INTERNATIONAL COMMISSION

FOR THE

NORTHWEST ATLANTIC FISHERIES

ANNUAL PROCEEDINGS

Vol. 6.

for the year

1955-56

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CONTENTS

FOREWORD

The Commission's publications are since 1953 established in two annual series, an "Annual Proceedings" and a "Statistical Bulletin." Occasional papers from the Commission may be published separately.

The Annual Proceedings contains the Commission's reports for the year in question: Administrative Report, Report of the Annual Meeting, Summaries of Research by the participating countries, scientific papers especially prepared for Meetings, and occasionally lists of scientists engaged in the various branches of the Commission's work, and of main laboratories concerned with this work (last printed in Ann. Proc. vol. 5).

The Statistical Bulletin deals with the fisheries statistics of the Convention Area, mainly those for the year in question, but also with statistics for former years collected and compiled by the Commission. The earliest Statistical Bulletins only dealt with the more important groups of groundfish. The Statistical Bulletins from vol. 4 (year 1954) deal also with the other fishes and with shellfish, however in a more summarized form.

The Statistical Bulletin for the year 1955 will be published in the beginning of 1957.

A list of the Commission's publications is found on the back of the cover.

Erik M. Poulsen,
Executive Secretary.

Halifax, 31 October, 1956

PART 1

Administrative Report for the Year ending 30 June 1956

BY THE EXECUTIVE SECRETARY, ERIK M. POULSEN

1. **Officers during the year.**

Chairman of Commission—Captain Tavares de Almeida, Portugal
Vice-Chairman of Commission—
Mr. Klaus Sunnanaa, Norway
Chairman Panel 1: Mr. B. Dinesen, Denmark
,, Panel 2: Mr. H. F. Barbier, France
,, Panel 3: Mr. C. Lopez Chicheri, Spain
,, Panel 4: Mr. J. H. MacKichan, Canada
,, Panel 5: Mr. F. W. Sargent, U.S.A.

The above officers were elected at the Annual Meeting in Ottawa in June 1955, and are serving for a period of two years.

Chairman of Standing Committee on Finance and Administration—
Mr. J. H. MacKichan, Canada
Chairman of Standing Committee on Research and Statistics—
Dr. L. A. Walford, U.S.A.

The above mentioned two chairmen function on a one year's term.

2. **Panel Memberships are as follows:**

Country	Panel No. 1	2	3	4	5	Total
Canada		+	+	+	+	4
Denmark	+					1
France	+	+	+	+		4
Iceland						0
Italy	+	+	+	+		4
Norway	+					1
Portugal	+	+	+	+		4
Spain	+	+	+	+		4
United Kingdom	+		+			2
United States			+	+	+	3
TOTAL	7	5	7	6	2	27

3. **Newsletters.**

Four newsletters were distributed from headquarters in order to circulate information relevant to Commission's activities and interests. The newsletters were issued on 1 Sep. 1955, 1 Dec. 1955, 10 Feb. 1956, and 15 May 1956.

4. **Commission's Publications.**

The Annual Proceedings, vol. 5 for the year 1954-55 was issued in November, 1955.

The Statistical Bulletin, vol. 4 for the year 1954 was issued in May 1956.

Of the Poster on Tagging, of which an English edition was issued in 1955, three other editions have been issued, two in French (for France and the French-speaking part of Canada), and one in Spanish. This in accordance with requests from the countries concerned. A corresponding poster has been issued in Portuguese by Gabinete de Estudos das Pescas, Lisbon.

5. **Co-operation with other International Organizations.**

The co-operation by means of exchange of meeting observers and exchange of reports and publications has been maintained through the year with—

The Food and Agriculture Organization of the United Nations (FAO).
Le Conseil International pour l'Exploration de la Mer (ICES).
The Permanent Commission of the International Fisheries Convention of 1946.
The International North Pacific Fisheries Commission.
The International Pacific Halibut Commission.
The International Pacific Salmon Fisheries Commission.
Commission Internationale pour l'Exploration de la Mer Méditerranée (CIEMM).

ICNAF was represented at the Annual Meeting of ICES in Copenhagen in October 1955 by Dr. Å. Vedel Tåning, Denmark, and Mr. R. S. Keir, Commission's Biologist-Statistician.

Dr. Paul M. Hansen, Denmark, represented the Commission as observer to the Meeting of the Permanent Commission of the International Fisheries Convention of 1946 in London, Sept. 1955. Reports by the observers of these two meetings have been circulated within the Commission (Serial No. 343 and 344). Dr. Å. Vedel Tåning acted as ICNAF observer to the Meeting of the Permanent Commission (1946) in London in May 1956 and has been appointed to represent ICNAF in meetings of the ICES Subcommittee on the International Geophysical Year 1957-58.

A number of members of the Standing Committee on Research and Statistics took part in a FAO meeting on the terminology used in the science of fisheries, in Biarritz in February 1956.

6. Co-operation with non-member countries.

Observers from the Federal Republic of West Germany attended the 1955 Annual Meeting as well as this year's Annual Meeting. Observers from Germany took part in the Biarritz Meeting of the Committee on Research and Statistics in March 1956. A considerable co-operation is being maintained covering the collection of statistics as well as the planning and reporting of Research work with the German Fisheries Institutes.

Observers from the Netherlands attended the Biarritz Meeting of the Committee on Research and Statistics, March 1956.

Observers from the Union of Soviet Socialist Republics attended the 1956 Annual Meeting.

The exchange of publications with fisheries institutions in a number of non-member countries has been maintained and developed.

7. Meetings within the Commission during the year.

A meeting of the Standing Committee on Research and Statistics was convened in Biarritz, France, 1-10 March 1956 with the main purpose of considering methods in use in the study of fisheries problems: sampling of stocks, measuring of nets, reading of fish ages, etc. Other important problems considered were the catches of the salt cod fleets, and special problems connected with the biology of cod, halibut and redfish. Observers from the Federal Republic of West Germany and from the Netherlands took part in the meeting as did observers from FAO, ICES and CIEMM.

8. Research Programs.

According to Commission's decision research programs for 1955 were forwarded to the Secretariat during December 1955-April 1956 from a number of the member-countries. Together with a survey by subareas prepared in the Secretariat they were circulated within the Commission during the same months.

9. Research Summaries.

Research summaries for the year 1955 were forwarded from the participating countries and from West Germany to the Secretariat during March and April. They were circulated as documents for the 1956 Annual Meeting together with a summary of researches by subareas prepared in the Secretariat, and are printed in this Proceedings Part 3.

10. Collecting of Statistics.

The Commission's collecting of statistics and the compilation of the data in the Secretariat have been continued according to Commission's requirements. The reporting of statistical data by the member countries has grown more and more complete during the years and in all essentials the requirements are being met. The use of punched cards are being considered as an aid in the compiling and analysing of the Commission's statistics. In the 1954 statistics for the first time all species have been considered; the statistics thus give the total landings by the fishing industries exploiting the Convention Area.

11. Sixth Annual Meeting.

The Sixth Annual Meeting of the Commission was held at Commission's Headquarters in Halifax, N. S. Canada in the days 11 to 15 June 1956. (See Chairman's Report, Part 2).

12. Other Matters.

In June-August the Executive Secretary made a travel with the Portuguese Hospital Ship "Gil Eannes" over the Grand Banks of Newfoundland

and through the fishing area of Subarea 1. In Greenland waters he moved aboard the Danish research vessels "Adolf Jensen" and "Dana" where he had the opportunity of following the Danish research work in the region between Disko and Kap Farvel.

In September-October the Biologist-Statistician visited European member countries of ICNAF. In Rome he had discussions with the staff of FAO, and in Copenhagen he further acted as observer for ICNAF for the Annual Meeting of ICES.

A list of annotated papers relevant to Commission's work was circulated on 1 December 1955.

An addition to the Guide to ICNAF papers covering the period October 1954 to September 1955 was circulated in October 1955.

A prescribed form for reporting data on mesh sizes of otter trawls was circulated within the Commission on 10 February 1956.

13. Financial Statements for the Fiscal Year ending 30 June, 1956.

The accounts of the Commission for the year ending 30 June, 1956 show an appropriation of $ Can. 34,100.00 and a total expenditure of $32,016.01, leaving an unobligated balance of $2,083.99.

The audit of the Commission's finances for the fiscal year ending 30 June, 1956, was made by the Auditor General's Office of the Government of Canada in July, 1956.

The report from the Auditor General's office, of August 9, 1956 says:

"As required by Section 11 (2) of the Financial Regulations of the Commission, I certify that:

(a) the financial statements are in accord with the books and records of the Commission; and

(b) the financial transactions reflected in the statements have been in accordance with the rules and regulations, the budgetary provisions, and other applicable directives; and

(c) the monies on deposit have been verified by certificate received direct from the Commission's depository.

Free access was given to all books of account and records necessary for the performance of the audit. Such further information as was required was readily provided. The co-operation of the Executive Secretary and his staff is acknowledged with appreciation."

The following three financial statements were attached to the Auditor's report:

Statement 1

Statement of budget appropriations, obligations incurred, and unobligated balances of appropriations for the year ended 30 June 1956

Purposes of Appropriations	Appropriated by Commission	Transfers approved by Commission	Amended Appropriations	Obligations incurred	Unobligated Balances of Appropriations
Personal services	$21,000	$	$21,000.00	$20,949.96	$ 50.04
Travel	3,700		3,700.00	2,842.98	857.02
Transportation of things	200		200.00	44.70	155.30
Communication services	1,000		1,000.00	976.66	23.34
Rent and utility services	300	(200)	100.00		100.00
Other contractual services including printing	5,700		5,700.00	5,038.73	661.27
Supplies and materials	1,100	(200)	1,300.00	1,288.13	11.87
Equipment	500		500.00	467.25	32.75
Annual Meeting	600		600.00	407.60	192.40
	$34,100		$34,100.00	$32,016.01	$2,083.99

Statement 2

Statement of income and expenditure for the year ended 30 June 1956

Income:			
Members' contributions assessed—			
Canada		$ 4,412.56	
Denmark		1,498.14	
France		4,560.08	
Iceland		526.66	
Italy		4,560.09	
Norway		1,498.14	
Portugal		4,449.45	
Spain		4,448.38	
United Kingdom		2,469.61	
United States		3,441.08	
			$31,864.19
Unobligated balances of 1954-55 appropriations			1,607.76
Credits to Member States resulting from advance to Working Capital Fund—Italy			626.97
Credits due to prior year's overpayments:	France	.01	
	Spain	1.07	1.08
			$34,100.00
Deduct obligations incurred (Statement 1)			32,016.01
Excess of income over obligations carried to Surplus Account			2,083.99

Statement 3

Statement of assets and liabilities as at 30 June 1956

Assets			Liabilities		
GENERAL FUND			Unliquidated obligation		$ 2,497.17
Cash at bank		$ 851.66	Credits due to Member States:		
Contributions receivable:					
			From 1952-53		
Italy—			contribution		
1953-54	$ 4,546.12		of Italy	$ 3,704.86	
1954-55	3,588.18				
1955-56	4,560.09		Iceland over-payment,		
	12,694.39		1955-56	.96	3,705.82
Denmark	.93	12,695.32			
			Due to Working Capital Fund		5,260.00
			Surplus Account		2,083.99
		$13,546.98			$13,546.98
WORKING CAPITAL FUND					
Cash at Bank		$ 6.60	Principal of Fund		$ 5,266.60
Due from General Fund		5,260.00			
		$ 5,266.60			$ 5,266.60

PART 2

Report of the Sixth Annual Meeting

11 - 15 June, 1956.

BY THE CHAIRMAN — TAVARES DE ALMEIDA

1. Time and Place of Meeting.

The Sixth Annual Meeting of the Commission was convened in the Forrest Building of Dalhousie University, Halifax, Canada, the 11th June, 1956, and continued on June 12, 13, 14 and 15. The Annual Meeting was preceded by meetings of the Committee on Research and Statistics on June 8 and 9.

2. Participants (Appendix I)

Commissioners, the majority of them accompanied by advisers, were present from the ten member countries: Canada, Denmark, France, Iceland, Italy, Norway, Portugal, Spain, United Kingdom and United States. Observers were present from the Federal Republic of West Germany, the Union of Soviet Socialist Republics, Food and Agriculture Organization of the United Nations, Conseil International pour l'Exploration de la Mer, International Fisheries Convention of 1946, International North Pacific Fisheries Commission and the World Meteorological Organization.

3. Opening Remarks (Agenda item 1)

Present at the opening were: The Premier of Nova Scotia, Hon. Henry D. Hicks; the President of Dalhousie University, Dr. A. E. Kerr; representatives of the consular agencies of member countries in Halifax, and of fisheries industries and organizations in Nova Scotia.

The Chairman opened the meeting and addressed a welcome to the guests, the observers and the participants, and extended the Commission's thanks for the interest shown the Commission by the institutions in Nova Scotia, especially Dalhousie University who housed the Commission's Secretariat and furnished accommodations for the Annual Meeting.

The Hon. Henry D. Hicks welcomed the delegates of the meeting to Nova Scotia, and expressed his best wishes for the success of this important meeting.

The President of Dalhousie University, Dr. A. E. Kerr, welcomed the Commission to the campus of the University and stated how satisfied the University was with having the Commission's Secretariat located at the University and with offering accommodations for its Annual Meeting.

The Chairman read a telegram of welcome from the Minister of Fisheries for Canada, the Hon. James M. Sinclair.

George R. Clark, Deputy Minister of Fisheries, Canada, extended on behalf of his government a hearty welcome to the Commission.

The Chairman expressed the Commission's best thanks for the welcome, and for the honour shown to the Commission by the guests attending the opening meeting.

Dr. H. W. Graham (U.S.A.) gave a lecture on the results of the haddock regulation in Subarea 5 (Agenda Item 11). The Chairman thanked Dr. Graham and declared the adjournment of the opening meeting.

4. The Agenda (Agenda item 2), cfr. Appendix II

The agenda, circulated 60 days in advance of the meeting, was adopted on a motion by Canada, seconded by U.K., it being understood that items could be dealt with out of their numerical order if necessary. On a proposal by the Chairman, it was agreed that proposals dealing with research and regulations should pass directly from panels to the Standing Committee on Research and Statistics and from there to the Plenary.

5. Publicity for the Meeeting (Agenda item 3)

The Chairman explained that the Canadian Government had provided for information to the press by offering the services of Mr. A. C. Rhydwen (Halifax). The Chairman expressed the Commission's thanks for this offer, and a committee consisting of J. H. MacKichan (Canada) and W. M. Terry and L. A. Walford (U.S.A.) was appointed to work with Mr. Rhydwen and approve the press releases.

6. Review of Panel Memberships (Agenda item 4)

Dr. Jónsson, Iceland, asked for a panel membership for Iceland in Panel 1. The application was approved by Panel 1 and by the Standing Committee on Finance and Administration, and accepted by the Commission, who expressed its appreciation that Iceland had taken a panel membership for a subarea in which Iceland carried out substantial fishing and important research work.

An application by United Kingdom for panel membership in Subarea 4 was, after some discussion, withdrawn by the U.K. delegation.

The question of the Italian membership in Panels 1, 2, 3 and 4 was considered. The Italian delegates stated that they had proposed to the Italian Government that it inform the Commission before the end of June 1956 if any changes were wished. Further action was deferred.

7. Report on Staff Matters (Agenda items 5, 6 and 9)

Upon recommendation by the Standing

Committee on Finance and Administration, the Commission approved the Administrative Report for 1955/56 and the Auditor's Report for 1954/55. The provisional financial statements for 1955/56 (up to 31 May) were approved.

The Commission noted with satisfaction that good progress had been achieved in the joint work by the Canadian and United States Commissioners regarding the problems connected with superannuation for staff members.

8. Budget (Agenda items 7, 8 and 16)

The Commission approved the recommendation of the Committee on Finance and Administration to appropriate $40,216 for the year 1956/57 for the following purposes:

Personal Services	$21,966
Travelling	6,550
Transportation of Things	400
Communication Services	1,000
Rent and Utility Services	300
Other Contractual Services, including Printing	6,000
Supplies and Materials	2,000
Equipment	800
Annual Meeting	1,200
	$40,216

It was noted by the Commission that the Standing Committee on Finance and Administration recommended an advance budget estimate for 1957/58 as follows:

Personal Services	$25,000
Travelling	5,000
Transportation of Things	200
Communication Services	1,100
Rent and Utility Services	300
Other Contractual Services, including Printing	10,500
Supplies and Materials	1,800
Equipment	500
Annual Meeting	600
	$45,000

In connection with the consideration of the budget, the Commission approved the recommendation by the Standing Committee on Finance and Administration that the decision of a former Chairman in respect to the distribution of the Commission's publications be confirmed, viz. that 100 copies may be distributed free to any member country and that any further number be charged for at the actual cost of production.

Also on recommendation by the Standing Committee on Finance and Administration, the Commission agreed that the date of billing would be 1 July 1956.

Upon recommendation by the Standing Committee on Finance and Administration, the Commission decided that instead of only the Executive Secretary being bonded in the sum of $25,000 that both the Executive Secretary and the accountant be bonded in the amount of $15,000 each.

It was recommended by the Committee that the existing rules for refund of home leave fares for staff members and dependents should be reviewed at the meeting in 1957. It was also agreed that as to class of travel for the Commission's staff while on Commission's business, the regulations of the Canadian Government should generally be followed. The Commission agreed to this.

Mr. MacKichan was re-elected Chairman of the Committee on Finance and Administration.

9. Report of the Standing Committee on Research and Statistics (Agenda items 13, 14 and 15)

The Chairman of the Committee, Dr. L. A. Walford, reported on the committee's work as follows:

The Committee on Research and Statistics opened its session this year on June 8th by continuing study of the Commission's research needs which it had begun at Biarritz, France, in March. Its principal point of reference was the list of recommendations which the working parties of experts had made regarding gaps in knowledge that must be filled in order to carry out the Commission's functions. To fill these gaps requires a comprehensive research program throughout the Convention Area. Such a program is beyond the capacity of any one member of the Commission; it must be carried out by all members closely collaborating in designing the work, coordinating the operations and integrating the interpretations. Such collaboration is the principal function of this Committee and is the purpose of interim meetings such as that held at Biarritz.

Taking a long view of the research needs of the Commission, it will be necessary for all of the members to increase their support of research. The amount of increase which each country should plan must depend on its present expenditures for fishery research in the area and on the volume of fish which it harvests. During this year's session, the Committee outlined research programs dealing with cod, haddock, redfish, and halibut, and with several subjects that apply to all species, namely population dynamics, causes of natural mortality and techniques of fishery research. These programs, which are appended to the report on the Biarritz meeting, are laid down as a guide for future planning, not as a prescription for full, immediate action. The Committee urges the Commission members to foster the orderly increase of support for fishery research in their respective countries as rapidly as feasible, beginning immediately by taking the essential first step of making provision for adequately sampling their fisheries at sea and also ashore.

The Committee's activities are beginning to produce a special literature on fishery problems of particular concern to the Convention Area. Some of this literature, as well as certain of the Committee's reports, have permanent value and should be published. Consequently the Commission should plan in its budgeting for reasonable growth of its publications. The Committee recommended that the Chairman's report on the Biarritz meeting should be published, together with a selection of the papers prepared for the meeting. It further recommends as a policy for ICNAF publication of scientific papers,

> "that papers be considered for printing when they have been prepared in response to an ICNAF request, or when they deal with fisheries problems in the ICNAF area and do not lend themselves to publication elsewhere."

One of the principal subjects which the Committee took up at Biarritz was The Most Effective Use of Men and Materials for the Needs of the Whole Commission. Among the conclusions of this discussion which need to be drawn especially to the attention of the Commission are the following recommendations:

A. Statistics and Sampling

A.1 In studying all the research needs of the Convention Area the Committee unanimously agreed that the highest priority should be assigned to collecting and reporting statistics and to sampling the catches of their fishing fleets.

A.2 Certain member countries should expand their collection of statistics to bring them up to the level of ICNAF requirements. This they should do by the use of log books, interviews of captains and sampling of their fleets.

