) and in terms of the effect on that yield and the yield per unit intensity of a doubling of fishing intensity, as follows:

Zone	Present yield (as % of max.)	Effect of doubling the fishing intensity on:-	
		Catch (as % of present level)	Catch/intensity
A	0-30	200-160	100-80
B	30-80	160-110	80-55
C	80-100	110-90	55-45
D	100-	<95	<50

The probable range of values of growth, mortality etc. for particular fisheries have been taken from those tabulated in Document No. 56, modified where necessary to allow for recent increases in fishing activity. On this basis the following classification of position of some of the major stocks in the ICNAF area may be drawn up.

Table 2. The position of some major ICNAF stocks on the yield-fishing intensity curve

Species	Div.	Mean annual catch ('000 tons)		Probable zone on yield curve	Notes
		1957-8	1962-3		
Cod	1A-F	294	416	C or D	Very large recent increase in effort. Possibly beyond max.) (Possibly no max. in yield curve as in top curve on Fig. 3)
	2HJ	36	235	B, C or D	
	3KL	212	266	C or D	
	3M	11	24	-	

Table 2. (cont'd)

Species	Div.	Mean annual catch ('000 tons)		Probable zone on yield curve	Notes
		1957-8	1962-3		
Cod	4X	13	17	(C) or D	(Probably beyond max.)
	4T+V(sp)	87)	138	C or D	
	4W	32)		C or D	
	5YZ	15	28	C or D	(Probably close to max.)
Haddock	3NO	49	22	C or D	(Probably a little below max.)
	4X	19	17	B, C or D	
	4VW	26	19	C or D	
	5YZ	50	59	C or D	(Close to max., pro- bably a little above)

For the redfish stocks the data are not generally good enough to place the present level of fishing on a yield curve with any precision, particularly as there have been very marked fluctuations in the amount of fishing on most stocks. However it can be fairly confidently stated that none of the exploited stocks are in zone A; that is, any further increase in fishing will give a marked reduction in the catch per unit intensity, though not necessarily a reduction in total catch.

This table should be used with some caution. First, like mesh assessments, the yields are on a per recruit basis. Actual yields in any year, besides depending on the fishing intensity, depend also on the recruitment to the stock in the immediately preceding years, as well as on the availability of the fish and the fishing selectivity, none of which can at present be predicted. Secondly, no changes are assumed to occur in the course of the developing fishery in the pattern of fishing, e. g. mesh size, or in the concentration onto small or large fish; however, small changes in these do not substantially alter the classification above. The yields are also calculated as equilibrium yields obtained from fishing at a given intensity for a period. In stocks with many age-groups in the fishery, (e. g. cod and redfish), a quickly developing intense fishery operating on a previously unexploited accumulation of fish can obtain, in the first year or so, a catch appreciably bigger than could ever be subsequently obtained as a sustained yield, even with the optimum fishing intensity and mesh size. The Subarea 2 fisheries for redfish and cod are examples of rapidly expanding fisheries to which this statement might apply.

Table 2 shows that for virtually all the stocks of fish which, at least until recently, supported major fisheries in the ICNAF area, the fishing intensity is around that giving the maximum sustained yield. Further increases in fishing intensity can at best increase the yield per recruit by some 10-20%, and may in several stocks reduce it. In all stocks sustained increases in fishing activity are likely to reduce the long-term catch per unit effort almost in proportion.

These conclusions agree in general with the observed trends in total catch and fishing activity described in the previous section. The total catch from the ICNAF area has increased appreciably in the last few years, but the increase has been achieved mainly by exploiting either species hitherto of only minor importance in the landings (e. g. herring and silver hake), or previously lightly exploited stocks of the major species (e. g. cod and redfish at Labrador). The degree to which this expansion on to new species or new stocks can continue is not a problem that can be answered simply by yield per recruit calculations; as is discussed in more detail in the next section.

4. Productivity of ICNAF fisheries

The statistical series compiled by ICNAF and summarized for the period since 1957 in Fig. 1 and 2 show that overall landings have gradually increased, but at a slower rate than fishing activity. The consequence has been a drop of about 40% in the overall catch per unit fishing activity in the more northern Subareas 1, 2 and 3. Production in the southern Subareas 4 and 5 remained relatively constant up to 1961 but since then there have been recent substantial changes. Fishing activity data are not yet available for these later years.

This decline of 40% in the overall catch per unit fishing activity in Subareas 1, 2 and 3 is less than would be predicted from the yield per recruit calculation for the individual cod and haddock fisheries given in Table 2.

There are two main reasons for this: one is that much of the recent increase in yield from these northern subareas has come from previously lightly fished stocks. The other is that the true fishing intensity shown in Fig. 3 has almost certainly increased substantially more than has our measure of fishing activity, which does not allow for increase in size of vessels and efficiency of gear and its use. Were it possible to have obtained a more refined measure of the true fishing intensity, a greater decline in catch per unit of fishing intensity more like that predicted from Table 2 and Figure 3, would have been expected.

Our present information suggests that there are a few major grounds in the northern subareas where fishing has not yet been attempted. Since a number of these fisheries may be approaching their maximum yield per recruit, further increases in fishing activity would be expected to lead to drops in the catch per unit fishing activity which are more nearly proportional to the increase of activity.

In most of these fisheries it appears that feasible changes in mesh size while helping to keep up total yield, cannot do much to offset the expected sharp downward trend in catch per unit effort if fishing activity continues to increase.

The same general considerations apply in Subareas 4 and 5 but with some

stocks of cod and haddock have been relatively constant. Yet other species are known to occur in the area, some of small size; they are not exploited and their abundance is unknown. Whether yield in these southern subareas continues to increase with increasing effort will depend on the flexibility of marketing, processing and fishing technology for new species, and the continued productivity of the presently developed fisheries. At the present there is no reason to suppose that such developments will not continue for these areas, and overall downward trends in yield per unit effort in the near future are, to this extent, not likely to be as sharp as in those fisheries which continue to exploit the same stocks.

Even in the northern areas organisms of the moderate sizes necessary as food for the larger cod and halibut must be abundant. Among these organisms herring and small fish might be directly exploited by modification of existing fishing and handling techniques. The immediate need for, and feasibility of such developments depends much on economic considerations, a subject for which data are not now collected or studied by the Commission's scientists.

In the light of these conclusions the Subcommittee

recommends (42)

that the detection of the existence of unexploited stocks and species, and measurement of their abundance, be pursued as a matter of great importance in order better to assess the potential productivity of the whole ICNAF area. In addition to direct fishing surveys, the distribution and relative abundance of fish eggs and larvae and the food contents of fish stomachs deserve special study.

With the continued expansion of ICNAF fisheries, there are certain to be major changes in the variety and balance of species taken. This is bound to change the relative abundance of particular species, and so to modify the original structure of the natural species community. In the long run this may affect the overall productivity in the area.

Two classes of effect may be anticipated following a major disturbance of community balance, which have been little studied in the ICNAF area. The first of these concerns effects of population density on recruitment, growth and mortality. With the possible exception of anomalies in the growth of cod in Subareas 1 and 4 which deserve continued study, there is as yet no evidence that such effects are of major importance in the ICNAF area.

The second effect concerns interactions between species which may alter their relative abundance and hence their overall productivity. Understanding of this problem requires knowledge at least of the species associations and food habits. We have at present no data from which to anticipate or distinguish the

Future Work of the Group

5.1 Mesh Assessments

5.1.1 Predicting the combined effects on mesh assessment of increased fishing activity and shifts of preference towards smaller fish is a matter which calls for a reappraisal of existing techniques of assessment. This will call for additional research by individual members of the Assessment Subcommittee.

5.1.2 There is still a lack of information about mesh selection in particular areas and for particular gears, especially in Subarea 2 and for large stern trawlers. The Subcommittee

recommends (43)

that the collection of data on length, girth and condition factor be continued, especially in the northern subareas so as to establish the extent to which selectivity varies in space and time.

5.1.3 It is also essential, for purposes of mesh assessments, to have up-to-date information on actual mesh sizes and gear in use in the Convention Area. The Subcommittee therefore endorses Recommendation (28) of the Gear and Selectivity Subcommittee concerning new means for the routine collection of information on mesh sizes, made necessary by the changes in requirements for reporting by countries of infractions to the ICNAF regulations.

5.2 Catch/effort assessments

There is a continuing need for analysis and interpretation of statistical data properly to advise the Commission on trends in stocks and fisheries and to establish as accurately as possible their present state in relation to their maximum productivity. The kind of catch/effort assessments attempted this year depend on estimates of growth and mortality, some of which are likely to be revised as fisheries develop, sampling increases, and its representativeness of the stocks is improved. Detailed studies of catch per unit fishing intensity and their interpretation as measures of abundance and mortality of particular stocks are also required.