A.3 All countries should collect and report to the Commission records of the quantities, species and sizes of fish discarded at sea. This information should be based on log book records supplemented by observations and measurements made at sea.

A.4 Quantities of statistical data on catches, sizes of fish, etc. exist among the member countries, (for example in log books) but are not fully accessible to workers because they are not published or are not in a comparable form. These data should be collected and published. The Secretariat has undertaken this task, but must have the co-operation of all members.

A.5 The sampling of fish caught to determine the lengths, ages, and weights of fish caught is generally inadequate. For all member countries, the sampling of the catches of cod (the most important of all species in the area) is inadequate; for some countries it is completely lacking.

A.6 Samples of commercial catches landed ashore can be obtained in large numbers at relatively low cost, and these should be taken wherever sampling can be referred to specific stocks of cod. Samples of landings do not give a complete picture of catches, for large quantities of cod may be discarded at sea. It is, therefore, important to sample catches at sea, moving from vessel to vessel in order to assess differences between sizes caught and sizes landed. Each country should send observers to sea on commercial vessels for this purpose. At least two observers should be employed for sampling at sea on commercial vessels by each of the governments carrying out substantial fishing in the Convention Area (Canada, France, Portugal, Spain). Portugal and Spain have already taken steps to meet this requirement. Other countries, such as Denmark and Norway, which carry on substantial exploitation, should sample correspondingly at sea. If sampling by member governments cannot be so expanded, the Commission should set up a joint program of sampling commercial catches. This would involve employment of observers and charter of vessels. It should be avoided until other methods of sampling are fully explored.

A.7 For each species sampled, each country should report to the Secretariat the sizes, ages, weights and sexes of fish sampled, by place and time of capture. The Commission should publish these statistics.

A.8 These additional statistics will considerably increase the load on the Secretariat, and it would, therefore, be necessary either to increase the assistance given to the Biologist-Statistician or to reduce the work required to produce the Statistical Bulletin with its present contents. The latter could be achieved by mechanizing the tabulation operation, and if this proved possible, the burden of the additional compilations would also be greatly lessened.

B. **Research Vessels and Laboratory Equipment.**

Many of the recommendations by this Committee require special equipment, which is necessary to carry out the research which the Commission must require.

B.1 As many observations of a special and technical nature must be taken systematically at sea, the need for research vessels working in the Convention Area is great. For example, fishing for young fish to assess strength of year groups and sampling of stocks by fishing in unfished areas are necessary tasks which can only be done from research vessels. The number of research vessels being operated in Subareas 2, 3, and 4 should be increased and the programs of these vessels, their schedules of operations and techniques of their observations and collection should be coordinated by group planning among the members in order to obtain the most efficient use of the ship time available.

B.2 Since research vessel operations are costly and scarce, every opportunity should be taken to make use of fishing vessels, patrol ships and any other ships which traverse or spend time in the Convention Area so as to obtain samples of plankton, information on water temperatures and, where possible, data on the fish stocks. Automatic collecting devices and recording instruments should be used whereever possible so as to minimize the need of technical personnel.

B.3 The Committee has begun taking inventory of all facilities for obtaining meteorological and hydrographic data and for collecting plankton samples systematically in the Convention Area.

After completing its work on the Biarritz report, the Committee took up a number of other matters which had been referred to it, studying them in small working parties, as follows:

1. International Geophysical Year. Those countries which have planned for hydrographic work in the Convention Area have agreed to participate in a coordinated program which will serve the requirements of IGY and at the same time contribute substantially to knowledge of fishery hydrography.

2. The Problem of Exemption from Regulations. The Committee studied a proposal by the United States for 10% annual exemption to the mesh regulation, and a communication from the United Kingdom relating to exemptions, and sent a report to the ad hoc committee for further consideration which includes the following generalizations:

> No vessel fishing for regulated species should use small mesh.
>
> To avoid hardship, vessels fishing for other species should not waste regulated species which are caught incidentally. Exemption to regulations are required for such fishing.
>
> Since the time and difficulty involved in revision of exemptions in regulations are not desirable, accepted regulations should have long-term stability as far as possible.

3. Technological Problems Regarding Construction and Measurement of Nets, raised by France in connection with Mesh Regulations in Subareas 3 and 4. After examining this problem carefully, the Committee recommended a course of research which should be undertaken without further delay by countries employing multiple codends, to determine the escapement of fish through them and to devise alternate means of strengthening codends without violating the regulations proposed for Subareas 3 and 4. The Committee reaffirmed that the method of mesh measuring employed by ICNAF should not be changed now, but that improvements should be made in the design of the gauge, and that it would be beneficial if both ICNAF and the Permanent Commission of the International Convention of 1946 were to adopt a common standard gauge. To this end the two bodies should work closely together in the development of an improved gauge.

It was agreed that measurements of mesh sizes of trawls used by all countries in the ICNAF area should be carried on permanently and that the Secretariat should collect such data.

4. Cod. The Whole Committee devoted a large part of its attention to conducting a workshop on techniques of cod research, and a symposium on cod biology.

An examination of tagging methods brought out a number of suggestions for improving the techniques of tagging and for increasing the number of tag returns. After reviewing the knowledge of cod biology in the Atlantic, the group affirmed the necessity of intensifying the study of cod throughout the ICNAF Convention Area as a whole, particularly in relation to the environment.

To improve forecasting of future changes in the important W. Greenland cod fishery, an increased study of ice conditions, meteorological factors and hydrographic changes should be carried out, as well as research on the relation of temperature to spawning success.

5. Miscellaneous. To facilitate the prompt reporting of information, the Committee recommended that each country should appoint one person to be correspondent for all matters concerned with research and statistics problems of the Commission.

To standardize methods of presentation and to facilitate processing, the committee requested that the Secretariat prepare a bulletin describing the methods of tabulation most suitable for various kinds of data to be submitted to the Commission.

To encourage the mechanization of fish measurement, the Committee recommended that FAO be asked to canvass fishery biologists on the various special instruments being used in fishery research and also for opinions on the requirements of a fish measuring device including suggestions of its technical characteristics or principles, and, if possible, drawings.

Plans for 1957 Meeting.

After discussing plans for the coming year, the Committee recommended:

1. That a 7-day Workshop on Population Dynamics and on the Selectivity of Fishing Units (Craft and Gear) be arranged to adjoin the 1957 Annual Meeting of the Commission in Lisbon.

2. That to avoid unnecessary overlap and duplication of effort,
   (a) ICES be invited to hold the 1957 meeting of its Comparative Fishing Committee at the same place and during the same period;
   (b) FAO be approached with a view to

      (i) Arranging that the ICNAF Workshop and the proposed FAO meeting on the same subjects be held jointly, and

      (ii) Ensuring that the date of the FAO Fishing Gear Congress in Europe (probably Hamburg) is adjusted so that those participating in the ICNAF meeting are able also to attend that Congress if they so wish.

It is expected that all the constituent parties mentioned above will meet at times as one body; according to convenience the work would thereafter be divided among groups representing special aspects of these problems, such as mesh measurements, definition of gear types, etc. Time would also be made for such formal proceedings as organizations may need to deal with recommendations and their own procedural matters.

Lionel Walford was re-elected Chairman for the ensuing year.

With the acceptance of the Research Report, the Commission approved the above-mentioned recommendations.

10. Reports of Meetings of Panels 1 to 5 (Agenda item 17)

The Commission approved the reports of Panels 1 to 5.

Panel 1 met once. The Commission noted the Panel's statement that all countries should carry out samplings of their commercial catches and report these to the Secretariat for compilation, and that hydrographic data should be reported to the Secretariat in table form; further that the Panel considered the cooperation with ICES as to hydrographic reporting satisfactory, and agreed that the generous offer of the International Ice Patrol to furnish ICNAF with data on their sections in Subarea 1 should be gratefully accepted. The Commission noted with satisfaction the progress in research work in the area, especially as to cod and halibut.

Panel 2 met twice. The Commission noted that Portugal had initiated samplings of its cod catches in Subarea 2, that Canada hoped to do so in the future, and that this country had continued its explorations for redfish in the Hamilton Bank Area.

Panel 3 met once. The Commission noted with gratification that the Spanish researches on haddock had been developed considerably, and that Portugal had initiated extensive samplings from its cod fishery in the Subarea. The Panel discussed the proposed mesh regulations, especially the French reluctance to accept the method of mesh measuring and the clauses as to chafing gear. Otherwise France had accepted the regulations, which in their entirety had been accepted by all other member countries. The question of the clauses on chafing gear was referred to the new ad hoc committee.

Panel 4 met once. The Commission noted that U.K. had withdrawn its application for a panel membership in view of the lack of substantial exploitation. It was further noted that

Portugal had commenced sampling of its commercial cod catches, and that joint researches by Canada and U.S.A. regarding haddock were carried out. For France the same problems as to the trawl regulations were found in Subarea 4 as in 3; the problems were considered by the Panel and also in the joint panels' meeting.

Panels 3 and 4 met jointly to consider the problems of mesh proposals and of chafing gear for Subareas 3 and 4.

Panel 5 met twice. The Commission noted that U.S.A. was facing minor difficulties in continuing the smallmesh study boat program, but that the Panel had agreed that this important study had to be continued. The U.S.A. proposal to amend the present exemption of the haddock regulation to allow a 10% per annum exemption was considered. It was agreed that a series of questions had to be answered before a decision could be taken. These questions were formed and referred to the Committee on Research and Statistics. It was agreed that part of these questions, especially as to enforcement, were hardly within the province of the standing committees Therefore the Panel proposed to the Plenary to establish another committee for such problems, and the Plenary appointed an ad hoc committee with Mr. Sargent (U.S.A.) as Chairman to deal with any such problems (cfr. Point 11).

In its second meeting, the Panel dealt with the answers from the Committee on Research and Statistics to the questions related to exemptions and with the considerations of the "Sargent" Committee (see 11) regarding this matter, and agreed upon the following recommendations:

1. That the Commission ask the members of Panel 5 to undertake a two-year experiment to determine the feasibility of the use of a 10% annual exemption to the cod-haddock regulation, and the effects of such an exemption upon the cod-haddock conservation program in the subarea.
2. That the Commission review the progress of the experiment after one year of work, to determine the advisability of continuing the experiment at the 10% level, and to modify that level if it appears desirable.
3. That the Commission, in order to implement this recommendation, propose to the governments that Paragraph 2 of the proposal concerning the regulation of the cod and haddock fishery in Subarea 5, adopted by the Commission at its 5th Annual Meeting be amended by the addition of the following words:

   > "or so long as such person does not catch, in any period of twelve months, cod or haddock in quantities in excess of 10% for each species of all the trawl-caught fish taken by such persons in that period of twelve months."

Joint meeting of Panel 3 and 4. In a joint meeting of Panels 3 and 4, the question of France's reluctance to accept the chafing gear clauses of the trawl regulations for Subareas 3 and 4 was considered.

It was agreed to recommend to the Commission that the following be added to the proposed regulations for Subareas 3 and 4: "Provided that paragraph IV is in abeyance and shall enter into force on July 1, 1957, unless the Government of France informs the Depositary Government of its continued objection prior to June 1, 1957."

It was understood that in the meantime experiments should be carried out by France and other countries to clear the problems involved.

With the subsequent acceptance of the Panel reports the Commission approved these recommendations.

11. Meeting of an Ad Hoc Committee on Administrative and Management Matters.

This committee considered the problem of a 10% annual exemption versus trip exemption from the regulations in Subarea 5. Canada was reluctant to adopt this form of exemption, but it could accept annual exemption as an experiment in Subarea 5 only as an alternative to per trip exemption, and on an experimental basis (two years).

U.S.A. agreed generally and it was decided that such an experiment should be carried out under the supervision of Panel 5.

The ad hoc committee then considered France's position with regard to regulations in Subarea 3 and 4 (the problem of extra cod-ends as chafing gear). France offered to initiate experiments to solve this problem. Other countries concerned offered to carry out similar experiments. This was agreed to by the Committee.

Finally the ad hoc committee proposed that the two standing committees should be consulted on setting up a more permanent committee to deal with matters such as the above-mentioned and other related problems, and that this proposal should be included in the agenda for the 1957 Annual Meeting.

12. Regulations of the Trawl Fishery for Cod and Haddock in Subareas 3, 4 and 5 (Agenda item 12)

The Commission noted from information by the Depositary Government and by delegates that the governments of all participating countries concerned had accepted or were to do so in the very near future the trawl regulations for cod and haddock fisheries in Subareas 3, 4 and 5 proposed by the Commission in its 1955 Annual Meeting, France however with reservation as to methods of mesh measuring and clauses for chafing gear.

13. Amendments to Regulations.

Based on advice from panels and committees (see item 10), the following recommendations were adopted by the Commission:

(1) That paragraph two (II) of the proposal concerning the regulation of the cod and haddock fishery in Subarea 5 adopted by the Commission at its Fifth Annual Meeting be amended by the addition of the following words:

> "or so long as such a person does not catch, in any period of twelve months, cod or haddock in quantities in excess of 10% for each species of all the trawl-caught fish taken by such persons in that period of twelve months."

(2) That the following be added to the proposed mesh regulations of the cod and haddock fishery in both Subareas 3 and 4:

> "Provided that paragraph IV is in abeyance and shall enter into force on July 1, 1957, unless the Government of France informs the Depositary Government of its continued objection prior to June 1, 1957."

14. Date and Place of Annual Meeting (Agenda item 10)

The Commission had been informed by the U.S.A. delegation that, in principle, all member countries had agreed to a change in the Convention to make annual meetings possible in any of the member countries, and that it could be expected that all countries would have signed this amendment of the Convention before the next annual meeting.

The Commission adopted with gratification a proposal by the Standing Committee on Finance and Administration to accept the invitation extended by the Portuguese Government to hold the Commission's Seventh Annual Meeting in Lisbon, Portugal. The Commission further adopted the proposal that the Annual Meeting commence May 20, and that the Standing Committee on Research and Statistics should meet also in the days prior to the Annual Meeting.

15. Acknowledgement and Adjournment.

The observers from the Republic of West Germany, U.S.S.R., F.A.O., the Permanent Commission of 1946, and ICES, thanked the Commission for the opportunity of attending the Annual Meeting.

Sargent (U.S.A.) expressed how pleased he had been to meet for the first time at an ICNAF meeting observers from Russia. He complimented the two standing committees (Research & Statistics and Finance & Administration) for the fine work they had achieved, and thanked the French delegation for the agreeable way in which they had helped to solve the problems in connection with the regulations in Subareas 3 and 4. He thanked the Chairman, Captain

Almeida, for the pleasant way in which the Annual Meeting had been conducted and for the great hospitality shown to the participants aboard the Portuguese hospital ship "Gil Eannes," and concluded by thanking the Secretariat for the strenuous work accomplished by it during the meeting.

MacKichan (Canada) acknowledged the valuable services of the additional secretarial staff provided by various offices of the Canadian Government and of the Press Officer, Mr. Rhydwen, and expressed the Commission's gratitude for the hospitality shown it by various institutions of the Province of Nova Scotia and the City of Halifax, as well as on board the Portuguese hospital ship "Gil Eannes."

The Chairman thanked the observers, the meeting participants, the Chairmen and the Secretariat for the way in which they had contributed to the success of this Annual Meeting, and the Sixth Annual Meeting adjourned.

APPENDIX I
LIST OF PARTICIPANTS

CANADA

Commissioners:

Mr. J. T. Cheeseman, President, West Atlantic Products Co. Ltd., St. John's, Nfld.

Mr. G. R. Clark, Deputy Minister, Department of Fisheries, Ottawa.

Mr. J. H. MacKichan, General Manager, United Maritime Fishermen Ltd., Halifax, N. S.

Advisers:

Mr. L. E. Baker, Chief Supervisor of Fisheries, Department of Fisheries, Halifax. N.S.

Mr. H. Bradley, Chief Supervisor of Fisheries, Department of Fisheries, St. John's, Nfld.

Mr. W. Doucet, Department of Fisheries, Halifax, N. S.

Mr. J. Estey, Member, Industry Advisory Committee for Canada, Loggieville, N.B.

Mr. A. Fleming, Biological Station, St. John's, Nfld.

Dr. J. L. Hart, Director, Biological Station, St. Andrews, N. B.

Dr. J. L. Kask, Chairman, Fisheries Research Board of Canada, Ottawa.

Dr. L. Lauzier, Biological Station, St. Andrews, N. B.

Dr. F. D. McCracken, Biological Station, St. Andrews, N. B.

Mr. P. K. McGrath, Member, Industry Advisory Committee for Canada, St. John's, Nfld.

Dr. W. R. Martin, Biological Station, St. Andrews, N. B.

Mr. D. Pyke, Member, Industry Advisory Committee for Canada, Lunenburg, N. S.

Mr. A. C. Rhydwen, Department of Fisheries, Halifax, N. S.

Mr. W. R. Ritcey, Member, Industry Advisory Committee for Canada, Riverport, N. S.

Dr. W. Templeman, Director, Biological Station, St. John's, Nfld.

DENMARK

Commissioners:

Dr. Paul M. Hansen, Head, Greenland Fishery Investigations, Charlottenlund Slot, Copenhagen.

Mr. E. Jacobsen, Royal Danish Consulate General, 17 Battery Place, New York.

Adviser:

Mr. L. Thygesen, Danish Westcoast Fishermen's Association, Esbjerg.

FRANCE

Commissioners:

Comm. H. F. Barbier, Maritime Representative, French Embassy, 1001 Connecticut Ave. N. W., Washington 6, D. C.

Mr. C. Ravel, Sous-Directeur des Pêches Maritimes au Ministère de la Marine Marchande, 3, Place de Fontenoy, Paris (7eme).

Advisers:

Mr. A. Dezeustre, Directeur d'Armement des Pêcheries de Grande Pêche de Bordeaux Bassens, Bordeaux.

Mr. Eude, Chef du quartier de l'Inscription Maritime à St. Pierre et Miquelon.

ICELAND

Commissioner:

Dr. Jôn Jônsson, University Research Institute, Fisheries Department, Borgartun 7, Reykjavik.

ITALY

Commissioners:

Mr. F. DeRege, Italian Consul, Summerhill, Montreal, P. Q.

Mr. L. Tozzoli, Italian Embassy Commercial Office, 136 Queen Street, Ottawa, Ontario.

NORWAY

Commissioners:

Dr. B. Rasmussen, Institute of Marine Research, Directorate of Fisheries, Bergen.

Mr. G. Rollefsen, Director, Institute of Marine Research, Directorate of Fisheries, Bergen.

Mr. K. Sunnanaa, Director of Fisheries, Directorate of Fisheries, Bergen.

PORTUGAL

Commissioners:

Captain Tavares de Almeida, Captain Portuguese Navy, Praça Duque da Terceira, 24, 1°, Lisbon.

Dr. Mario Ruivo, Comissão Consultiva Nacional das Pescarias do Noroeste do Atlântico, Gabinete de Estudos das Pescas, Lisbon.

SPAIN

Commissioners:

Mr. C. L. Chicheri, Commercial Attache, Spanish Embassy, Ottawa, Ontario.

Mr. O. Rodriguez M., Biologo de la Dirección General de Pesca Marítima, Madrid.

Adviser:

Mr. S. Olascoaga G., Vice-Consul for Spain, St. John's, Newfoundland.

UNITED KINGDOM

Commissioners:

Mr. A. J. Aglen, Scottish Home Department, St. Andrew's House, Edinburgh 1.

Mr. R. S. Wimpenny, Fisheries Laboratory, Lowestoft.

Dr. H. Wood, Marine Laboratory, Scottish Home Department, Victoria Road, Torry, Aberdeen.

UNITED STATES

Commissioners:

Mr. B. Knollenberg, Chester, Connecticut.

Mr. F. W. Sargent, Director, Division of Marine Fisheries, Department of Conservation, Boston, Mass.

Mr. A. J. Suomela, Associate Director, Fish and Wildlife Service, Department of the Interior, Washington 25, D. C.

Advisers:

Dr. H. W. Graham, Chief, North Atlantic Fishery Investigations, Fish and Wildlife Service, Woods Hole, Mass.

Mr. E. Medico, Branch of Commercial Fisheries, Boston, Mass.