5.3 The Assessment Subcommittee notes that knowledge of the general productivity of marine communities is becoming of more critical importance in the ICNAF area as fishing intensifies and spreads its effects on different components of the fish communities and their food chains. Research on marine community dynamics is likely to be difficult and we urge that ICNAF do even

The Subcommittee notes that FAO is setting up a working group to consider the feasibility of encouraging such studies by holding a scientific symposium on the productivity of marine communities. The Subcommittee commends this step and accordingly

recommends (44)**

that ICNAF express formally its interest to FAO in the promotion of studies on the fish and fish-food aspects of production chains in marine communities, and offer to cooperate in co-sponsoring a symposium if required.

5.4 Research in the broad field of fishery assessment depends heavily on the initiative of individual scientists. However, proper scientific discussion and evaluation of results must be undertaken by the Assessment Subcommittee in order to give the best advice to the Commission. It is not possible to do this adequately in the short period directly before the Annual Meeting of the Commission. To fulfill its responsibility, the Subcommittee believes that mid-year meetings, such as those held in 1960 and 1961 when preparing the 1961 Mesh Assessment Report, are necessary. It might well be appropriate to hold such meetings contiguously with ICES; this would enable the members of the Subcommittee to have the benefit of the experience of and contact with ICES workers not normally attending ICNAF meetings but who are engaged in research on fundamentally the same kinds of fish and problems. Reports from such meetings would be communicated well in advance to the annual meetings of the Research & Statistics Committee. Such additional meetings of the Assessment Subcommittee, the first of which might well take place in 1965, would need to be held at fairly regular intervals, though not necessarily annually.

TABLE I - LANDINGS (000's TONS), FISHING ACTIVITY (FISHING DAYS)
AND CATCH PER FISHING DAY IN SUB-AREAS 1, 2 & 3, - 1957-1963
(LANDINGS EXCLUDE SHELLFISH)