Mr. E. A. Power, Branch of Commercial Fisheries, Fish and Wildlife Service, Washington, D. C.

Mr. W. M. Terry, Office of International Activities, Department of the Interior, Washington, D. C.

Dr. L. A. Walford, Chief, Branch of Fishery Biology, Fish and Wildlife Service, Washington 25, D. C.

Assistant Advisers:

Mr. H. H. Eckles, Branch of Fishery Biology, Fish and Wilflife Service, Washington 25, D. C.

Mr. J. Clark, Fish and Wildlife Service, Woods Hole, Mass.

Mr. T. D. Rice, Executive Secretary, Massachusetts Fisheries Association, Boston, Mass.

Mr. C. Taylor, Fish and Wildlife Service, Woods Hole, Mass.

Mr. L. O. Warner, Member, Industry Advisory Committee for the U. S., Providence, Rhode Island.

Mr. J. P. Wise, Fish and Wildlife Service, Woods Hole, Mass.

FEDERAL REPUBLIC OF WEST GERMANY

Observers:

Direktor Freyberg, Verband der Deutschen Hochseefischereien, Bremerhaven.

Dr. J. Lundbeck, Forschungs-Bundesanstalt fuer Fischerei. Institut fuer Seefischerei, Neuer Wall 70-74, Hamburg 36.

Dr. Meseck, Bundesernaehrungsministerium, Albrecht Thaer-Haus, Zi. 116, Bonn 12.

Dr. K. Ruscher, Embassy of the Federal Republic of Germany, 580/82 Chapel St., Ottawa 2, Canada.

THE UNION OF SOVIET SOCIALIST REPUBLICS

Observers:

Mr. N. M. Saburenkov, Official of the USSR Ministry of Fish Industry.

Mr. A. D. Shveitser, Interpreter for the USSR delegation.

Mr. V. Silivanov, U.S.S.R. Embassy, Ottawa, Ontario, Canada.

Mr. V. I. Travin, Official of the USSR Ministry of Fish Industry.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Observer:

Mr. Sidney Holt, Fisheries Biology Branch, FAO, Rome.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA

Observer:

Mr. A. J. Aglen, Member, International Council for the Exploration of the Sea, Charlottenlund, Denmark.

INTERNATIONAL FISHERIES CONVENTION 1946

Observer:

Mr. K. Sunnanaa, Chairman, International Fisheries Convention 1946, 3 Whitehall Place, London.

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Observer:

Mr. G. R. Clark, Deputy Minister, Department of Fisheries, Ottawa, Ontario, Canada.

WORLD METEOROLOGICAL ORGANIZATION

Observers:

Mr. R. A. Hornstein, Officer in charge, Halifax Forecast Office, P. O. Box 653, Halifax, N. S.

Mr. K. T. McLeod, Meteorological Div., Dept. of Transport, 315 Bloor St. W., Toronto, Ontario.

SUPERVISOR OF PRESS RELATIONS

Mr. A. C. Rhydwen, Information and Education Officer, Box 550, Halifax, N. S.

SECRETARIAT

Dr. Erik M. Poulsen, Executive Secretary.
Mr. Ronald S. Keir, Biologist-Statistician.
Miss Theresa Devine, Secretary.
Miss Jean Maclellan, Clerk-Stenographer.

SECRETARIAL ASSISTANTS

Miss Carol Connors, Miss Joy Gwinnell, Mrs. M. E. McPhail and Miss Else Poulsen.

APPENDIX II

AGENDA

1. Opening of the meeting by the Chairman.
2. Adoption of Agenda.
3. Policy with regard to publicity for the Annual Meeting.
4. Review of panel memberships.
5. Report on staff matters, with presentation of the administrative report 1955/56 and financial statements for the year 1955/56.
6. Presentation of Auditor's Report for the financial year 1954/55.
7. Consideration of budget estimate for 1956/57.
8. Consideration of advance budget estimate for 1957/58.
9. Consideration of superannuation plan for staff members.
10. Date and place of Annual Meeting, 1957.
11. Report on the effects of the haddock regulations in Subarea 5.
12. Progress report on the regulations of the trawl fishery for cod and haddock in Subareas 3, 4, and 5.
13. Report on the Meeting of the Standing Committee on Research and Statistics in Biarritz, France, March 1956.
14. Report on collaboration with other institutions, international or national, as to hydrographic researches in the Convention Area and in the adjacent waters.
15. Report on meetings of Standing Committee on Research and Statistics, June 1956.
16. Report on meetings of Standing Committee on Finance and Administration, June 1956.
17. Reports on meetings of Panels 1-5, June, 1956.
18. Other business.
19. Adjournment.

PART 3

Summaries of Research 1955

A. Summaries by Countries

I. Canadian Researches, 1955

SUBAREA 2. BY W. TEMPLEMAN

No groundfish investigations apart from hydrography were carried out in Subarea 2 in 1955.

Hydrography. An attempt was made in late July to take the two sections off northern and central Labrador which were last taken by the *Investigator* II in 1950, but the area was covered with floe ice and the stations could not be occupied.

The section across the Labrador current beginning off Seal Islands and extending across the Hamilton Inlet Bank area and shown in Fig. 1 was taken by the *Investigator* II in July-August. In this section there was a much smaller volume of water below -1°C. and below 0°C. in 1955 than in 1954.

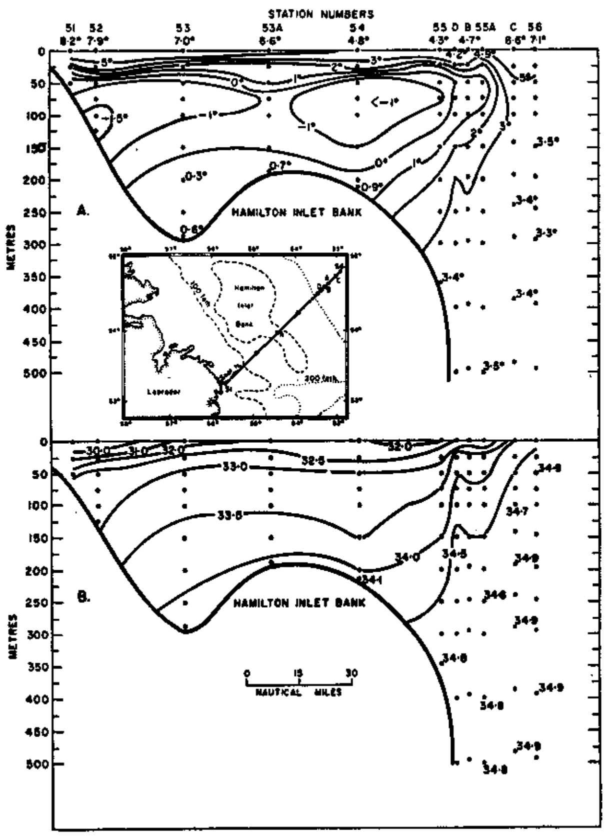


Fig. 1. **Hydrographic section off Seal Islands-Hamilton Inlet Bank, Labrador, July 31-August 1, 1955; A—Temperature °C.; B—Salinity ‰.**

SUBAREA 3. BY W. TEMPLEMAN

The sampling, for size and age, of the commercial catch of the important groundfish species both offshore and inshore was continued at Bonavista, St. John's, Burin, Fortune, Ramea and Isle aux Morts. Location of catch and effort statistics were collected for the offshore vessels.

Haddock *Melanogrammus aeglefinus* (L.). The annual haddock survey on the Newfoundland Banks was carried out by the "Investigator II" in May and June. The 1949 year-class of haddock continued to predominate in the commercial sizes. This year-class and the total of all year classes of haddock were most numerous at 41 centimetres on the Grand Bank and at 42 centimetres on the St. Pierre Bank. On the Grand Bank, haddock of the 1952 year-class with a modal size at 31 centimetres were plentiful on the southeastern part where also moderate numbers of the 1953 year-class with a modal size of 25 centimetres were present. Both these year-classes were considerably less plentiful in the southwestern portion of the bank. Only a few one-year-old haddock were obtained.

On the St. Pierre Bank haddock younger than the 1949 year-class were not found in significant numbers.

During the haddock survey on the Grand Bank between May 17 and June 18 the haddock had moved from the deeper water where they had spent the winter, and were most numerous at 30 to 40 fathoms. The haddock were in greatest numbers in temperatures of 7 to 3°C. and the cod in temperatures below 2°C.

In research-vessel catches on the Grand Bank the year-class distribution of 617 haddock was: 1953 year-class 6%; 1952, 20%; 1949, 66%;

1946, 3%. Other year-classes were 1% or less. On St. Pierre Bank for 115 haddock, 90% belonged to the 1949 year-class and other year-classes were 2% or less.

Most of the Canadian haddock catch in the area was landed in the round condition.

Tagging and Migrations. On the Virgin Rocks of the Grand Bank, 1,570 cod, *Gadus callarias* L. were tagged, and 500 cod were tagged on the Southeast Shoal of the Grand Bank.

From the cod tagging on Burgeo Bank in 1954 there has been migration to the neighbouring coastal areas and some to the Gulf of St. Lawrence and to the eastern part of the South coast of Newfoundland and St. Pierre Bank. There were no recaptures from the Grand Bank.

Cod tagged on the northern plateau of St. Pierre Bank, 1954, were recaptured mainly near the tagging area and in the southeastern coastal area of Newfoundland. Only about 1% have been recaptured on the Grand Bank and none in the Gulf of St. Lawrence or on the northeast coast of Newfoundland.

Cod tagged at St. Anthony and La Scie in 1954 have migrated along the coast northward toward southern Labrador and southward as far as Cape Race. Of several hundred recaptures from each tagging area, not one St. Anthony cod and only one La Scie cod has been recaptured in the Grand Bank-St. Pierre Bank area.

Cod tagged at Bonavista in 1954 have spread north and southwards along the east coast of Newfoundland. The four bank recaptures (out of 120 recaptures) were all taken on the northern slope of the Grand Bank.

Cod tagged in 1954 at Fermeuse and at Cape Pine and Cape St. Mary's on the Avalon Peninsula show a much greater relation to the banks than do the northern cod. Out of about 400 recaptures, 76 recaptures have come from the bank areas including 52 from the Grand Bank, 19 from St. Pierre and Green Bank, 1 from Burgeo Bank and 4 from Banquereau.

Of 499 American plaice, *Hippoglossoides platessoides* (Fabr.), tagged in St. Mary's Bay in June and September, 1954, only one has been recaptured; in November 1955, inshore off the middle of the eastern side of the Avalon Peninsula, a distance of about 65 nautical miles from the point of tagging. From 1,000 American plaice tagged near the northern tip of the Grand Bank in October, 1954, there were 26 recaptures in 1955, all, except one, near the point of tagging. The one exception was caught on the northeastern part of the bank about 130 nautical miles from the tagging area.

Redfish, *Sebastes marinus* (L.). During the year, the redfish population in Hermitage Bay was sampled bi-monthly by the "*Marinus*."

In Hermitage Bay at the present time the redfish length frequency curve is typically tri-modal. The peaks are well separated indicating only occasionally successful years for larval survival. By means of a cover of ½ inch nylon or ⅜ inch cotton over the codend a numerous group of small redfish has been captured, well separated in length from larger fish. This group can thus be followed independently of age-readings, and has shown the following average total lengths (from the anterior tip of the lower jaw with the mouth closed to the mid-point of the fork of the caudal fin).

1953	December	—	7.1 cm.
1954	June	—	8.1 cm.
1954	September	—	8.8 cm.
1954	December	—	9.0 cm.
1955	April	—	9.6 cm.
1955	June	—	10.6 cm.
1955	August	—	11.3 cm.
1955	Oct.-Nov.	—	11.8 cm.

A preliminary study of the scales and otoliths of these fish shows that at least 90% of the fish forming the above group were of the same year-class. These fish with scale ages showing an incomplete first year in December, 1953, showed 1+ years in December, 1954, and 2+ during August, 1955. In hundreds of sets, between December, 1953, and December, 1955, only three redfish were caught of a definitely more recent year-class.

The 0+ scale age-group first caught in 1953 was probably of the 1952 or the 1951 year-class since the scales of redfish are unlikely to appear in their first year.

Hydrography. In April the usual hydrographic sections on the southern part of the Grand Bank and on St. Pierre Bank were occupied by the "Investigator II."

In July and August five hydrographic sections were taken from Bonavista to the southern slope of the Grand Bank. Compared with the 1954 section there was less water below -1°C. in the Bonavista section and the lowest temperatures were not as low. In the St. John's to Flemish Cap section (Fig. 2) temperatures below

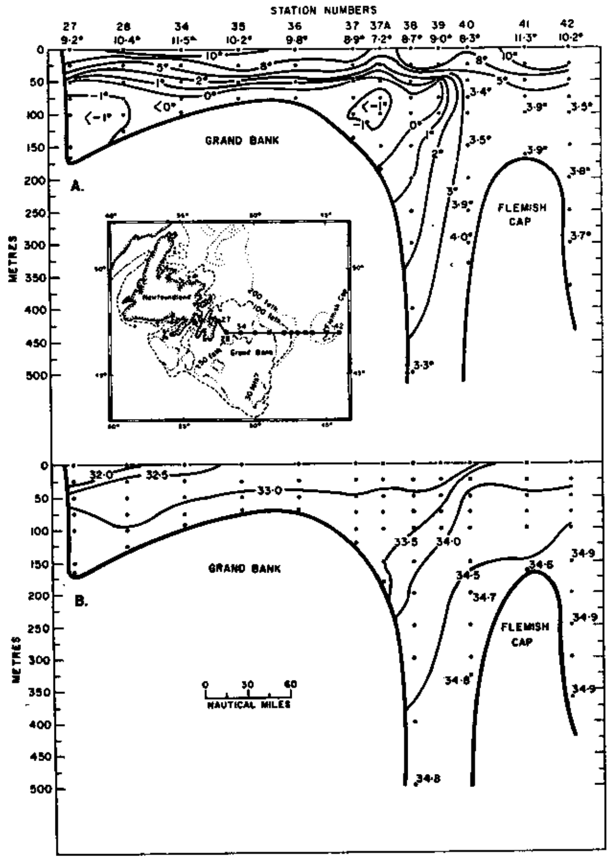


Fig. 2. **Hydrographic section, St. John's-Grand Bank-Flemish Cap; July 20-25, 1955; A—Temperature °C.; B—Salinity ‰.**

-1°C. in the Avalon Channel were not as low as in 1954 but to the east and also immediately north of the Grand Bank there was more water below 0°C. and especially on the north fringe of the bank much more below 2°C. On the southwest slope of the Grand Bank there was much more cold water from the eastern branch of the Labrador Current extending westward along the southwest slope than in 1954, reflecting the greater amounts of cold water found on the northern parts of the bank.

Bottom temperatures in August were higher on the central part of the bank and lower on the southern part of the bank than in April.

The inshore upper warm-water layer did not remain as stable and as shallow throughout the summer as in 1954, and the inshore cod, though fairly abundant, were not so abundantly available in shallow water over so long a period as in 1954.

SUBAREA 4. By W. R. MARTIN

Cod. A population dynamics study of cod from Subdivision 4T has shown that the post-war conversion from line fishing to otter trawling has adversely affected the fish stocks. The sizes of cod caught are below the optimum for maximum landings. The best size for first capture has been calculated to be about 1½ kilograms, round weight. The study has shown that even with large-mesh nets, the present intensity of fishing is sufficiently high for best use of the resource (see Fig. 3).

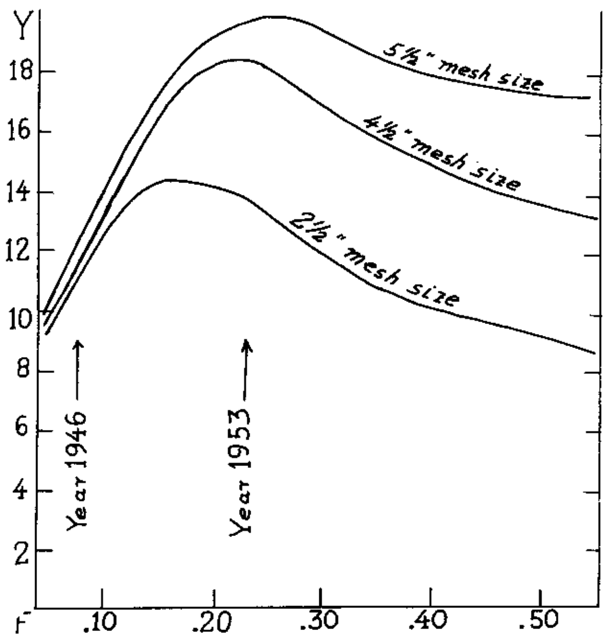


Fig. 3. **Cod, Gulf of St. Lawrence, Subdivision 4T off Northern New Brunswick. Y=yield in 1000 pounds from 10,000 half pound cod. F.=Instantaneous fishing mortality (fishing intensity). Natural mortality assumed to be .12.**

TABLE 1—SUBAREA 4 COD TAGGING EXPERIMENTS—1953 to 1955

	Number Tagged	Recovered to Dec. 31/53	Recovered Jan. 1— Dec. 31/54	Recovered Jan. 1— Dec. 31/55	Total Recovered to Dec. 31/55
1953 Lockeport—4X inshore					
Lea Hydrostatic	933	229 (25%)	91	4	324 (35%)
Yellow Petersen Disk	303	92 (30%)	70	5	167 (55%)
Red and White Petersen Disk	305	114 (37%)	78	7	199 (65%)
Monel Metal Strap	263	32 (12%)	43	3	78 (30%)
TOTAL	1,804	467 (26%)	282	19	768 (43%)
1954 Canso—4W inshore					
Lea Hydrostatic	175		45 (26%)	18	63 (36%)
Yellow Petersen Disk	178		49 (28%)	37	86 (48%)
Red and White Petersen Disk	121		27 (22%)	28	55 (45%)
TOTAL	474		121 (26%)	83	204 (43%)
1954 Louisbourg—4V inshore					
Lea Hydrostatic	318		42 (13%)	39	81 (25%)
Yellow Petersen Disk	298		52 (17%)	49	101 (34%)
Red and White Petersen Disk	194		51 (26%)	32	83 (43%)
TOTAL	810		145 (18%)	120	265 (33%)
1955 Caraquet—4T inshore					
Lea Hydrostatic	1,206			78 (6%)	
Yellow Petersen Disk	2,645			160 (6%)	
TOTAL	3,851			238 (6%)	

Cod tagging was continued in the Bay of Chaleur region of the Gulf of St. Lawrence. From June to September, 1955, 3,851 cod were tagged in this area. The tagging was done from the 55 foot M.B. *Mallotus*, and most of the fish for tagging were caught by handline. Recoveries during 1955 are compared with recoveries from other cod taggings in Table 1. The percentage of tags recovered was relatively small, and cod showed more movement than in other areas.

These tagging data are providing useful information on discreteness of stocks, growth rates and fishing mortality rates of cod.

Haddock otoliths. During 1955, the validity of the otolith method of aging Subarea 4 haddock was studied. Annual formation of one hyaline and one opaque zone was found in haddock otoliths sampled during the period 1947 to 1954. Dominant year-classes did not lose their relative importance, compared with adjacent year-classes, as they passed through the fishery. Fish from length modes, sampled as the modes moved along the length distribution scale, added one annulus per year to their otoliths. For these reasons, the majority of haddock-otolith age determinations were believed to be correct.

Mesh selection. The selective properties of cotton and nylon meshes were compared with those of manila meshes. The results of these studies are shown in Fig. 4. Nylon meshes allow cod and haddock of a larger size to escape than do cotton or manila meshes of the same internal size. Cotton in turn allows larger fish to escape than manila. For the purpose of releasing small cod and haddock, a $4\frac{1}{2}$ inch mesh manila codend is about equivalent to a $4\frac{1}{4}$ inch mesh cotton and a 4 inch mesh nylon codend.

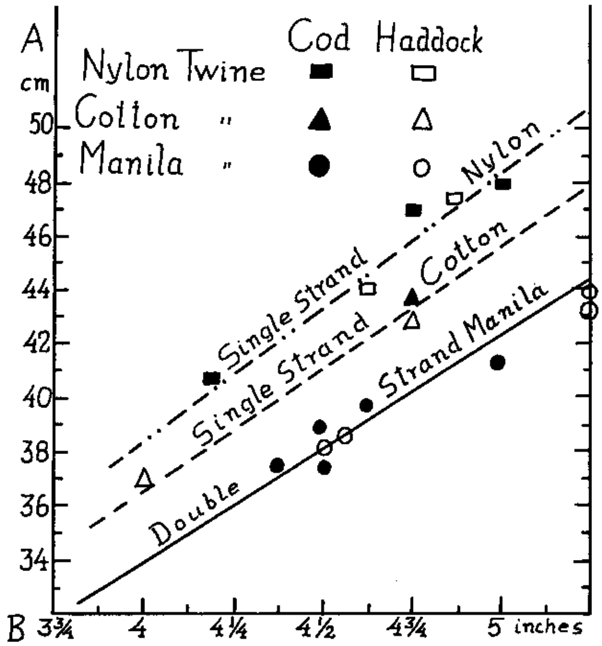


Fig. 4. Comparison of 50% selection points for cod and haddock with codends of manila, cotton and nylon strands. A—50% selection point. B—internal mesh size.

The effect of "chafing gear" (the protective material on top of some codends) on the release of small haddock was studied. When attached loosely, as specified in ICNAF mesh regulations, "chafing gear" did not affect the 50% selection point of a largemesh codend. When attached tightly, "chafing gear" reduced the 50% selection point by 3 to 4 centimetres.

Redfish. Growth and maturity of Subdivision 4T redfish were studied. Female redfish were found to grow faster, mature at a larger size (25-30 cm.), and attain a larger size than male redfish. The modal lengths of males were 35 to 36 centimetres and of females 38 to 40 centimetres. Gulf of Maine redfish are reported to mature at a smaller size and reach a smaller adult size. On the other hand, European *Sebastes marinus* are reported to mature at a much larger size and attain a much larger adult size. Maximum releases of larvae in June was also found to be intermediate between Gulf of Maine (July) and northern Europe (May).

Halibut, *Hippoglossus hippoglossus* (L.). Statistics of halibut landings were reviewed. The greatest landings have been made by the Canadian offshore fleet. Vessels fishing for halibut contributed the greatest share of these offshore landings and most of the fish were "medium" and "large" (over 6 kg.). Otter trawlers and dory vessels fishing other species in the shallow water of the same regions, took only a small portion of the total weight landed, but a large proportion of the total number of halibut landed. Growth of the small halibut was believed to more than compensate for their natural mortality. It may be possible to increase halibut landings by reducing the catches of small halibut.

Fish eggs and larvae. Analyses of collections from five cruises made during 1955 have not been completed. Distribution and abundance of planktons showed four major areas of production south of the Laurentian Channel: (a) off southwestern Nova Scotia, (b) off northeastern Nova Scotia, (c) southern Gulf of St. Lawrence, and (d) northwestern Gulf of St. Lawrence. High plankton productivity would seem to be related to the bank areas. Summer plankton including young fish were scarce in 1955 as compared with relatively large quantities present at the same time in 1954.

Hydrography. The Atlantic Oceanographic Group continued to make seasonal surveys of the Bay of Fundy, Scotian Shelf and the Gulf of St. Lawrence areas. Three cruises were made in 1955. The early summer survey was extended to the estuary of the St. Lawrence. The hydrographic section off Halifax is described in Fig. 5. The surface layer was much warmer and less saline than in the summer of 1954, especially near the coast. The minimum temperature in the cold-water layer was lower in 1955 than in 1954.

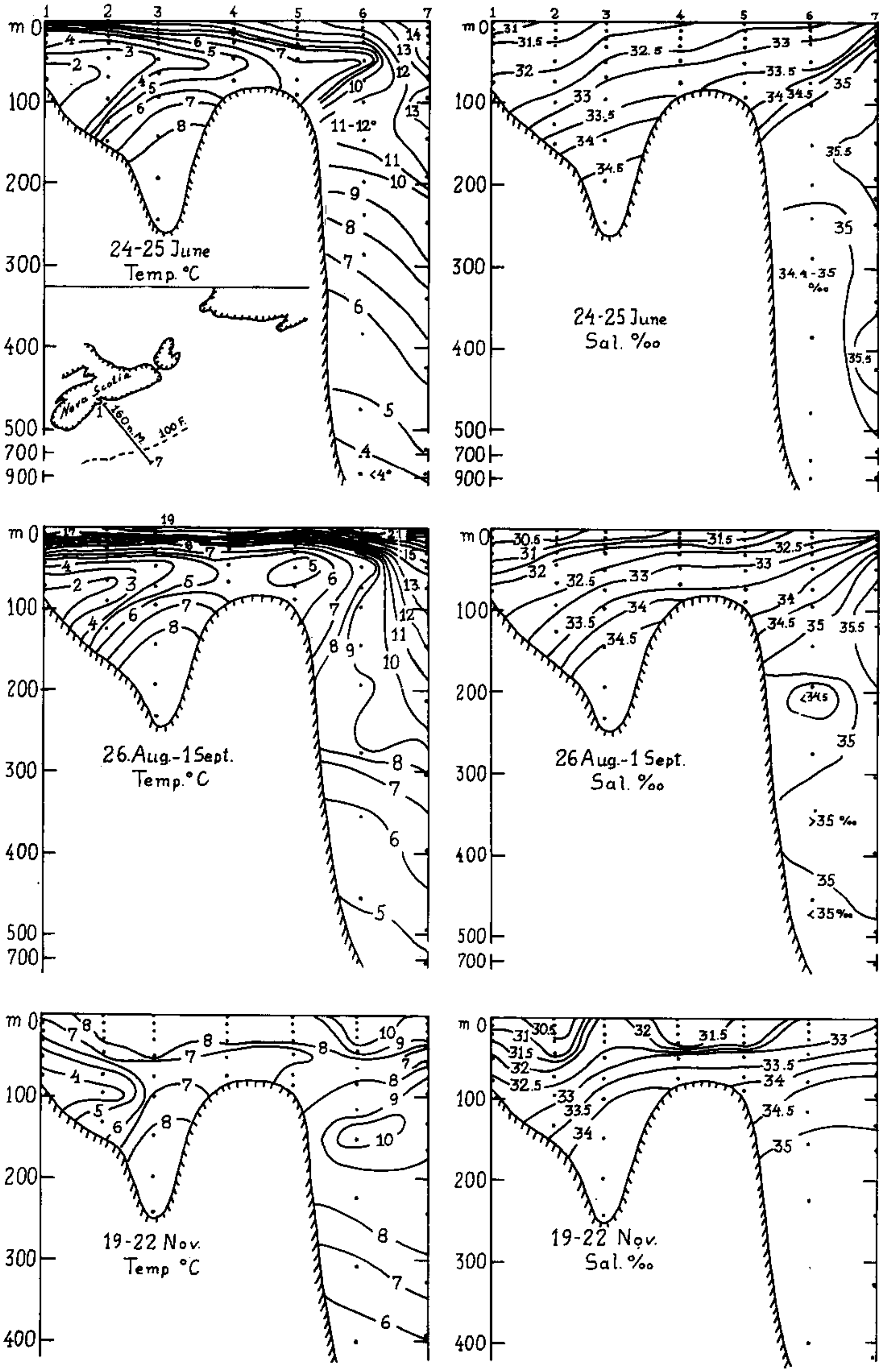


Fig. 5. Hydrographic section across the Scotian Shelf off Halifax, 1955, 24-25 June, 26 Aug.-1 Sept. and 19-22 Nov. Left—temperature, right—salinity.

Analysis of surface water temperatures at six points along the coast revealed a general decrease in 1955 as compared to the previous year. Short-term forecasting of annual mean surface water temperatures at St. Andrews, N. B., may now be done with some reliability. It is predicted that the mean temperature will decrease again in 1956. With some reservation, this downward trend from peak temperatures in 1953 applies to Subarea 4 generally.

Currents and volume transport have been calculated by dynamical methods for Cabot Strait from data collected through the years 1950-54. Great variations were found: currents were strongest in August and least in April and May. Currents were outward on the Cape Breton side and inward on the Newfoundland side.

Analysis of bottom temperatures on the Magdalen shallows (Subdivision 4T) shows that seasonal variation in bottom temperature is controlled by stratification. The thickness of the intermediate cold layer is of primary importance.

II. Danish Research Report, 1955.

(A) COD IN WEST GREENLAND COASTAL WATERS AND OFFSHORE BANKS, 1955.

BY PAUL M. HANSEN

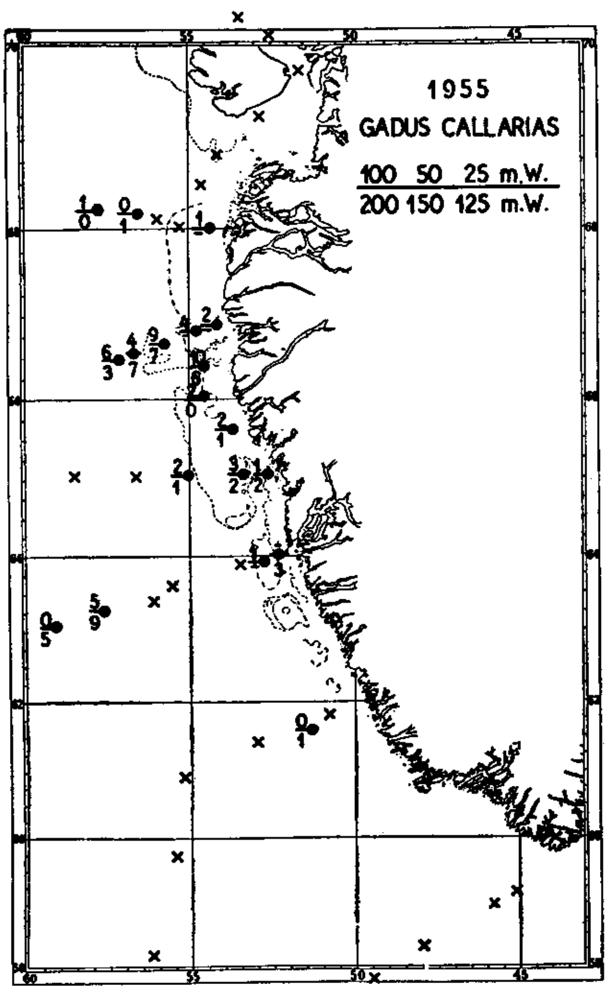


Fig. 1. Catches of cod larvae per 30 minutes haul with a 2 m. stramin bag from the "Dana," July-August 1955. Numbers in hauls with a 100-25 m. wire and with a 200-125 m. wire are shown respectively above and below the line.

1. Occurrence of cod fry.

The catches of cod, *Gadus callarias* L., larvae from the "Dana" in July with the 2m. stramin net are given in Fig. 1. The numbers were small, the largest ten per 30 minutes in a haul with 100-25 m. wire. The highest numbers were found on the southern part of Store Hellefiske Bank. The absence of cod larvae in the hauls on the two southern sections in the Davis Strait (only one larvae was taken on the Frederikshåb section) indicates that there has been no transport by the current of cod fry from the Icelandic or other spawning grounds.

Judging from the poor occurrence of cod fry the 1955 year-class will be a very poor year-class, of small importance to the fishery in the future.

2. Occurrence of small cod of the age-groups I, II and III.

Small cod were taken in rather big numbers in hauls with a fine meshed seine in several localities in coastal waters and in the fjords, especially in Godthåb, Sukkertoppen and Holsteinsborg districts, and with a shrimp trawl in a coastal locality (63°53′N, 51°28′W) at depths from 220 to 240 m. where trawling experiments have been carried out regularly during all seasons since July, 1953.

As the 1953 year-class predominated in these catches in 1955, there is reason to consider it a good year-class which will be of some importance to the fishery from 1958-59 onwards.

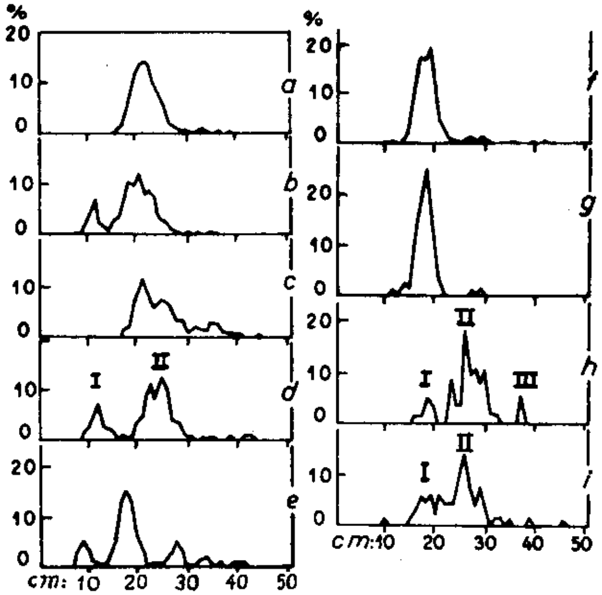


Fig. 2. Length-frequencies of small cod, age-groups I, II and III. The small letters to the right indicates the samples (see Table 1.).

The length-frequencies of small cod taken by hand-seine, pound-net and shrimp-trawl on different stations in West Greenland are given in Fig. 2 and details concerning the catches are given in Table 1. It is apparent that one single size-group between 15 and 25 to 30 cm. dominates. Otolith readings showed that this size-group corresponds with the II-group (i.e. 1953 year-class).

TABLE 1.

Sample	Position	Date	Gear	No. of Specimens
a	66°55'N 53°40'W	22/6	seine	1159
b	65°43'N 53°12'W	30/6	seine	786
c	64°19'N 50°25'W	14/6	pound net	420
d	60°36'N 45°14'W	23/8	seine	181 - (ages
e	63°53'N 51°28'W	20/1	shrimptrawl	157 deter-
f	,, ,,	19/2	,, ,,	698 mined)
g	,, ,,	4/4	,, ,,	92
h	,, ,,	26/11	,, ,,	53) (ages
i	,, ,,	20/12	,, ,,	63) deter- mined)

3. The age composition of the stock of cod in commercial catches.

a. Offshore banks.

As in previous years a large number of cod otoliths with length measurements have been collected from catches taken by hand line from the "Dana" on the banks, from long line by the "Adolf Jensen" and from Greenland fishing boats in coastal waters and fjords. A total of 6,058 otoliths have been used for age determinations; 922 from the "Dana", 2,638 from the "Adolf Jensen" and 2,498 from the Greenlanders' catches.

The age analyses of catches from the offshore banks are given together with average lengths of males and females in Table 2. In Fig. 3 the age compositions of seven catches from the banks (left) and the corresponding length measurements in 5 cm. groups (right) are given. Samples 3 and 6 are from long line catches of the "Adolf Jensen." The remaining samples are from catches taken by hand line from the "Dana."

TABLE 2. Cod from West Greenland Banks 1955. Frequency percentages and mean lengths of males and females.

Year-class	Age group	1 Store Hellefiske Bank 68°04'N 54°54'W 1/8. 27-30 m.			2 Store Hellefiske Bank 66°52N 54°30'W 2/8. 51m., 3.8°C.			3 Off Holsteinsborg 66°59'N 54°08'W 27/7 and 2/8.			4 Lille Hellefiske Bank 65°01'N 54°21'W 3/8. 34 m., 2.6°C.		
		%	M. cm	F.	%	M. cm	F.	%	M. cm	F.	%	M. cm	F.
1951	IV	7.8	44.6	43.5	5.1	46.1	44.7	0.3	—	38.0	2.3	47.0	47.3
1950	V	47.5	54.2	55.0	32.3	56.3	54.9	11.9	54.6	56.8	19.8	58.0	54.9
1949	VI	2.8	63.2	—	2.1	66.0	67.0	2.0	61.7	60.3	3.0	66.4	60.0
1948	VII	10.6	63.9	64.4	12.8	68.1	67.1	9.2	65.8	67.3	13.7	65.5	66.5
1947	VIII	26.3	67.3	70.5	36.9	71.9	71.4	35.9	68.2	70.4	46.8	70.6	73.2
1946	IX	0.6	68.0	—	3.1	70.3	78.5	3.1	66.3	73.2	1.1	72.0	78.0
1945	X	2.2	71.0	76.0	3.6	76.5	88.3	7.1	74.2	75.5	4.9	76.6	77.8
1944	XI	—	—	—	0.5	76.0	—	5.1	80.3	78.3	1.5	75.0	85.3
1943	XII	—	—	—	—	—	—	1.4	81.0	78.0	1.9	78.7	83.5
1942	XIII	0.6	83.0	—	2.6	91.0	85.0	13.2	79.1	82.4	4.9	79.3	81.8
1941	XIV	0.6	—	85.0	—	—	—	0.7	73.0	82.0	—	—	—
1940	XV	—	—	—	1.0	85.0	—	4.7	82.3	87.5	—	—	—
1939	XVI	—	—	—	—	—	—	0.3	—	95.0	—	—	—
1938	XVII	—	—	—	—	—	—	0.7	90.0	106.0	—	—	—
1937	XVIII	—	—	—	—	—	—	—	—	—	—	—	—
1936	XIX	0.6	—	88.0	—	—	—	3.1	80.3	89.8	—	—	—
1935	XX	—	—	—	—	—	—	—	—	—	—	—	—
1934	XXI	—	—	—	—	—	—	1.0	104.0	88.3	—	—	—
Total		179			195			295			263		

Year-class	Age-group	5 Fylla Bank 64°10'N 52°48'W 4/8. 45 m., 2.0°C.			6 Fylla Bank 63°53'N 53°22'W 31/3. 200 m., 1.1°C.			7 Dana Bank 62°45'N 51°09'W 9/8. 55 m., 1.1°C.		
		%	M. cm	F.	%	M. cm	F.	%	M. cm	F.
1951	IV	—	—	—	0.3	—	41.0	—	—	—
1950	V	4.8	63.0	58.4	32.1	54.6	54.1	7.0	52.3	58.0
1949	VI	5.2	64.0	65.6	11.2	58.4	59.5	3.5	63.5	—
1948	VII	14.4	66.0	67.6	14.7	63.1	63.1	10.5	62.3	66.3
1947	VIII	57.7	71.5	72.6	37.2	66.1	68.7	52.6	66.6	72.4
1946	IX	5.2	75.3	79.5	1.2	68.0	79.5	3.5	65.0	79.0
1945	X	8.3	79.8	76.0	1.6	78.0	77.0	15.8	70.0	74.0
1944	XI	1.3	79.0	90.0	0.3	78.0	—	—	—	—
1943	XII	0.9	83.0	90.0	0.3	—	77.0	1.8	73.0	—
1942	XIII	1.3	—	91.7	0.3	74.0	—	3.5	74.0	77.0
1941	XIV	—	—	—	0.3	—	82.0	—	—	—
1940	XV	0.4	—	75.0	—	—	—	—	—	—
1939	XVI	—	—	—	0.3	—	78.0	—	—	—
1938	XVII	—	—	—	—	—	—	—	—	—
1937	XVIII	—	—	—	—	—	—	—	—	—
1936	XIX	0.4	—	100.0	—	—	—	—	—	—
1935	XX	—	—	—	—	—	—	—	—	—
1934	XXI	—	—	—	—	—	—	1.8	—	89.0
		228			311			57		

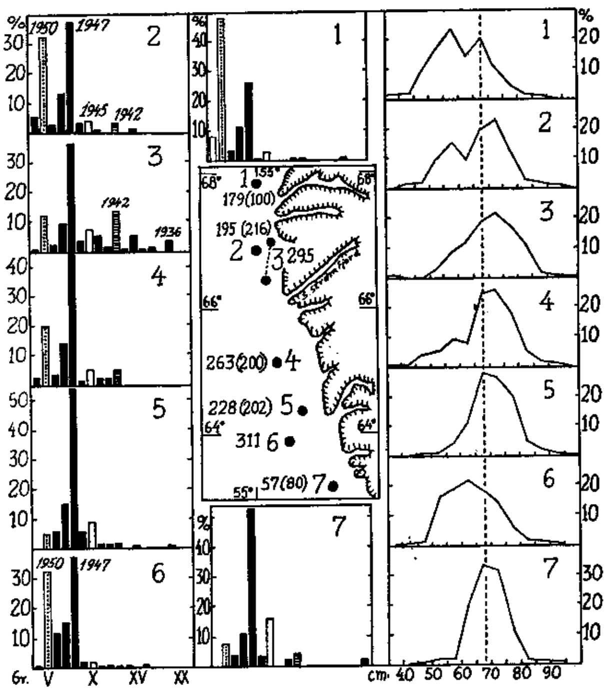


Fig. 3. Percentage age distribution (left) and length measurements by 5 cm. groups (right) of cod caught on Greenland Banks, 1955. Off each station are given no. of specimens investigated and in brackets of cod tagged.