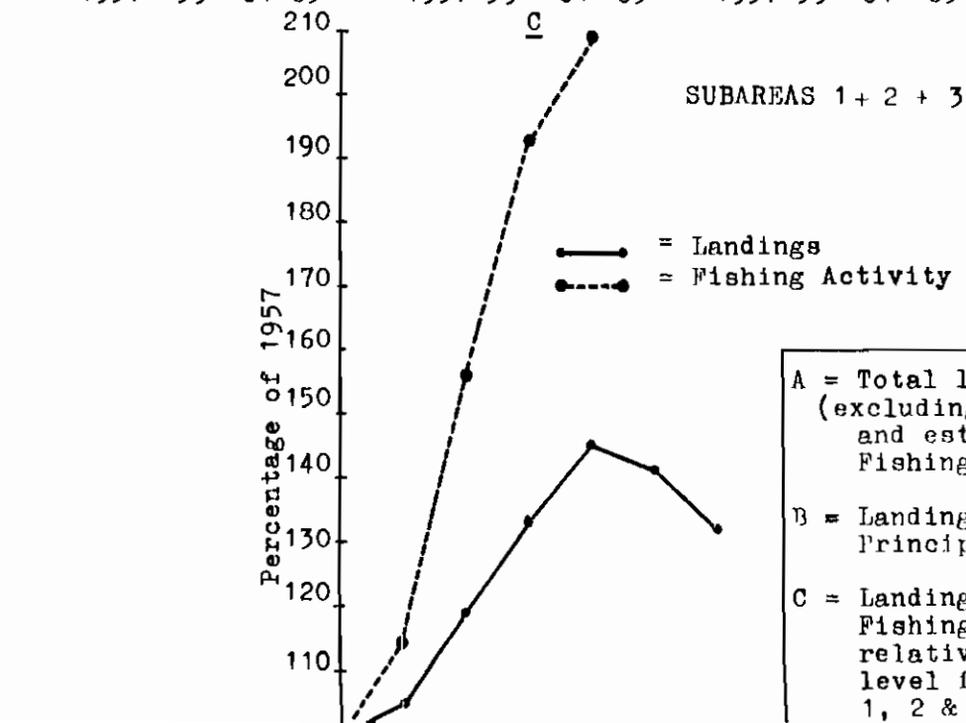
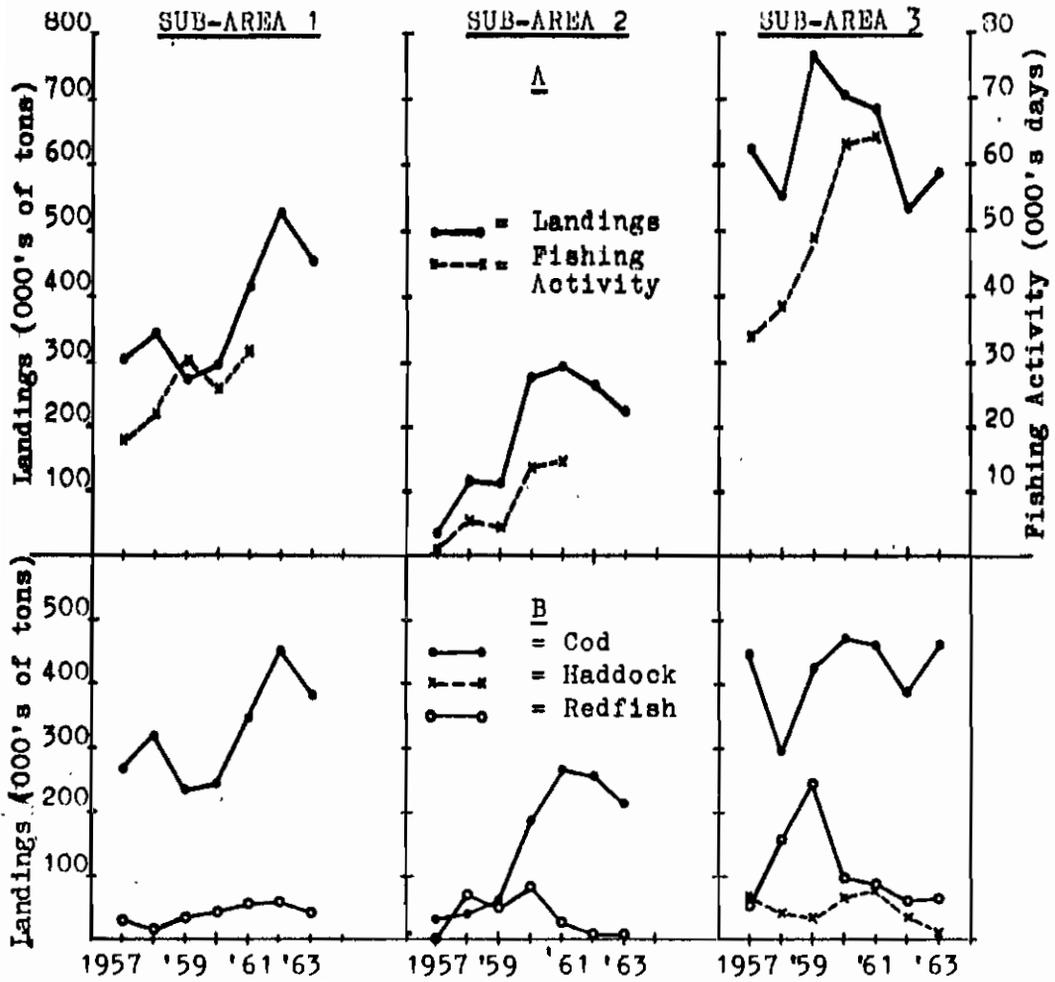
SUB-AREA	SPECIES	1957	1958	1959	1960	1961	1962	1963
1	COD	269.0	318.8	233.5	242.8	345.4	450.7	381.7
	HADDOCK	0.2	-	-	-	0.7	-	0.1
	REDFISH	28.1	17.9	32.5	44.2	54.4	60.4	43.0
	HALIBUT	1.2	1.3	0.1	0.9	0.8	0.8	0.8
	FLOUNDERS	0.7	1.1	1.4	-	1.4	-	3.0
	TOTAL (ALL SP.)	304.1	345.0	273.0	294.7	414.4	526.4	455.5
	CATCH PER DAY (TONS)	17	12	9	11	13	-	-
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	17,800	22,600	30,200	26,300	32,900	-	-
2	COD	32.1	40.2	60.0	188.2	265.0	255.2	215.7
	HADDOCK	-	-	-	-	-	0.1	0.1
	REDFISH	-	77.6	52.8	82.9	25.6	7.7	6.1
	HALIBUT	-	-	0.1	0.4	0.2	0.1	-
	FLOUNDERS	-	-	-	1.5	1.1	0.4	0.4
	TOTAL (ALL SP.)	32.5	119.0	114.0	279.6	296.7	265.9	223.1
	CATCH PER DAY (TONS)	29	22	28	20	21	-	-
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	1,100	5,500	4,100	13,900	14,700	-	-
3	COD	448.8	292.8	425.3	470.0	460.6	389.0	464.0
	HADDOCK	68.1	44.4	35.0	67.1	79.7	35.1	14.4
	REDFISH	57.7	158.7	246.1	99.3	89.9	61.3	68.6
	HALIBUT	2.2	2.1	2.4	2.8	2.4	1.8	1.3
	FLOUNDERS	26.3	24.5	25.1	35.1	30.0	27.2	33.7
	TOTAL (ALL SP.)	627.0	552.0	763.6	704.3	684.0	533.3	589.3
	CATCH PER DAY (TONS)	18	14	16	11	11	-	-
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	34,500	38,300	48,900	63,400	64,300	-	-
1, 2 & 3	COD	749.9	651.8	718.8	901.5	1071.0	1094.9	1061.4
	HADDOCK	68.3	44.4	35.0	67.1	80.4	35.1	14.6
	REDFISH	85.8	254.2	331.4	226.4	169.9	129.4	120.7
	HALIBUT	3.4	3.4	2.6	4.1	3.4	2.6	2.1
	FLOUNDERS	27.0	25.6	26.5	36.6	32.5	27.6	37.1
	TOTAL (ALL SP.)	963.6	1016.0	1150.6	1278.6	1395.1	1325.6	1267.9
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	53,500	66,400	83,200	103,600	111,900	-	-