Excepting the northernmost of the samples (No. 1), the 1947 year-class dominates in all the catches. The 1950 year-class was the second largest dominating in the catch on the northern part of Store Hellefiske Bank (47.5%). In 1954 it amounted to 25-30 percent of the catches on the same place and date. The higher percentages in the 1955 catches result from the growth of the individuals of the 1950 year-class in the interjacent year. In 1955 the mean length of cod of the 1950 year-class was 55.8 cm. and it is by that length cod generally enter the commercial catches. The 1950 year-class was also taken in rather large numbers, 32.3% (sample No. 2), on the southern part of Store Hellefiske Bank. In sample 3 it was only about 12% because this sample was taken on a long-line with big halibut hooks. In samples 5 and 7 cod of the 1950 year-class occur in very small numbers while it was very strongly represented (32.1%) in sample 6, a long-line catch in the early spring from Fylla Bank. Year-classes older than 1947, for instance the former rich 1945 and 1942 year-classes, were only poor in the catches. Only in the southernmost of the seven samples from the Offshore Banks (No. 7) does the 1945 year-class amount to more than 10% (viz. 15%). The 1942 year-class is without importance in all samples except 3, the sample taken by long-line with halibut hooks, and its occurrence must be ascribed to the big sized hooks which chiefly catch large cod.

The graphs showing length measurements of cod in 5 cm. groups given in Figure 3 agree with the corresponding age analyses. The two peaks on the graphs (55-60 cm. and 65-75 cm.) represent the predominating 1950 and 1947 year-classes.

According to the investigations only two year-classes have been of importance on the banks in 1955. Most important to the fishery on the banks was the 1947 year-class which in 1955 had a mean length between about 68-72 cm. corresponding to a mean weight of about 3-3.5 kg. The next important year-class is the 1950 year-class, but the small size of its individuals (mean length about 54-58 cm. and a mean weight of about 1.4-1.7 kg.) undoubtedly means that it has been of very little value to the commercial fishery.

b. Coastal waters and fjords.

A total of 4,730 otoliths from 23 samples of cod from coastal waters and fjords were read and the data are given in Table 3 (Fig. 4). Most

TABLE 3. Cod from coastal waters and fjords of West Greenland 1955. Frequency percenteges

Year-class	Age-group	8 Sep.	9 Sep.-Oct.	10 Aug.-Sep.	11 Aug.-Sep.	12 July	13 June-July	14 Aug.	15 Sep.	16 May	17 June	18 Feb.-Apr.	19 Sep.	20 Sep.
1951	IV	—	—	–	—	—	1.5	—	—	15.7	4.4	0.1	7.2	24.7
1950	V	—	—	0.5	21.2	4.1	**46.2**	3.9	1.6	**31.0**	**34.2**	2.0	10.8	**47.8**
1949	VI	—	—	1.0	4.9	—	18.1	1.3	—	8.5	7.6	2.0	7.2	8.0
1948	VII	—	—	2.6	10.3	6.1	12.1	5.2	2.4	5.1	3.2	0.7	3.6	1.8
1947	VIII	15.5	7.5	**52.3**	**55.6**	**41.8**	21.6	**35.0**	**22.8**	10.9	19.6	6.8	18.0	10.6
1946	IX	2.1	1.3	2.1	1.1	1.0	0.5	1.3	1.6	1.0	2.5	0.9	1.8	—
1945	X	12.4	11.3	15.0	3.7	9.2	—	10.4	11.0	8.2	12.7	12.6	**33.3**	—
1944	XI	3.1	2.5	2.6	0.6	5.1	—	3.9	2.4	0.3	1.3	1.7	2.7	—
1943	XII	7.7	6.3	3.1	1.1	6.1	—	5.2	3.1	0.3	1.3	3.6	4.5	1.8
1942	XIII	**33.0**	**37.5**	13.0	1.4	12.2	—	**23.4**	**33.1**	4.1	3.8	17.8	8.1	2.7
1941	XIV	6.7	7.5	2.1	—	3.1	—	1.3	3.1	1.0	—	2.1	—	0.9
1940	XV	7.7	7.5	3.1	—	7.1	—	6.5	11.8	7.5	5.1	**24.0**	2.7	0.9
1939	XVI	3.6	1.3	—	—	1.0	—	—	0.8	0.3	0.6	3.1	—	—
1938	XVII	—	1.3	0.5	—	—	—	—	—	5.1	2.5	13.7	—	—
1937	XVIII	0.5	2.5	0.5	—	—	—	—	—	—	—	1.6	—	—
1936	XIX	4.6	3.8	1.6	—	1.0	—	—	2.4	0.3	—	5.9	—	0.9
1935	XX	—	—	—	—	—	—	—	—	0.3	—	0.3	—	—
1934	XXI	3.1	5.0	—	—	2.0	—	2.6	3.9	—	1.3	0.8	—	—
1933	XXII	—	3.8	—	—	—	—	—	—	—	—	—	—	—
1932	XXIII	—	1.3	—	—	—	—	—	—	—	—	—	—	—
Total		194	80	193	788	98	199	77	127	293	158	745	111	113

Year-class	Age-group	21 May	22 Oct.	23 July-Aug.	24 Oct.	25 Aug.-Sep.	26 Sep.	27 Apr.-May	28 June	29 Aug.	30 Oct.
1951	IV	2.3	11.5	1.0	1.0	—	—	—	7.9	3.0	4.6
1950	V	6.8	36.8	24.0	8.5	—	4.0	5.7	44.4	44.6	18.3
1949	VI	3.4	11.5	40.5	14.0	—	2.7	5.7	22.2	32.6	15.2
1948	VII	1.1	4.6	6.0	4.5	—	1.3	6.5	0.8	5.1	4.1
1947	VIII	8.0	25.3	19.5	37.0	34.9	22.7	18.7	18.3	12.1	38.1
1946	IX	1.1	1.1	1.0	0.5	—	1.3	—	—	—	1.0
1945	X	6.8	6.9	3.5	12.5	22.9	32.0	49.6	5.6	2.5	13.2
1944	XI	2.3	—	0.5	—	1.2	5.3	2.4	—	—	1.0
1943	XII	—	1.1	1.5	3.0	1.2	4.0	—	—	—	—
1942	XIII	17.0	—	1.5	8.0	18.1	14.7	9.8	—	—	1.5
1941	XIV	2.3	—	—	0.5	2.4	1.3	—	—	—	—
1940	XV	36.4	1.1	0.5	2.0	8.4	1.3	1.6	—	—	2.0
1939	XVI	3.4	—	—	1.5	1.2	4.0	—	—	—	1.0
1938	XVII	5.7	—	—	2.0	3.6	1.3	—	—	—	—
1937	XVIII	—	—	—	0.5	—	—	—	—	—	—
1936	XIX	2.3	—	—	2.5	3.6	1.3	—	—	—	—
1935	XX	—	—	—	0.5	—	—	—	—	—	—
1934	XXI	1.1	—	0.5	1.5	2.4	2.7	—	—	—	—
1933	XXII	—	—	—	—	—	—	—	—	—	—
1932	XXIII	—	—	—	—	—	—	—	—	—	—
Total		88	87	200	200	83	75	123	125	199	197

of the samples were taken by long-line with cod hooks, samples 12, 14 and 25 by long-lines with two-thirds cod hooks and one-third halibut hooks, samples 16 and 17 from pound-net catches and sample 22 from a shrimp-trawl catch. In the two samples (8 and 9) from Subdivision 1A the 1942 (XIII) year-class predominates and the two old year-classes 1934 (XXI) and 1936 (XIX) are present in greater numbers than in other subdivisions. It is a common phenomenon that old rich year-classes occur in the catches in Subdivision 1A several years after they have decreased and nearly disappeared from the catches in the southern subdivisions. In the samples from Subdivisions 1B and 1C (10-15) the rich 1947 year-class predominates except in sample 13 where the 1950 year-class predominates with 46.2%. The samples from Subdivision 1D are from the interior part of the Godthåb fjord (18-19), from the coastal area close to the entrance of this fjord (20-22) and from the interior part of the Ameralik Fjord (16-17). The samples from the Ameralik Fjord are from pound-net catches so the age composition shows a great number of small young cod with predominance of the 1950 year-class. In the samples from Godthåb Fjord in winter and in early spring (18 and 21), just before and during the spawning period, cod of the 1940 year-class (age group XV)and older age-groups make up 49%. The 1940 year-class predominates, with the 1942 year-class second. Godthåb Fjord is the only locality where the 1940 year-class has been of importance during a period of years. The youngest year-classes,

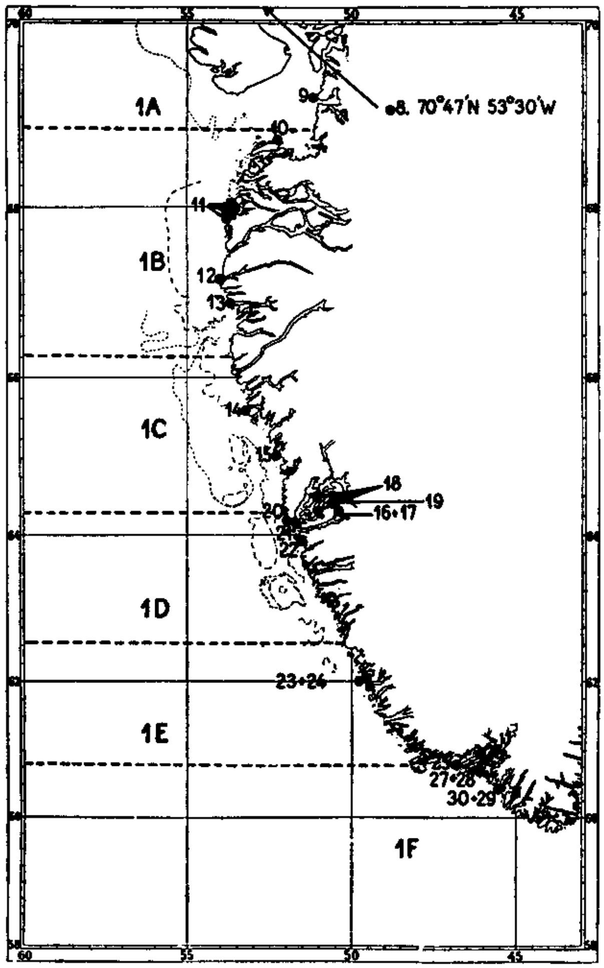


Fig. 4. Localities from the coastal waters and fjords where otolith samples have been collected in 1955 for age analyses. The numbers correspond with those given in Table 3.

younger than eight years, occur in small numbers especially in sample 18. The sample from Godthåb Fjord in September (19) is quite different from the samples taken in winter and in spring. Of the oldest age-groups the XV (1940) is the only one represented (with 2.7%). The 1945 year-class predominates with 33.3%. The two samples from the coastal area in September and October (20 and 22) are very similar to each other with the 1950 year-class predominating and the 1947 year-class as the second largest. In Subdivision 1E only two samples have been collected, in July-August and October. In sample 23 the 1949 year-class predominates with 40.5%, while the 1950 year-class is the second best. In sample 24 the 1947 year-class predominates with 37%, next the 1949 year-class with 14%. The output of the commercial fishery in Subdivision 1E has consisted mainly of small cod which seems to indicate that the 1949 and 1950 year-classes have been very rich. The pound-net fishery is however very important in this subdivision in spring and early summer.

Samples 25-30 are from Subdivision 1F. They are very different according to age composition. The 1950 and 1949 year-classes predominate in 28 and 29 and are represented as the second and third largest in sample 30. With the occurrence of rather large quantities of small sized cod in the commercial catches it seems that these young year-classes have been of similar importance to the fishery as in Subdivision 1E. However, unlike 1E, there is no pound-net fishery in Subdivision 1F. The 1945 year-class which until 1954 highly predominated the catches in Subdivision 1F, predominates only in two samples (26 and 27) in 1955, and the 1947 year-class which in previous years has been of much less importance than in the northern subdivisions predominates in two samples (25 and 30). Year-classes older than the 1945 year-class were very poorly represented in the samples except samples 25 and 26.

4. Tagging experiments.

2,486 cod were tagged in 1955; 798 on the offshore banks from the "Dana" and 1,688 in coastal waters and fjords from the "Adolf Jensen," the "Tornaq" and the "Immanuel."

604 recaptures were reported in 1955. The distribution of the different years' tagging returns is given in Table 4. 571 recaptures have been

TABLE 4. Recaptures off Greenland (Gr.) and off Iceland (Ic.) from 1955 of age-determined cod tagged in 1949-55.

Year-	Age-	1949		1950		1951		1952		1953		1954		1955		Total			
class	group	Gr.	Ic.	Gr.	Ic.	Gr.	Ic.	Gr.	Ic.	Gr.	Ic.	Gr.	Ic.	Gr.	Ic.	Gr.	%[1]	%[2]	Ic.
1934	XXI	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.3	0.5	—
1935	XX	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1936	XIX	—	—	—	—	—	—	2	—	—	—	2	—	1	—	5	1.4	1.8	—
1937	XVIII	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1938	XVII	—	—	—	—	—	—	—	—	—	—	4	—	3	—	7	2.0	1.8	—
1939	XVI	—	—	—	—	—	—	1	—	—	—	3	—	—	—	4	1.2	1.8	—
1940	XV	1	—	—	—	1	—	6	—	2	—	19	—	10	—	39	11.2	13.1	—
1941	XIV	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—
1942	XIII	1	—	1	—	2	—	6	1	3	—	19	1	3	—	35	10.1	14.5	2
1943	XII	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.3	0.5	—
1944	XI	—	—	—	—	—	—	2	—	—	—	3	—	—	—	5	1.4	2.2	—
1945	X	1	1	1	—	1	3	7	6	8	5	22	6	4	—	44	12.7	18.1	21
1946	IX	—	—	—	—	—	—	—	1	—	—	2	—	—	—	2	0.6	0.9	1
1947	VIII	—	—	—	—	1	—	7	—	13	—	57	3[3]	16	—	94	27.1	35.3	3[3]
1948	VII	—	—	—	—	1	—	1	—	1	—	4	—	5	—	12	3.5	3.2	—
1949	VI	—	—	—	—	—	—	—	—	1	—	3	—	11	—	15	4.3	1.8	—
1950	V	—	—	—	—	—	—	—	—	1	—	9	—	52	—	62	17.9	4.5	—
1951	IV	—	—	—	—	—	—	—	—	—	—	—	—	18	—	18	5.2	—	—
1952	III	—	—	—	—	—	—	—	—	—	—	—	—	3	—	3	0.9	—	—
??		1	1	4	1	5	2	29	1	39	1	124	—	22	—	224			6
Total		4	2	6	1	11	5	61	9	68	6	273	10[3]	148	—	571			33[3]

(1) % of age-determinated cod only. (2) excluding 1955. (3) Including one recaptured in the Barents Sea.

taken in West Greenland waters, 32 in Iceland waters and 1 in the Barents Sea. In addition one has been reported from the Newfoundland area taken by a Portuguese vessel. This remarkable recapture has not been confirmed hitherto, but it is made probable by another recapture of a tagged Greenland cod from the same area in 1954. The latter recapture which was reported and confirmed in 1955, was a cod tagged off Sydproeven, Subdivision 1F, September 20, 1951, recaptured by a Newfoundland trawler in Conception Bay, Newfoundland, Subdivision 3L, November 20, 1954. Its length when tagged was 63cm. and it belonged probably to the 1945 year-class, and was thus 9 years old when recaptured. This is the first reported recapture of a tagged Greenland cod from the Newfoundland area. The cod recaptured in the Barents Sea was tagged off Nanortalik, 60°08'N, 45°28'W, Subdivision 1F, September 9, 1954. The tag (plastic) was found when the cod was landed by a German trawler. It was reported that the fish must have been taken off Röst or Malangen or on the Skolpen Bank in the Barents Sea in December 1955, and had then been about 15 months in the sea between tagging and recapture. It was a male eight years old, 1947 year-class, and had just reached maturity. This is the second cod tagged in Greenland and recaptured in the Barents Sea in the last two years. This year, 1956, another remarkable recapture was reported by a German trawler on the Anton Dohrn Bank between East Greenland 65°45'N 30°00'W, February 7, 1956. The cod was tagged on 60°14'N, 45°31'W, September 17, 1953. It was a male, 64 cm. when tagged and 73.5 cm. when recaptured. It belonged to the 1945 year-class and had reached maturity when 9 years old. All these recaptures, two from the Barents Sea, two from Newfoundland and one from the Anton Dohrn Bank seem to indicate for the recent years a more dispersed emigration of cod from the Greenland area.

Among the 32 cod recaptured in Iceland waters, 22 were tagged in Subdivision 1F, two on the Dana Bank, four on Fylla Bank and one on each of: Fiskenaes Bank, Banana Bank, Lille Hellefiske Bank and Store Hellefiske Bank.

There have been many long migrations of cod in the Greenland area itself both northwards and southwards. Of special interest is a comparatively large number of migrations from the coastal and from the fjord area to the offshore banks, with none from the offshore banks to the coastal waters and fjords. It seems that the stock of cod on the banks is recruited to a high degree from cod which have grown up in the coastal waters and in the fjords.

TABLE 5

Locality of tagging (1955 taggings omitted)	Locality of recapture: Offshore banks	Coastal waters	Fjords	Iceland	Barents	?	(Numbers in ( ) give the stationary cod) Total
Offshore banks	214(69)	2	—	9	—	—	225
Coastal waters	39	32(17)	16	22	1	1	111
Fjords	14	16	87(18)	1	—	2	120

The frequencies of year-classes (age groups) are given in Table 4. Otoliths from a total of 324 recaptured cod have been collected for age determinations. As in 1954, the great majority of the cod recaptured in Iceland waters belonged to the 1945 year-class (X-age group). The 1947 year-class (Gr. VIII) gave two recaptures off Iceland and one from the Barents Sea. Thus the 1947 year-class now has reached maturity and some of its individuals have emigrated to distant spawning grounds. It will be interesting to see if the emigration of this rich year-class will be continued to a higher degree in the coming years.

The age frequencies among the recaptures from Greenland waters show a predominance of the 1947 year-class which was to be expected. The 1950 year-class comes as the second best and the 1945, 1942 and 1940 year-classes are nearly equally represented. The comparatively strong representation of the latter year-class is due to the rather large number of recaptures from the Godthåb Fjord, the only locality where cod of the 1940 year-class occur in large numbers.

In Table 6 the numbers of recaptures reported from the different nations are given. As in 1953 and 1954, the largest numbers of recaptures have been reported from Portuguese and Greenland fishermen. Portugal reported no less than 259 recaptures from the West Greenland area. This must be due to the excellent system of organization Portugal has developed in collection of information about recaptures of tagged cod. It would be desirable if all nations which carry out fishery in West Greenland waters could organize the important collection of tags and of data on recaptures in such a way that the full value of the tagging experiments can be achieved. As the situation is now, it must be feared that many fishermen keep the tags from recaptured cod as souvenirs or amulets, or throw them away.

TABLE 6

Recaptures from 1955

	Greenland	Iceland	Barents Sea
Greenland	271	—	—
Faroe Islands	7	—	—
Norway	16	—	—
Iceland	7	27	—
United Kingdom	2	1	—
France	4	—	—
Germany	4	4	1
Portugal	259	—	—
Spain	1	—	—
Total	571	32	1

(B) HYDROGRAPHIC CONDITIONS IN THE EASTERN PART OF LABRADOR SEA AND DAVIS STRAIT, 1955.