(CONTINUED)

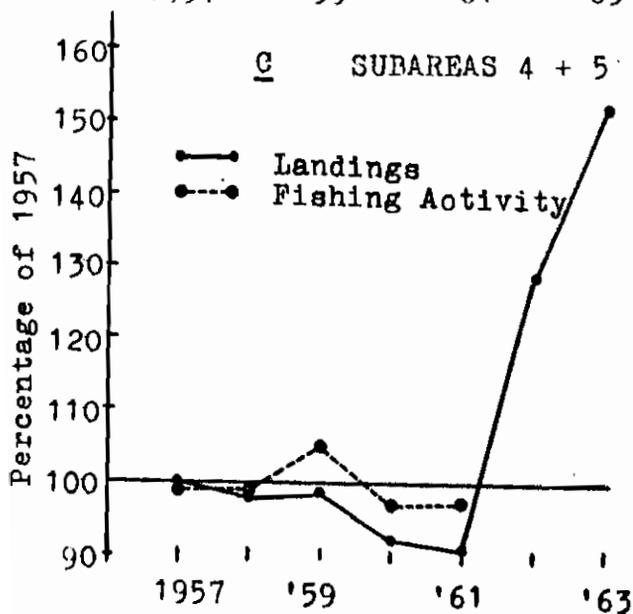
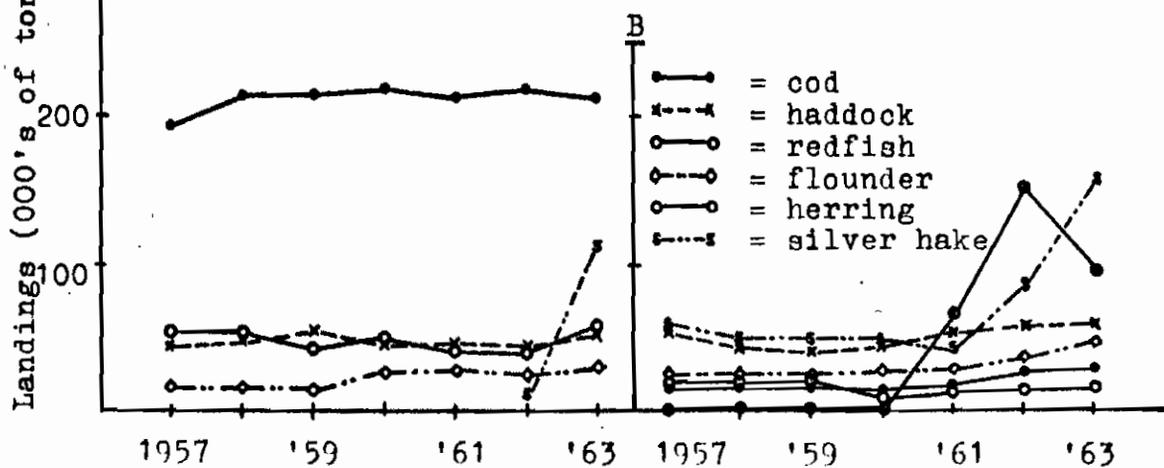
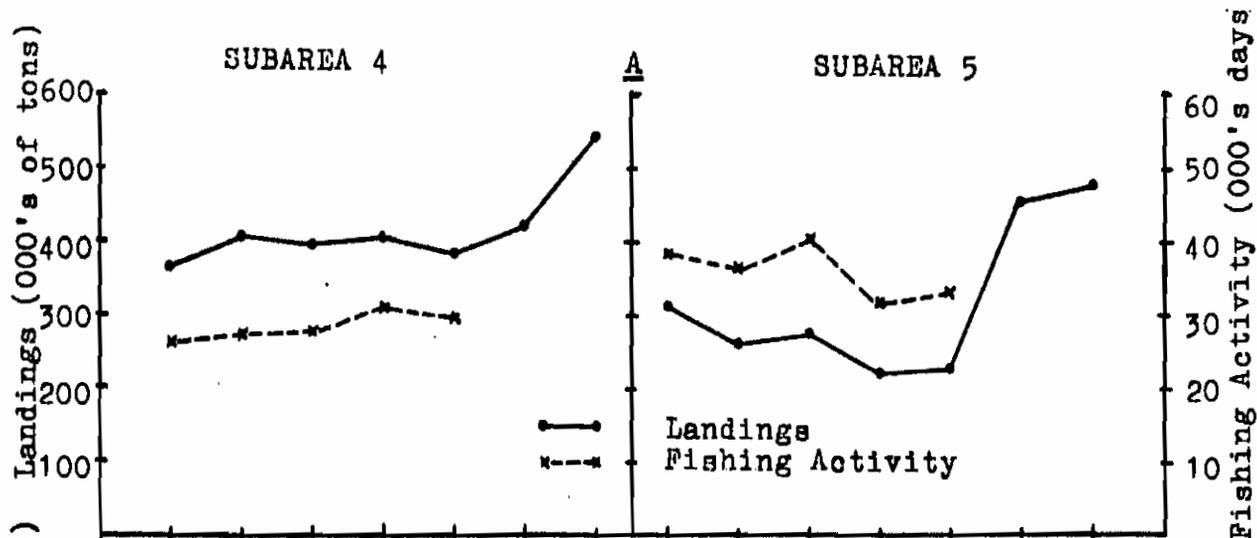
**TABLE 1 (CONTD.) - LANDINGS (000'S TONS), FISHING ACTIVITY (FISHING DAYS)
AND CATCH PER FISHING DAY IN SUB-AREAS 4 AND 5 - 1957-1963**
(LANDINGS EXCLUDE SHELLFISH AND INSHORE HERRING)