BY FREDE HERMANN

During July, 1955 the Danish R/V "Dana" worked the hydrographic stations shown in Fig. 5. The hydrographic conditions of the Sections I-VI are shown in the attached Fig. 7-12; the conditions of the section Cape Farvel-Hamilton Inlet Bank are shown in Fig. 14 and 15.

The ice conditions in 1955 were unusually severe at West Greenland. Great quantities of heavy "Storis" were carried by the East Greenland Current round Cape Farewell and up along the west coast where in July it was found as far north as Fiskenaes Bank. Owing to the ice conditions the easternmost stations of the Cape Farewell and Frederikshåb sections could not be taken.

Fig. 5 gives the temperature distribution at 50m and shows the location of sections I to VI, the section Kap Farvel-Hamilton Inlet Bank, and some additional hydrographic stations worked between the sections. As could be expected from the distribution of the ice the Arctic component of the West Greenland Current was strongly developed and caused negative water temperatures as far north as west of Fyllas Bank and low temperatures over the banks south of Fyllas Bank.

Over the shallow part of Fyllas Bank the temperature was slightly below normal and on the western slope considerably below normal. Over Lille Hellefiske Bank and Store Hellefiske Bank the conditions were about normal.

The Atlantic component of the West Greenland Current, the Irminger current, was also well developed off the middle part of West Greenland, but its core was situated deeper and further west-

Fig. 5. Temperature distribution at 50 metres depth, and location of sections, July, 1955.

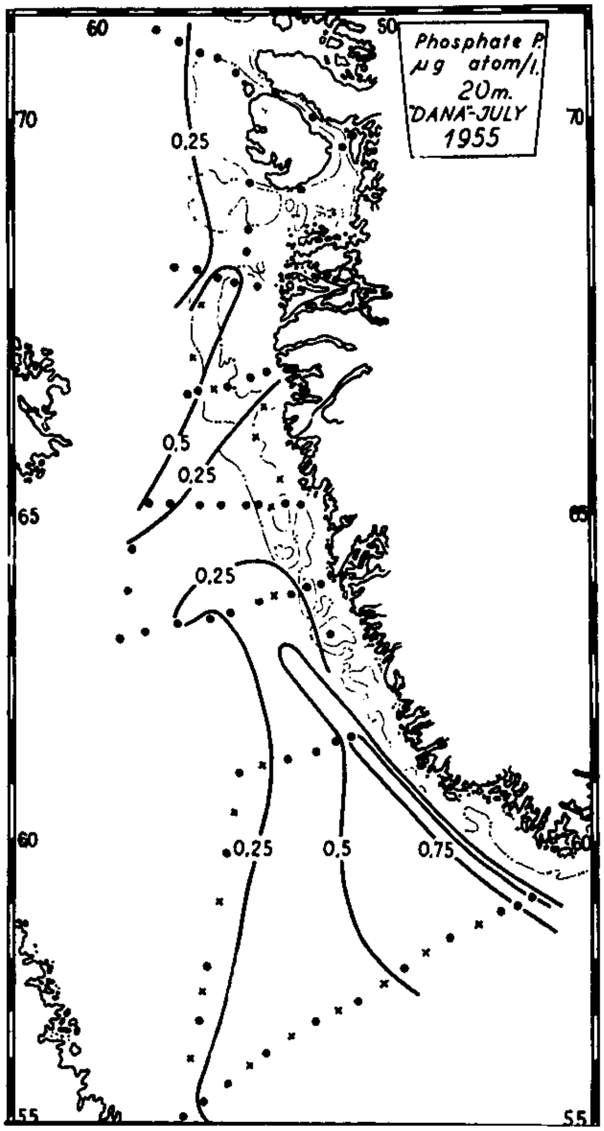


Fig. 6. **Distribution of Phosphate at 20 metres, July, 1955.**

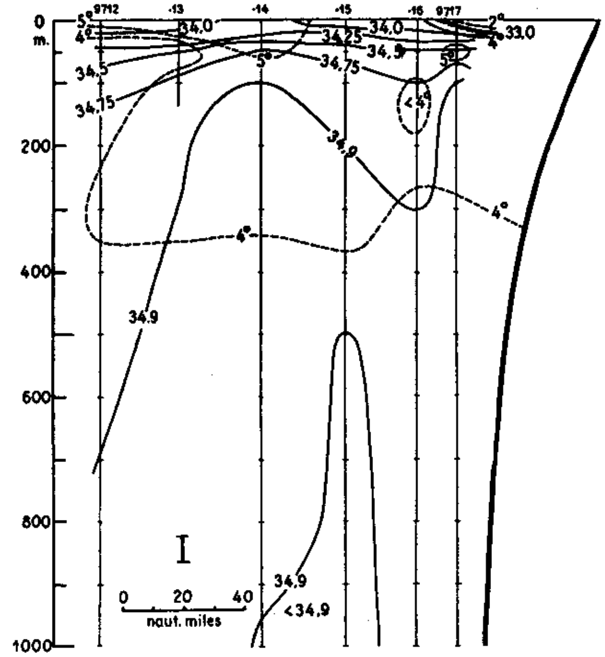


Fig. 7. **Section I: off Frederikshaab, 14th to 15th July, 1955.**

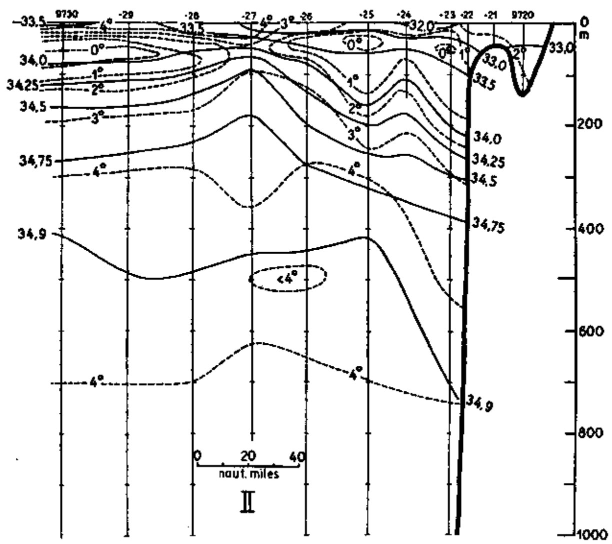


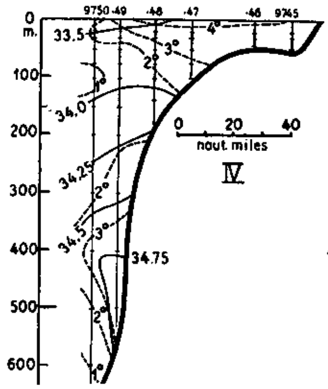
Fig. 8. **Section II: across Fylla Bank, 20th to 22nd July, 1955.**

ward from the bank than usual. Consequently it had little influence on the conditions on the banks. It is remarkable that higher temperatures were found in section III in this warm undercurrent than in the more southerly Fyllas Bank section (II). As, furthermore, this current does not seem to be so well developed in the incomplete Frederikshåb section (I), there is reason to believe that the warm current was decreasing in strength during the time of observation.

Phosphate determinations were carried out for the upper 100 metres and Figure 6 gives the distribution of phosphate at 20 metres. As in the previous years a maximum of phosphate was found off the western slope of the banks. In the northernmost part of the area higher concentrations than usual were found.

Observations from M/K "Adolf Jensen" showed that the temperature over the shallow part of Fyllas Bank on 31st March was as low as 0°.7 and on 11th May had increased to 0°.4 over the bottom.

In the entrance of Godthåb Fjord position 64°07'N-51°53'W a hydrographic station was worked from M/K "Adolf Jensen" throughout the year as often as possible. These observations are of more than local interest as it is believed that many of the features in the variation of temperature are representative of those for the middle part of the West Greenland area. The maximum bottom temperature (Fig. 13) is reached as late as Nov.-Dec. due to the influence of the warm Irminger Current. The maximum bottom temperature was higher in 1953 than in 1954. In March the winter cooling reached the bottom and nearly homothermous water of -0°.5 was found both in 1954 and 1955.



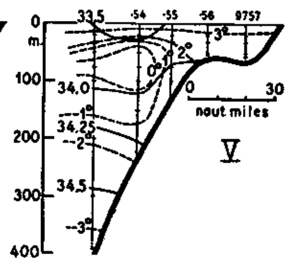


Fig. 10. (left) Section IV: across Store Hellefiske Bank, 24th to 25th July, 1955.

Fig. 11. (right) Section V: off Egedesminde, 25th to 26th July, 1955.

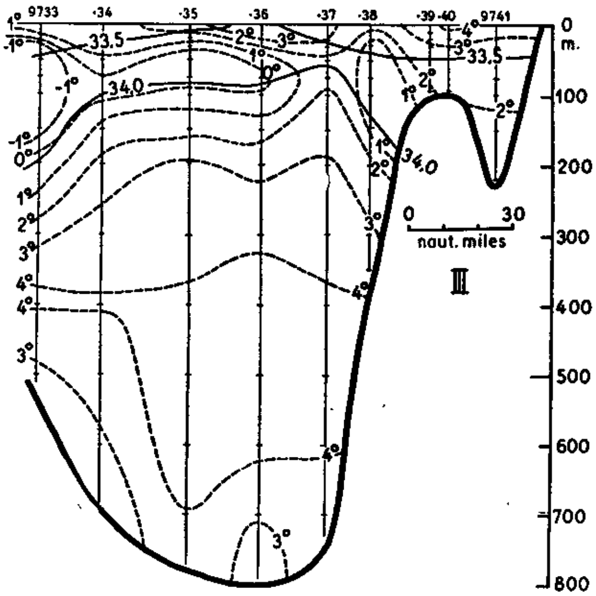


Fig. 9. Section III: across Little Hellefiske Bank, 22nd, 23rd July, 1955.

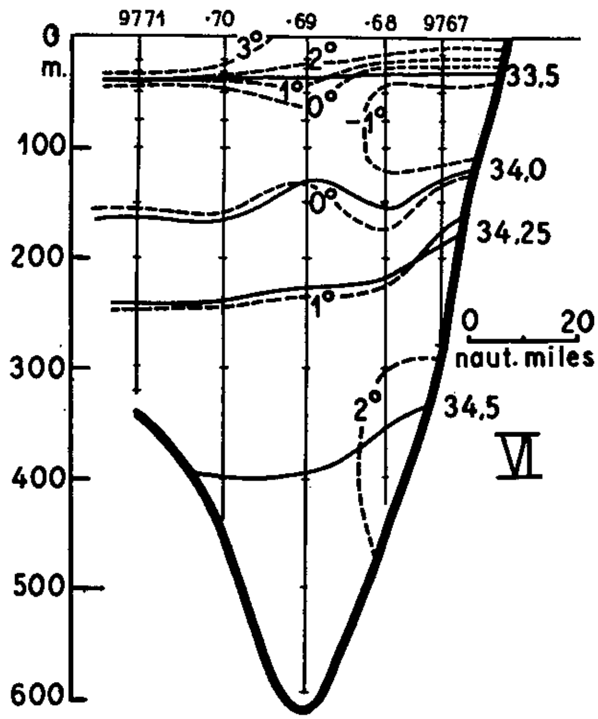


Fig. 12. Section VI: off Hareoe, 30th July, 1955.

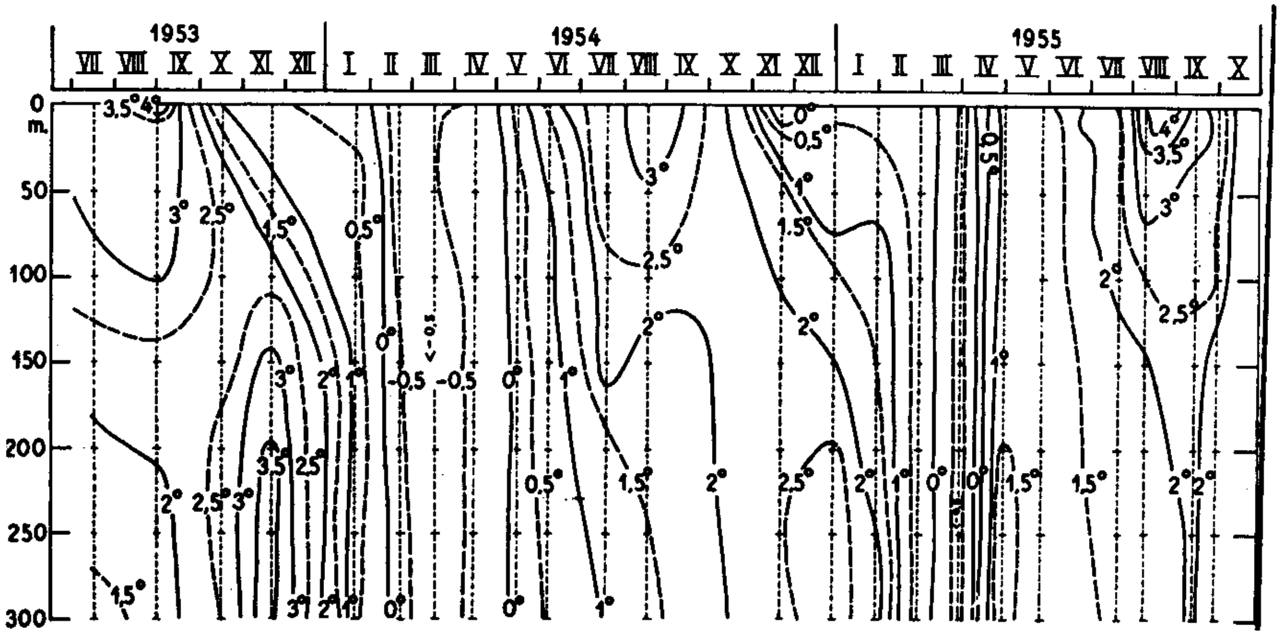


Fig. 13. Variation of temperature in the entrance of Godthaabfjord, July 1953 to October, 1955.

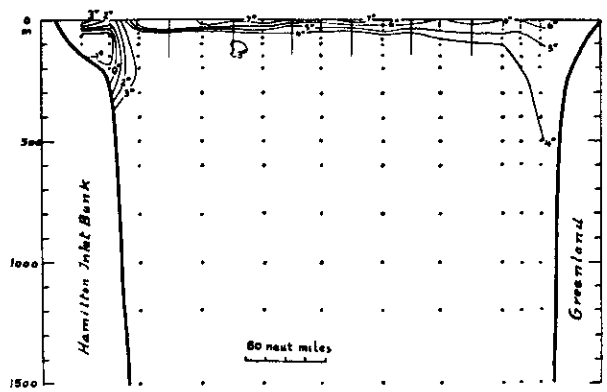


Fig. 14. Section Kap Farvel-Hamilton Inlet Bank, 9-12 July, 1955. Temperature °C.

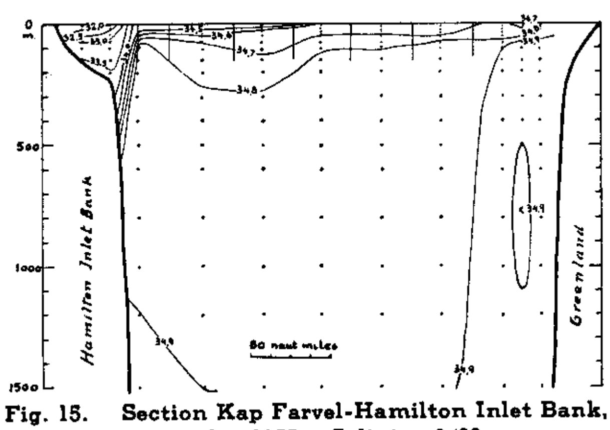


Fig. 15. Section Kap Farvel-Hamilton Inlet Bank, 9-12 July, 1955. Salinity 0/00.

(c) SECTIONS FAROES TO EAST GREENLAND AND CAPE FAREWELL TO WEST IRELAND.

BY FREDE HERMANN

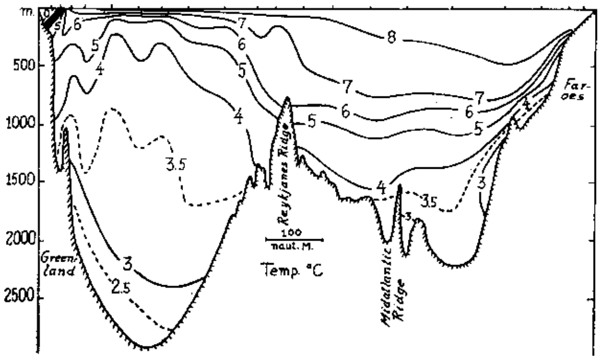


Fig. 16A. Transatlantic Section along 62°N. from the Faroes (right) to East-Greenland (left). R. V. "Dana" 1-7 July, 1955. Temperature °C. The stations are marked along the surface line.

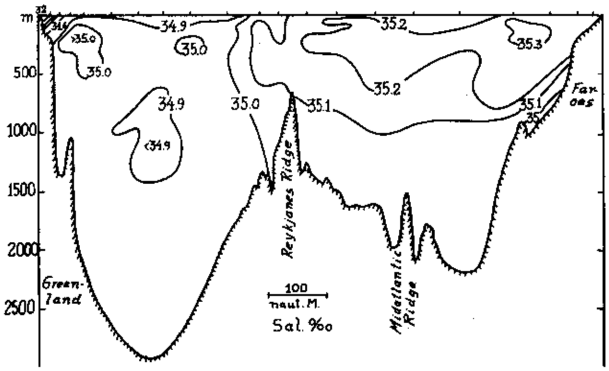


Fig. 16B. Same Section as Fig. 16A. Salinity 0/00.

Two transatlantic sections were worked from R/V "Dana," the section along 62°N from the Faroes to East Greenland from 1 to 7 July (Fig. 16) and from Cape Farewell to Ireland from 13 to 21 August (Fig. 17).

As in 1954 the warm Atlantic water with temperature above 8°C. was found in great thickness in the eastern part of the section (Fig. 16A.). Over the slope off the Faroes relatively cold water indicates an overflow of Norwegian Sea deep water over the Faroe-Iceland ridge or between the Faroes and Faroe Bank. The bottom water with salinity above 35 ‰ found in the deep eastern basin must be a mixture of Norwegian Sea deep water with Atlantic water.

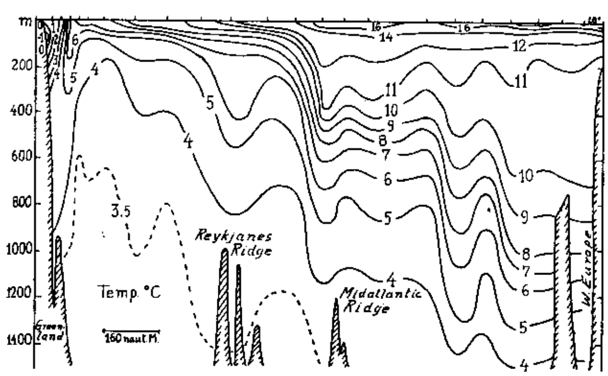


Fig. 17A. Transatlantic Section from Kap Farvel (left) to Ireland (right). R. V. "Dana" 13-21 Aug. 1955. Temperature °C. The stations are marked along the surface line.

West of the Reykjanes Ridge the strong inclination of the isotherms and isohalines indicates a strong northgoing current, the Irminger Current. In the western part of the section the East Greenland Polar Current was found over the Greenlandic shelf and outside the shelf the southgoing branch of the Irminger Current was found. Only small amounts of Atlantic water were found in the Irminger Sea.

In the Greenland-Ireland section (Figures 17A and 17B) the Polar Current seems to be of greater volume than usual and it is remarkable that temperatures below -1°C. were met here as late as the middle of August. The Irminger Current was not so well developed and its core with temperature above 5° was situated far from the shelf.