Sub-Area	Species	1957	1958	1959	1960	1961	1962	1963
4	COD	187.8	213.9	213.5	218.5	212.0	218.8	212.9
	HADDOCK	47.7	48.9	53.4	46.3	46.9	44.0	51.0
	REDFISH	54.8	54.9	42.9	49.7	41.9	43.2	59.0
	HALIBUT	2.8	2.6	2.5	2.7	2.4	2.9	2.1
	FLOUNDERS	16.9	17.0	19.6	26.1	27.0	25.9	30.9
	SILVER HAKE	-	-	-	-	-	8.8	123.0
	TOTAL (ALL SP.)	368.2	403.2	395.2	405.5	387.2	422.6	542.9
	CATCH PER DAY (TONS)	14	15	14	19	13	-	-
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	26,400	27,100	27,900	31,000	29,800	-	-
	5	COD	13.2	16.9	16.4	14.4	18.0	26.6
HADDOCK		54.7	44.7	40.7	45.8	51.9	59.1	59.6
REDFISH		18.5	16.0	15.5	11.4	14.1	14.1	15.7
HALIBUT		-	0.1	0.1	0.1	0.1	0.1	0.1
FLOUNDERS		23.2	25.7	24.8	27.1	29.1	38.4	48.3
SILVER HAKE		57.0	48.2	49.8	46.7	42.5	86.2	147.0
HERRING		-	-	-	-	67.6	151.4	97.3
TOTAL (ALL SP.)		310.5	262.5	275.6	220.8	228.8	451.1	479.4
CATCH PER DAY (TONS)		8	7	7	7	9	-	-
ESTIMATED FISHING ACTIVITY (DAYS FISHING)		38,400	36,800	40,200	32,800	33,100	-	-
6	COD	201.0	229.6	229.9	232.9	230.0	245.4	242.0
	HADDOCK	102.4	93.6	94.1	92.1	98.8	103.1	110.6
	REDFISH	73.3	70.9	57.8	61.1	56.0	57.3	74.7
	HALIBUT	2.8	2.7	2.6	2.8	2.5	2.4	2.2
	FLOUNDERS	39.5	42.7	44.4	53.2	56.1	63.7	78.6
	SILVER HAKE	57.0	48.2	49.8	46.7	42.5	95.0	270.0
	HERRING*	-	-	-	-	67.6	151.4	97.3
	TOTAL (ALL SP.)	678.7	665.7	670.8	626.3	615.2	873.7	1020.7
	ESTIMATED FISHING ACTIVITY (DAYS FISHING)	64,800	63,900	68,100	63,800	62,900	-	-

* LANDINGS FROM SUB-AREA 5 ONLY



A = Total landings (excluding shellfish) and estimated Fishing Activity
 B = Landings of Principal Species
 C = Landings and Fishing Activity relative to 1957 level for Subareas 1, 2 & 3 combined.



A = Total Landings (excluding shellfish and inshore herring) and Fishing Activity
 B = landings of Principal Species
 C = landings and Fishing Activity relative to 1957 level for Subareas 4 and 5 combined.

should the layout of any other form deviate in essential respects from that of the ICNAF or STANA forms.

3. Common and Scientific Names of Fishes

The Subcommittee reviewed the List of Common and Scientific Names of Fishes as they would now appear in the Statistical Bulletin (Document No. 12). In the light of comments and papers presented at the meeting, an ad hoc group of Drs. Krefft, Martin, Templeman and the Secretariat was asked to review this list. Their revisions are presented in Annex 1 to this Report. A review of species names of the Invertebrates will be made by Dr. Medcof of Canada during the ensuing year and reported to the Secretariat.

4. Fishing Effort Statistics

The Subcommittee

recommends (46)

that annual data on number of trips, vessels and days absent continue to be collected on ICNAF Statistical Form presented annually in summary form as a meeting document, and published every third year in the List of Vess

5. Redfish Statistics by Depth Zones

Three documents (France (St. Pierre & Miquelon), Poland, U. S. A.) contained data on catch and effort by depth zone. Three other documents (Poland, U. S. A., U. S. S. R.) dealt with the associations of length and catch with depth. While not conclusive, there was some indication of changes with depth in length and sex composition.

It was pointed out that data will have to be accumulated for some years in order that the relationships may be examined in relation to fishery changes. Accordingly the Subcommittee

recommends (47)

that the collection of redfish statistics of catch and effort by depth zones, associated wherever possible with length composition, be continued and that their usefulness be reviewed again next year.

Mr. Gulland (UK) agreed to examine the available data and supply the Subcommittee next year with an assessment of the results which might be expected

Discards and Industrial Fish

It was generally agreed that the ICNAF Statistics Form 4 (Discards and Industrial Fish) needed to be simplified and decided that data on discards and industrial fish could be better reported on separate forms.

(a) Discards - The outline of a simplified form for discards was devised and a provisional layout is shown in Annex 2 to this Report. This lists the discards and sampled landings by division and quarter with an annual summary. A description of the method used for obtaining these data (e. g. observation at sea, interview at dockside, logbooks, etc.) is entered on the bottom of each form. The ICNAF Statistician and the Statistical Chairman shall prepare a final version of this form.

(b) Industrial catches - The Subcommittee distinguished two types of industrial fish catch:

(i) that from vessels engaged primarily in catching fish for reduction. The amounts of this catch should be reported as round fresh weights on the regular statistical forms with species composition insofar as possible. The category "main species sought" should be stated as "Industrial", with a species name in parentheses if a single species is concerned.

(ii) that for vessels which are primarily engaged in food-fish production but which reduce for industrial purposes species and sizes of fish undesirable for food, this by-catch-for-reduction should be reported on a form similar to that for discards. A final version of this form will also be prepared by the ICNAF Statistician and the Chairman of Statistics but its layout will be similar to that shown in Annex 2. It should be noted here that the offal from the processed food-fish catch which is also often reduced on board vessels for industrial purposes, should be converted to "round fresh" weight and included with the statistics of food-fish catch.

The Subcommittee therefore

recommends (48)

that the forms and procedures for reporting discards and industrial catches as specified in paras. 6(a) and 6(b) above be tried out in 1964 and the results reviewed at next year's meeting.

Sampling for Discards

The Sampling Subcommittee reported that it could not yet provide any specific advice on sampling procedures which might be useful in connection with es-

8. Coordination with ICES

(a) The Subcommittee acknowledged with thanks the 1963 Report of the ICES Statistical Committee and took note of the following Recommendations B(1) and B(7) of that Committee, viz.:

- "B(1) That (i) in view of the need for continued close co-operation between ICES, ICNAF and FAO in the fishery statistics field, the Council should continue to maintain its active support for and participation in the work of the Continuing Working Party on Fisheries Statistics in the North Atlantic area,
- (ii) the activities of the Working Party should not be confined to the area north of 36°00'N latitude, but should embrace the whole of the ICES and ICNAF statistical areas,
- (iii) in accordance with a decision reached at the last Annual Meeting of ICNAF, the Council should be represented at future meetings of the Continuing Working Party by a member of its Statistical office and the Chairman of the Statistical Committee, the costs of their participation being borne from the Council funds,
- (iv) these proposals be brought to the attention of ICNAF and FAO."