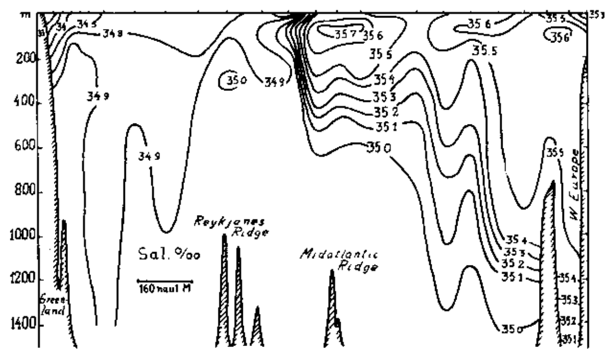


Fig. 17B. Same section as Fig. 17A. Salinity 0/00.

One of the most striking features in the section is the sharp front between the subarctic water and the warm and saline water between station 9796 and 9797. The front is situated in the southeastern part of the trough between the Reykjanes Ridge and the Mid Atlantic Ridge. This front was found in nearly the same position in 1954 and seems thus to be rather closely connected with the bottom configuration.

The two sets of inclinations of the isotherms between the Mid Atlantic ridge and the European Continental Slope (stations 9800 to 9801 and 9803 to 9804) indicate strong northgoing currents at these positions.

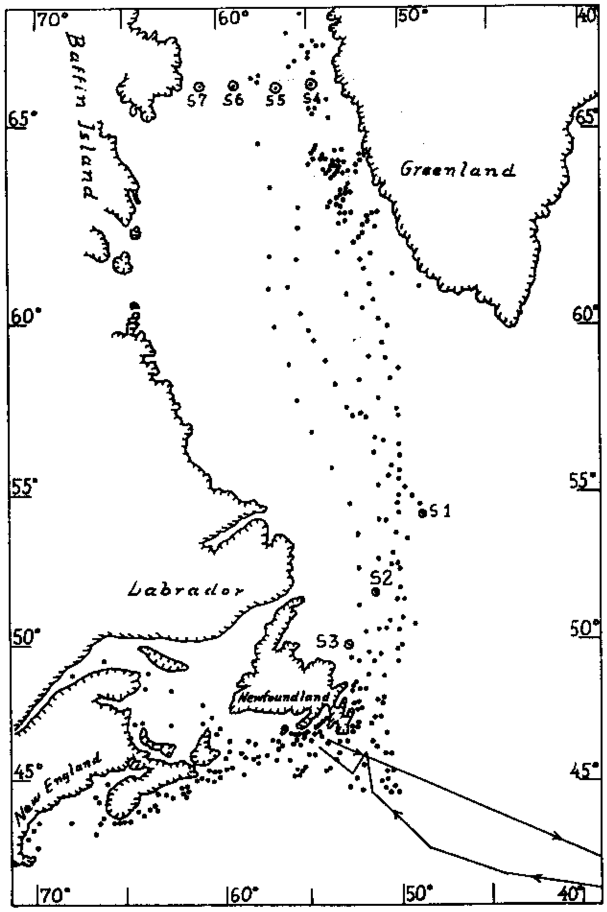


Fig. 1. **Map showing the area where hydrographic observations were made from "Aventure" in 1955. The full line indicates the route, where only thermograph observations were made; dots indicate localities where surface water samples were taken; dots with a circle indicate localities where also deeper water was sampled.**

III. French Research Report, 1955.

BY J. ANCELLIN

Observations of temperature of surface water (part of the observations are from thermograph) were made from the frigate "Aventure" during its campaign in the Convention Area in 1955. Samples of water for determination of salinity were also collected.

In addition, the vessel carried out observations of hydrographic conditions in deeper waters at certain places in the Davis Strait (up to 65°N. Lat.) and between Newfoundland and Cape Farewell (see map, Fig. 1). On the map the full line indicates the route where only temperature observations by thermograph were made, the crosses indicate the localities where samples of surface water were taken; the stations where samples from deeper water were also collected are marked on the map by a point surrounded by a circle and a Station number.

The results of the hydrographic observations will be published in the "Bulletin d'Information du Comité d'Oceanographie et d'Etude des Côtes."

IV. German Research Report, 1955

SUBAREA 1 BY J. LUNDBECK

On its first trip to the Iceland-Greenland waters (26 May to 10 July, 1955) the work of the research vessel "Anton Dohrn" was restricted to the east of Greenland and just touched the southern end near Cape Farvel. The second trip (5 Sept.-19 Oct., 1955) included the west coast of Greenland where eight hydrographic profiles and trawl catches from the banks down to about 450 m. were made. Unfortunately at that time very few cod could be caught in the area fished (up to 69°N) and cod in quantities did not reappear in the shallow waters of Northern Store Hellefiske Bank until the ship was about to return homeward.

The routine observations of the market landings have been continued and even increased owing to the larger amount of the German catches off West-Greenland. Indeed the fishery rose about twenty-fold in comparison to the preceding year (20,677 tons in 92 trips against 1,137 tons in 5 trips 1954). Two-thirds consisted of redfish and one-third of cod. However, the time spent in actual fishing did not increase to the same degree in consequence of the markedly better catches, which amounted to 34.5 tons per fishing day as compared with 20.6 tons in 1954.

The whole season was divided into two essentially different parts. Whereas in the first months the fishery almost exclusively took cod, partly for salting, in the beginning of July it changed over to redfish. Then in the autumn it came to an end with but a slight recovery off southern Greenland towards the close of the year. This shift was apparently caused by the sudden and heavy inset of the "slack" period due to the arrival of very much ice and cold water from the East Greenland current. It has been regarded as a real success for the German Greenland fishery to overcome the difficulties of the disappearance of the cod by fishing redfish, which in the deeper waters did not suffer from the changing water conditions.

At the time of the investigations (20 Sept.-10 Oct.) there was in the surface a narrow tongue of warm water above 3°C. from outside Fyllas Bank across the more northern banks to about 68°N., and a similar cold one of less than 2°C. extending from South Greenland to Noname Bank. The bottom temperature lay between 1° and 2°C. and exceeded 3°C. only in greater depths and on the shallower parts of the northern Store Hellefiske Bank—the area, where the cod then reappeared.

The cod has been caught, according to the known population abundance, in very much larger quantities during the first half of the year than ever before, the catch per day amounting in the average of January to June to 25 tons and reaching a monthly maximum of 32 tons in February and June as compared with 21 tons in June 1954. The following table gives a summary of the age-compositions as yet available for the landings and (in brackets) for the whole catches before market selection.

Year	Coastal area	Age-Groups % 1942-44	1945	1946	1947	1948	1949	1950	1951-53	predominant lengths, cm.
1952	West	17	49	17	17	0	—	—	—	65-75
		(11)	(34)	(17)	(34)	(3)	(1)	(0)	(—)	(45-55, 65-75)
	South	27	66	1	5	0	0	0	0	60-75
1953	West	10	31	10	46	3	—	—	—	55-75
	South	25	64	1	8	1	1	—	—	60-90
1954	West	10	30	2	48	2	8	0	—	60-80
1955	West	9	8	3	53	12	9	6	—	60-75
		(5)	(11)	(2)	(27)	(4)	(6)	(23)	(23)	(40-75)
	South	9	29	1	17	1	18	24	1	50-65, 75-85
		(2)	(16)	(1)	(13)	(1)	(20)	(40)	(8)	(45-65)
	East	20	59	1	6	3	9	2	0	80-100
		(6)	(66)	(1)	(6)	(1)	(15)	(3)	(2)	(75-95)
	Iceland	10	55	1	4	4	14	10	2	70-90

From the table it appears that the good 1947 year-class reached its as yet highest percentage of a little over 50% in the landings in 1955. Furthermore, the 1950 year-class, though still undersized, appeared in the catches in supernormal quantities. Similar to the findings of preceding years, in the southern parts of Greenland the 1945 year-class was much more pronounced

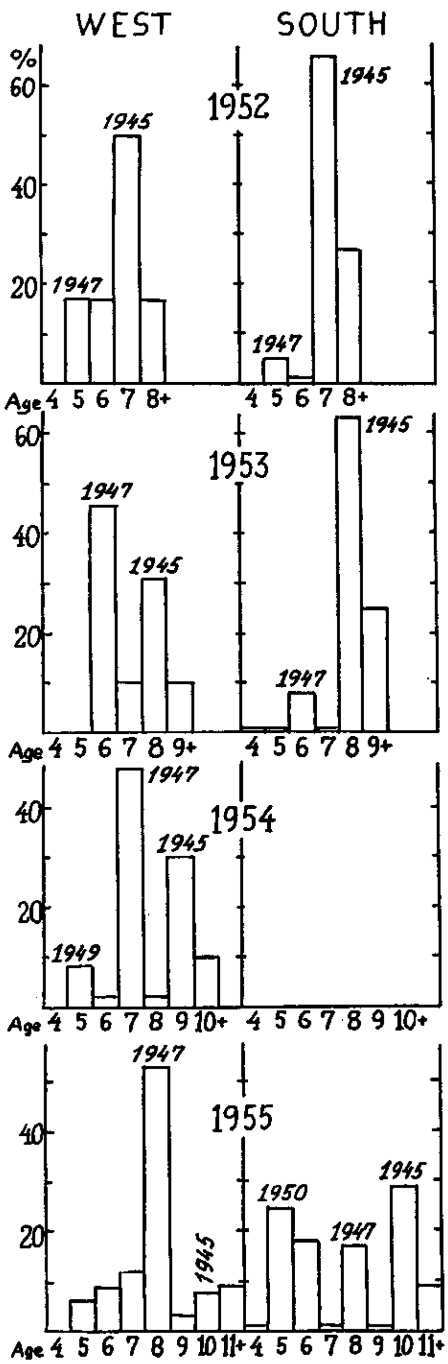


Fig. 1. **Age distribution in frequency % in samples of cod from German trawlers, 1952-55 from banks of West Greenland (WEST) and from off the South Coast (SOUTH).**

than the more northerly distributed 1947 year-class, and that may also be true for the 1950 year-class (see Fig. 1). There has also been opportunity to procure comparable data from Eastern Greenland as a connecting link to the Icelandic stock of cod. Off Angmagsalik and on the Iceland-Greenland-ridge rather large numbers of the 1945 year-class have been met, many of them still wholly immature, but to a certain extent, comparatively late in season, ripening for the first time. In the general age composition there seems to be a nearer relation to the Icelandic cod stock than to the genuine Greenlandic one. In fact, of the two year-classes 1947 and 1950, which are rich in Western Greenland but less so in Iceland, the first was but slightly pronounced in East Greenland and the second was replaced by the 1949 year-class, which is known to be rich in Iceland also. In southern Greenland both the rich Greenland 1950 year-class and the rich Icelandic one of 1949 were found almost in equal strengths.

For the redfish it may be pointed out, that the investigations at sea as well as on the market have now proved clearly, that in the whole distribution area as far westerly as West Greenland the deep sea form (*Sebastes mentella*) is always associated with the normal form (*Sebastes marinus*) but inhabiting greater depths; perhaps in the western areas there are more intermediate forms than farther east. The market measurements (without separating these forms) showed that the redfish in the catches were rather large. The length distribution is shown in $^{\circ}/_{\circ\circ}$ in the table page 42.

During the months July to September an average of 37 tons redfish were caught per fishing day with a maximum of 63 tons in August, a higher peak than ever found in any other place including the newly exploited "Dohrnbank"

Redfish cm. groups	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 74	average length cm.	average weight gr.
West Greenland	2	1	145	445	369	30	1	5	2	0	44.0	1,208
East Greenland	2	10	75	254	389	212	53	2	2	1	47.0	1,469
West Iceland	—	2	174	488	257	75	4	—	—	—	43.7	1,135

on the Iceland-Greenland-ridge, where the highest monthly average, in October, amounted to 38 tons only. There seems to be a wide seasonal and spatial range for the catching possibilities of redfish off Western Greenland.

V. Icelandic Research Report, 1955.

BY JÓN JÓNSSON

The Icelandic researches in the Greenland waters in 1955 have been concentrated in the region east of Greenland.

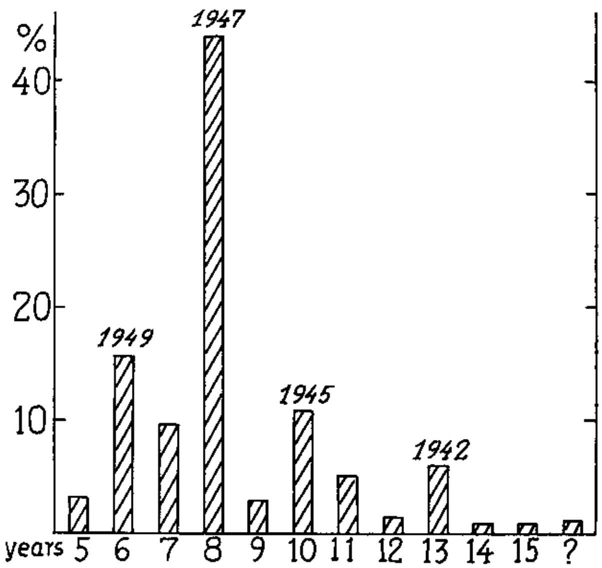


Fig. 1. Age distribution in frequency % of a sample of cod fished by an Icelandic trawler on Frederikshaab Banke (West Greenland) 25-29 May, 1955.

From the waters off West Greenland a smaller number of otoliths (of cod) have been collected from Icelandic trawlers. The following table shows the age-distribution of a sample of trawl-caught cod (200 specimens) from Frederikshaab Banke, 25th-29th May, 1955, with mean lengths for the separate year-classes:

Year-Class	Age	%	Cm.
1950	5	3.0	53.5
49	6	15.5	58.6
48	7	9.5	64.7
47	8	44.0	69.3
46	9	3.0	71.7
45	10	10.5	77.0
44	11	5.0	79.2
43	12	1.5	79.3
42	13	6.0	79.3
41	14	0.5	79.0
40	15	0.5	86.0
?	?	1.0	67.0

The 1947 year-class—8 years old—is absolutely dominating with 44% (Fig. 1). Next comes the 1949 year-class with 15.5% and the 1945 year-class with 10.5%. The old rich 1942 year-class still plays a certain role with 6%.

VI. Norwegian Research Report, 1955.

BY BIRGER RASMUSSEN

The Fishery.

During the 1955 fishing season a total of 73 Norwegian long-liners participated in the fishery off West Greenland. This is 6 vessels more than in the preceding year. Of the vessels 10 were fishing exclusively for halibut while 63 boats were engaged in the cod fishery. In addition to the long-liners 10 Norwegian trawlers made one or two trips each to these fishing grounds. The total catch amounted to 15,470 tons of salt cod. In addition 826 tons of halibut and 45 tons of fresh cod were landed. The catch of cod (*Gadus callarias* L.) in 1955 was somewhat smaller than in the preceding year.

The Norwegian long-liners started their fishery in the last week of April. During the first part of the season they were fishing on the southern banks, and mainly on Frederikshaabs Bank, Fiskenaes Bank and Danas Bank. The cod in these localities was of rather good size, but otherwise the fish was in poor condition with a small liver content. The long-line fishery was mainly carried out along the slopes of the banks in depths of 250-350 meters. According to reports the temperature conditions were very suitable for the fishery in the early period. However, towards the end of June heavy drift ice and cold Arctic water were carried around Cape Farewell. In July the ice covered the southern fishing banks, and the majority of the long-liners were forced to retreat northwards. In July the Norwegian fleet therefore fished mostly on Fyllas Bank. In August-September the fishery moved further north, to Lille Hellefiske Bank and the Holsteinsborg Deep. Very few, if any, of the Norwegian vessels carried out any fishing on Store Hellefiske Bank, as the cod here generally was too small for salt-fish production.

As regards the influx of drift ice on the southern Banks, our observations show that on July 10-11 the ice-pack stretched 90 miles offshore in the area of Danas and Fiskenaes Bank. Also Fyllas Bank was more or less covered by the ice. The presence of drift ice limited to a certain extent the long-line fishery during the whole month of July.

As in earlier years the Norwegian Institute of Marine Research collected material for the study of the composition of the long-line catches and the temperature conditions in relation to fishing. Cod samples from various banks were collected on board a commercial long-liner. About 2000 measurements and otoliths were taken from cod. Likewise tagging was made to a limited extent, and further studies made on the conversion factors.

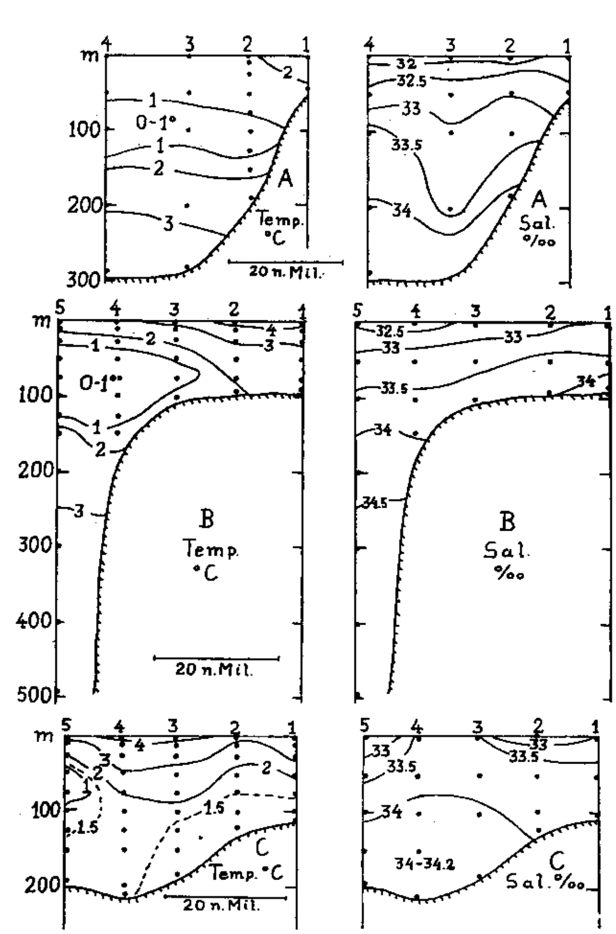


Fig. 1. Hydrographic sections across Fylla Banke (A), Southern Part of Lille Hellefiske Banke (B), and northern part of Lille Hellefiske Banke (C), 3-4 Aug., 1955. Left—temperature, right—salinity.

Hydrographic Conditions.

On August 3-4, hydrographic sections were worked westwards from Fyllas Bank, and across the southern and northern part of Lille Hellefiske Bank (see Fig. 1). Temperature recordings were made by bathythermograph registering down to 250m. Water samples were taken by means of ordinary Nansen water bottles.

All three sections show that a core of cold arctic water is present along the western slopes of the banks. In the particular depths where the long-lines usually are set (150-200 m.) the bottom temperatures show the following trend:

On the Fyllas Bank the bottom temperature is 1.5-2.5°C. At the time of observation the long-line fishery in this area is thus carried out in relatively temperate water lying underneath the cold arctic water which covers the slope between 75 and 150 m.

On the southern part of Lille Hellefiske Bank the temperature conditions are similar. Here the cold water covers the slope between 100 and 150 m of depth, while still further down the temperatures are satisfactory for fishing.

On the northern part of Lille Hellefiske Bank the core of cold water lies still somewhat deeper, covering the slope down to 200 m of depth.

In spite of the heavy influx of drift ice during July, and the presence of a core of cold water, the temperatures in the sea cannot be termed unusually low in 1955. The hydrographic conditions do not differ very much from those found towards the end of July 1954 on the same banks. But the cold water seems to have remained longer in 1955, and this has probably influenced the shoaling of pelagic cod in the Holsteinsborg Deep.

In the Holsteinsborg Deep the cod usually concentrate in pelagic shoals towards the end of July. In 1955 this shoaling did not occur till about the middle of August. In order to study the temperature conditions in this area a section of 5 stations was worked with bathythermograph across the Deep from the southern edge of Store Hellefiske Bank towards the northern edge of Lille Hellefiske Bank. The observations show that the cold arctic water has penetrated into the southern part of the Deep. In the middle and northern part of the Deep the temperatures vary considerably from surface down to 250 m. The horizontal thermocline usually found in 70-90 m had not yet formed and only few pelagic cod were present. An indication of stratification of the water layers was, however, found in the southern part of the Deep where the temperature rose sharply from 2 to 3°C. between 50 and 60 m. In that area a rich occurrence of plankton organisms was found and dense shoals of pelagic cod were present.