"B(7) That, in order to promote closer contact and collaboration between ICES and ICNAF in the statistics field, the Council request ICNAF to supply the reports of its Statistical Subcommittee as working documents for the meetings of the Statistical Committee. In return the Council should offer to supply the reports of the Statistical Committee to ICNAF."

The Subcommittee expressed its appreciation of the response of the ICES Statistical Committee and agreed that the question of the southern part of the ICES Statistical Area did not create any difficulties insofar as ICNAF participation in CWP is concerned, and it accordingly

recommends (49)

- (a) that ICNAF should proceed with plans to be represented at the 1965 meeting of CWP in accordance with recommendation (59) of 1963 Redbook.

"1) That, hereafter, the report of the ICNAF Statistics

It was further noted that ICES agreed to obtain its catch statistics for West Greenland (ICNAF Subarea 1) from the ICNAF Secretariat, and would in this case need to require its member countries to report such data to them. The ICNAF Secretariat had, in fact, supplied such data for 1963.

Geographical Grid Systems

The Subcommittee reviewed Documents No. 10 and 91 on geographical grid systems and noted that FAO is circulating a draft report on World Grid Systems (Document No. 91) for comment. It was agreed that statistical reporting by geographic areas smaller than divisions cannot be advised for the foreseeable future. If smaller reporting units are desired, e.g. for reporting tag returns, the Subcommittee suggested that coordinates of latitude and longitude be used.

Main Species Sought

It was agreed that the Secretariat should be asked to clarify the definition of 'main species sought' for statistical reporting with all member countries.

Report from ICNAF Statistician

The Subcommittee noted that the Secretariat had completed on time, and in good order, all its statistical assignments for the year, and was commended for this fine performance.

Statistical Subcommittee

Annex 1. List of changes in species names in Document No. 12

7. Clupea harengus L.
8. Bay Anchovy Anchoa mitchilli (Val.)
12. Salmo salar L.
13. Trouts (Chars)
14. Osmerus mordax (Mitch.)
16. Scomber scombrus L.
17. (a) Bluefin Tuna Thunnus thynnus (L.)
(b) Albacore " alalunga (Bonn.)
(c) Bigeye Tuna " obesus (Lowe)
(d) Yellowfin Tuna " albacares (Bonn.)
(e) Skipjack Euthynnus (Katsuwonus) pelamys (L.)
19. Xiphias gladius L.
23. Roccus saxatilis (Walb.)
26. Stenotomus chrysops (L.)
27. Squeteague Cynoscion regalis (Schn.)
28. Menticirrhus saxatilis (Schn.)
31. Sphoeroides maculatus (Schn.)
33. Cyclopterus lumpus L.
35. Lopholatilus chamaeleonticeps G. et B.
37. Atlantic Saury (Billfish) Scomberesox saurus (Walb.)
38. Macrozoarces americanus (Schn.)
39. Gadus morhua L.
47. Brosme brosme (Asc.)
56. Lophius americanus Val.
66. Aequipecten irradians Lamarck
67. Conchs
71. Prawn (shrimp)
74. Seaweeds

Statistical Subcommittee

Annex 2. Proposed form for reporting industrial and discard fish

VESSEL TYPE		TONNAGE CLASS		COUNTRY		YEAR		SPECIES		
DIVISIONS	FIRST QUARTER JAN.-MARCH		SECOND QUARTER APRIL-JUNE		THIRD QUARTER JULY-SEPT.		FOURTH QUARTER OCT.-DEC.		TOTAL FOR YEAR	
	AMOUNT OF DISCARD	AMOUNT OF LANDINGS SAMPLES	AMOUNT OF DISCARD	AMOUNT OF LANDINGS SAMPLED	AMOUNT OF DISCARD	AMOUNT OF LANDINGS SAMPLED	AMOUNT OF DISCARD	AMOUNT OF LANDINGS SAMPLED	AMOUNT OF DISCARD	AMOUNT OF LANDINGS SAMPLED
METHOD USED (E.G. OBSERVATION AT SEA; INTERVIEW AT DOCKSIDE; LOGBOOKS, ETC.) :										

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SUMMARY LIST OF RECOMMENDATIONS

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