Catch Composition.

In 1955 samples of cod were obtained from commercial catches taken in various areas. The size of cod caught on bottom long-lines varies somewhat from one locality to another. The mean sizes of the fish caught on the different banks are as follows:

	Mean Length (cm.)	Age
Store Hellefiske Bank, southern slope	72.80	9.58
Lille Hellefiske Bank, central part	73.49	9.84
Lille Hellefiske Bank, western slope	78.60	11.13
Fyllas Bank, southern slope	73.71	9.98
Fiskenaes Bank, southern slope	73.09	8.95
Danas Bank, eastern shallow	71.95	10.10
Total mean	73.72	9.87

The size distribution of the cod in the various localities is illustrated in Fig. 2. Generally the curves show a maximum around 70 cm. in all localities. An exception is the sample from the western slope of Lille Hellefiske Bank where the fish are larger with a maximum around 80 cm. As indicated in the lower part of the figure, these maxima correspond very well with the prominence of the two outstanding year-classes 1947 and 1942.

The age composition of cod in the Norwegian long-line catches on the different banks is shown in Table 1. On the northern banks the 1947 year-class is very prominent, the catches containing 44 per cent of this age group. On the western slope of Lille Hellefiske Bank the 1947 year-class becomes less prominent and large fish of the 1942 year-class are predominating. The sample from this locality contains 20.9 % of cod born in

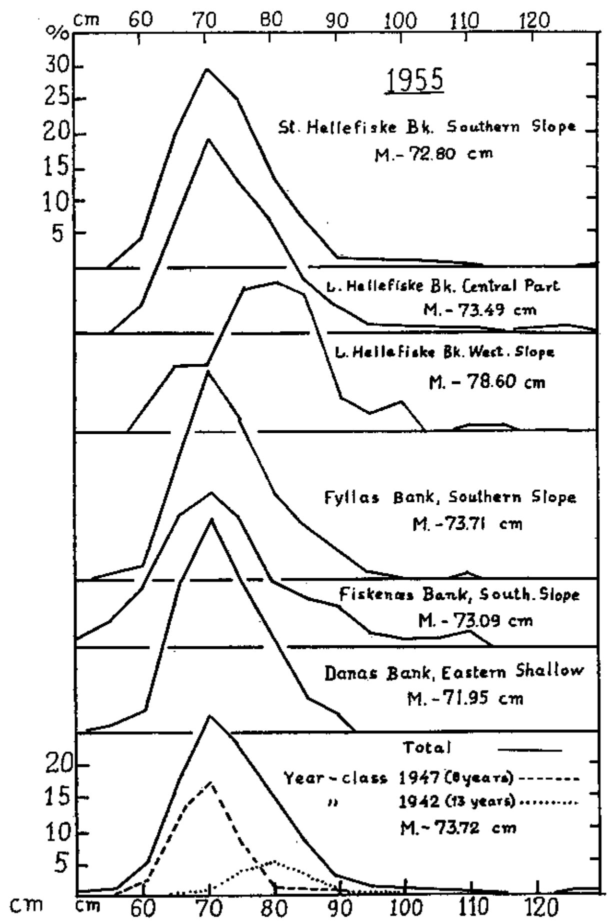


Fig. 2. **Size distribution in frequency % and by 5 cm. groups of cod caught on bottom long-lines by Norwegian vessels, summer 1955, on West Greenland fishing banks.**

1947 and 27.5% of cod born in 1942. On the Fyllas Bank, Fiskenaes Bank and Danas Bank, the 1947 year-class show a gradual numerical decrease towards the south. It is replaced more or less by the 1945 year-class.

Of particular interest perhaps is the sample taken on the eastern shallow slope of Danas Bank. The cod in this locality has a very low mean size (71.95 cm.) compared to other localities, while the mean age is fairly high (10.1). This sample was caught in a depth of about 50 m. According to the observer, the fish apparently was so-called "fjord-cod." The cod in this particular locality must have had a very slow growth. This is a phenomenon which otherwise occurs in some Greenland fjords. In the Godthaab Fjord, for instance, the Danish investigations have shown that the cod grow slowly, and the catches do not contain such large fish as should be expected from the age composition.

Of particular importance to the Norwegian fishery are the pelagic shoals of cod in the Holsteinsborg Deep. In 1955 we did not succeed

TABLE 1. WEST GREENLAND. COD AGE COMPOSITION OF NORWEGIAN LONG-LINE CATCHES

Age Years	Southern slope Store Hellefiske Bank %	Central part Lille Hellefiske Bank %	Western slope Lille Hellefiske Bank %	Southern slope Fyllas Bank %	Southern slope Fiskenaes Bank %	Eastern shallow Danas Bank %	Total Mean %
5	0.6	0.6	0.5	0.8	4.7	—	0.8
6	0.8	0.8	—	—	8.6	1.7	1.2
7	7.4	6.7	5.1	4.8	14.9	2.6	6.9
8	43.9	44.3	20.9	40.0	36.0	33.6	40.4
9	10.7	7.4	7.2	5.6	3.9	11.2	8.1
10	9.0	8.8	9.7	16.1	10.9	16.4	10.0
11	5.6	3.5	8.7	8.0	2.3	3.5	4.8
12	5.8	5.2	9.2	7.3	3.9	11.2	6.1
13	9.4	15.3	27.5	12.1	8.6	13.8	14.5
14	2.8	2.5	4.1	0.8	3.1	0.9	2.6
15	1.4	1.7	2.0	0.8	0.8	1.7	1.6
16	1.2	0.7	2.0	—	—	1.7	0.9
17	—	0.2	—	—	0.8	0.9	0.2
18	0.4	0.2	—	1.6	—	—	0.3
19	0.8	1.5	1.2	1.6	1.6	0.9	1.2
20	0.2	0.1	0.5	0.8	—	—	0.2
21	0.2	0.3	1.5	—	—	—	0.4
22	—	0.1	—	—	—	—	0.1
Total ind.	503	864	196	124	128	116	1931

in obtaining samples of cod caught with pelagic long-lines. On August 4, however, a sample of cod from this locality was taken on handlines. The commercial fishery had not yet started. In this sample the 1942 year-class constituted only 3.2%. In 1952 this year-class made up 37.2% of the catch in this area and it has since decreased steadily. It has been replaced by the 1947 year-class which in 1955 made up 33.2 per cent of the catch. A new strong year-class is that of 1950 which in the sample was represented by 32.2%. Due to the heavy influx of young fish the mean size of the Holsteinsborg cod in 1955 is only 63.54 cm. against 72.36 cm. in 1954 and 75.99 cm. in 1952. The mean age of Holsteinsborg cod caught on long-lines was in 1952 11.1 years, in 1953 10.0 years and in 1954 9.9 years. In 1955 the cod caught with hand-lines had a mean age of only 7.0 years. This handline sample is not considered representative for the ordinary Norwegian catches in this locality. According to reports from the fishermen relatively large cod were caught later in summer when the commercial fishery started.

The total age distribution of cod in longline catches in the different years from 1948 to 1955 is shown in Fig. 3. The 1942 year-class, which has dominated the Norwegian catches since 1950, is now on the decrease and the 1947 year-class has taken its place. In 1955 the 1947 year-class constituted 40.4% of the total catch. Next in importance comes the still strong 1942-class with 14.5% and the 1945-class with 10%. These three year-classes alone make up about 65% of the Norwegian catch.

According to Paul M. Hansen the 1950 year-class is estimated to be very rich, and in 1955 it was very prominent on the northern part of Store Hellefiske Bank where it constituted 47.5% of the Danish catch. But this year-class has not yet appeared in any numbers in the Norwegian long-line catches. In 1955 it made up only 0.8 % of the catch. It will hardly become of importance to the fishery till 1957 or 1958.

The 1947 year-class will in the coming years dominate in the Norwegian catches. In 1955 the cod of this year-class has a mean size of 69.22 cm. A cod of 70 cm. gives a saltfish size of

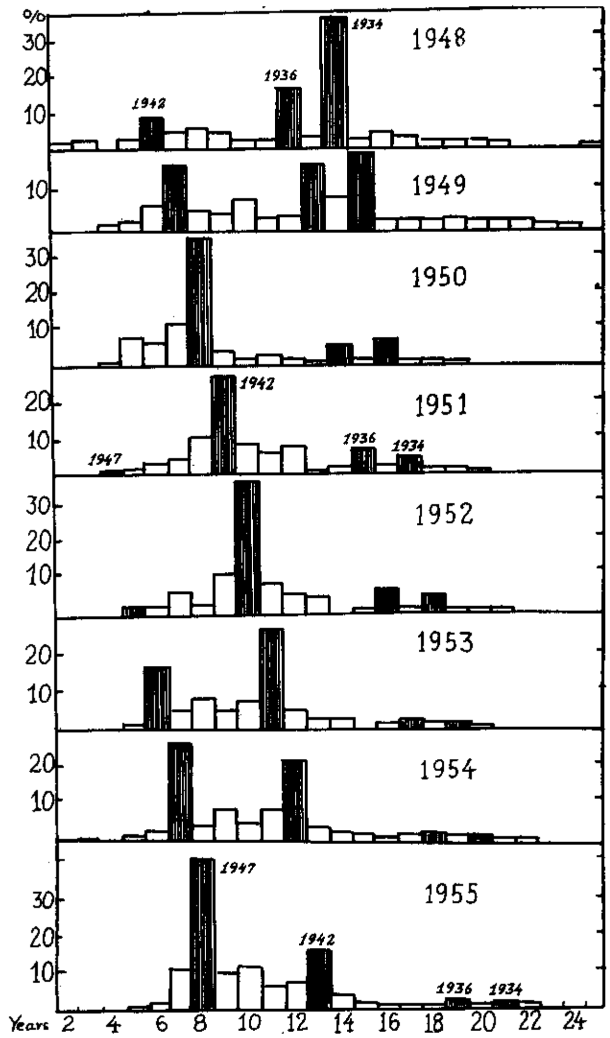


Fig. 3. Age distribution of cod in commercial Norwegian long-line catches in the different years from 1948 to 1955.

about 53 cm. According to Norwegian standard a saltfish is most valuable when 58 cm. or more. The 1947 year-class thus still gives a product somewhat too small sized for our demand. But already next year the 1947-class should give a satisfactory saltfish size.

Tagging of Cod and Halibut.

Tagging of cod was continued in the West Greenland area during the summer of 1955. In early July 132 cod were tagged on Lille Hellefiske Bank. From the middle of July to August 5 a further 137 cod were tagged in the Holsteinsborg Deep. Thus a total of 275 cod were marked in the area. Some recaptures have already been reported. The results of the tagging experiments have not as yet been worked up.

Experiments on tagging of halibut, *Hippo glossus hippoglossus* (L.), in the Davis Strait were instituted in 1955. An observer from the Norwegian Institute of Marine Research began during the latter part of July the tagging operation on board a commercial halibut vessel. The fishery was, however, very poor and the observer succeeded in tagging only 20 individuals during his stay on board. An arrangement was made with the captain of the vessel, and later in the season he succeeded in tagging 80 specimens. Thus a total of 100 halibut were tagged. The halibut were released in various localities off West Greenland, off northern and central Labrador and off Cape Farewell. The tag used for halibut was the ordinary yellow plastic disc employed also in the cod taggings. The disc was fastened in the gill cover with silver wire. Only one recapture was reported towards the end of the season. The fish was retaken in the same locality where tagged.

A very small number of halibut were tagged in the years 1948-50. The recaptures made seem to indicate that the halibut stays in the same locality or that it returns to the same locality in summer after intervening migrations.

Conversion Factors.

In 1955 further experiments on conversion factors were carried out by Norway. The results largely confirm those earlier reported. The conversion factor found in the 1955 experiments for landed, salted to round, fresh cod was 2.92, or very close to the 3.0 agreed to by ICNAF. The 1955 experiments, as those of earlier years, show that the conversion factor increases with increasing size of fish. A small cod of 55 cm. has a conversion factor of 2.46, a large cod of 95 cm. one of 3.49.

The conversion factor from salted length to live length of the cod seems to be identical for all size categories. In experiments from the years 1953, '54 and '55 it was found to be 1.30, 1.31, and 1.31 respectively. A factor of 1.3 may be considered satisfactory for converting from landed salt fish length to live length.

VII. Portuguese Research Report, 1955.

BY MARIO RUIVO

The Portuguese researches in the Convention Area in 1955 have included samplings of cod (*Gadus callarias* L.) from catches by Portuguese fishing vessels from June to November in Subareas 1, 2, and 3. The results from Subareas 1 and 2 are summarized in a preliminary form below. only a part of the material has been elaborated up to now.

The samplings were made partly directly from the Hospital Ship "Gil Eannes," when contacting fishing vessels, and partly by means of observers on board the fishing vessels. Catches were sampled from dory vessels as well as from trawlers.

In connection with the samplings, parasites (mainly *Clavella uncinata* (O.F.M.)) were collected from cod. This was done as these parasites may furnish an additional help in characterizing the cod populations of the various areas. A preliminary paper by Lidia Nunes-Ruivo, dealing with the morphology of *Clavella uncinata* in relation to the regions of fixation on the host was distributed for the 1956 Annual Meeting (Document No. 20, Serial No. 379).

A series of experiments on conversion factor for cod from landed weight to round fresh weight were carried out in Subareas 1, 2, and 3. A paper by Mario Ruivo giving details and results of these experiments was circulated for the 1956 Annual Meeting (Document No. 18, Serial No. 377). The results are summarized in the paper as follows: "Considering the relative uniformity of the mean values obtained for the various subareas of the N.W. Atlantic, we feel that a single conversion factor can be applied without discriminating between Subareas 1, 2, and 3. We therefore propose to adopt—also from its easy application in statistical calculations—for the conversion of weights of green salted cod landed from the Portuguese fleet to round fresh fish as coming from the sea in the ICNAF area, the conversion factor 3.0."

OBSERVATIONS ON THE COD IN SUBAREA 1 (GREENLAND) AND 2 (LABRADOR).

(1) **Subarea 1, Greenland** (Table 1-4).

28 of the samples collected in this subarea, amounting to around 3,000 specimens, have been used for the determination of age by means of otoliths. Nearly all samples were from dory vessels using lines with hooks Nos. 14½ and 15 (Samples L). Only two samples were from trawlers (Samples A). The size of meshes in the cod end of the trawls have a mean dimension of 117 mm.

TABLE 1 **List of Samples investigated from Portuguese dory vessels and trawlers in Subarea 1, 1955. L—dory vessels, A—trawlers.**

Sample Dory vessel G (L)	Sample Group No.	Date	Bank	Lat.	Long.
2		12-6-55	Fylla B.	64°01′ N	53°02′ W
3	3	13-6-55	,, ,,	64°07′ N	53°06′ W
5		17-6-55	,, ,,	63°54′ N	52°24′ W
6	2	18-6-55	Fiskenaes B.	63°00′ N	52°00′ W
7		22-6-55	Lille Hellef. B.	65°10′ N	53°38′ W
8	5	23-6-55	,, ,, ,,	65°09′ N	53°40′ W
10		28-6-55	,, ,, ,,	65°07′ N	53°25′ W
12	6	30-6-55	Helders B.	66°06′ N	54°20′ W
13		2-7-55	,, ,,	66°08′ N	54°15′ W
15		5-7-55	Store Hellef. B.	67°35′ N	54°46′ W
18	13	9-7-55	,, ,, ,,	67°40′ N	55°02′ W
19		11-7-55	,, ,, ,,	67°46′ N	55°00′ W
21	15	13-7-55	,, ,, ,,	67°59′ N	54°43′ W
22		14-7-55	,, ,, ,,	68°02′ N	54°39′ W
25	9	19-7-55	,, ,, ,,	67°22′ N	54°27′ W
26		20-7-55	,, ,, ,,	67°20′ N	54°21′ W
28	14	23-7-55	,, ,, ,,	67°48′ N	54°39′ W
30	10	25-7-55	,, ,, ,,	67°15′ N	54°18′ W
33	11	29-7-55	,, ,, ,,	67°18′ N	55°05′ W
32	12	27-7-55	,, ,, ,,	67°28′ N	54°04′ W
35		2-8-55	,, ,, ,,	67°20′ N	54°14′ W
36		3-8-55	,, ,, ,,	67°26′ N	54°12′ W
39		8-8-55	,, ,, ,,	67°06′ N	54°42′ W
40	8	10-8-55	,, ,, ,,	67°04′ N	54°46′ W
42		12-8-55	,, ,, ,,	66°52′ N	54°34′ W
43	7	13-8-55	Helders B.	66°23′ N	54°18′ W

Trawler

Trawler G (A)		Date	Bank	Lat.	Long.
2	4	30-6-55	Fylla B.	63°40′N	52°50′ W
3		1-7-55	,, ,,	64°00′N	53°00′ W

TABLE 2. **Age Distribution and Mean Length of Cod Caught by Portuguese Fishing Vessels in W. Greenland Waters in 1955. Bold Figures denote No. of Sample Group. Detailed information on locality, date and gear in Table 1.**

Year Class	Age	Fiskenaes Bank, **2**, 18-6, 1955, 100 spec. (44% ♂♂) %	M. Length (cm.)	Fylla Bank, **3**, 12/17-6, 1955, 327 spec. (48% ♂♂) %	M. Length (cm.)	Fylla Bank, **4**, 30-6, 1-7, 1955, 162 spec. (61% ♂♂) %	M. Length (cm.)	Lille Hellefiske Bank, **5**, 22/28-6, 1955, 305 spec. (48% ♂♂) %	M. Length (cm.)
1951	IV	—	—	—	—	2.6	41.3	—	—
1950	V	1.0	56.0	3.4	55.5	8.6	49.2	1.3	57.0
1949	VI	1.0	60.0	2.8	63.9	1.2	59.0	0.7	58.0
1948	VII	5.0	63.8	8.6	64.5	8.6	64.9	6.2	67.0
1947	VIII	54.0	69.4	56.0	71.7	43.2	66.9	37.1	70.5
1946	IX	4.0	71.5	5.8	73.2	2.4	70.0	4.3	73.0
1945	X	13.0	76.6	10.2	76.3	14.8	74.9	13.1	77.3
1944	XI	2.0	80.5	3.1	77.6	2.4	69.7	5.2	76.9
1943	XII	2.0	75.0	2.2	76.3	5.5	75.3	6.5	77.3
1942	XIII	16.0	84.7	7.1	82.7	9.3	71.3	18.2	80.0
1941	XIV	—	—	0.9	84.0	0.6	79.0	3.3	81.4
1940	XV	—	—	—	—	—	—	1.6	84.3
1939	XVI	1.0	87.0	—	—	—	—	1.6	85.9
1938	XVII	—	—	—	—	0.6	97.0	—	—
1937	XVIII	—	—	—	—	—	—	—	—
1936	XIX	1.0	81.0	0.3	80.0	—	—	0.4	87.0
1935	XX	—	—	—	—	—	—	—	—
1934	XXI	—	—	—	—	—	—	0.4	86.0

TABLE 2 (con't)

Year Class	Age	Helders Bank, **6**, 30-6, 2-7, 1955, 191 spec. (44% ♂♂) %	M. Length (cm.)	Helders Bank, **7**, 13-8, 1955, 79 spec. 51% ♂♂ %	M. Length (cm.)	Store Hellefiske Bank, **8**, 8/12-8, 1955, 280 spec. (45% ♂♂) %	M. Length (cm.)
1951	IV	—	—	—	—	—	—
1950	V	0.5	56.0	10.1	57.5	6.8	55.8
1949	VI	1.0	63.5	3.7	63.5	5.2	57.3
1948	VII	8.4	67.4	7.6	67.3	7.5	67.3
1947	VIII	51.8	70.4	42.9	69.5	47.8	71.9
1946	IX	8.4	70.4	6.4	73.3	5.7	74.2
1945	X	6.8	75.9	13.9	77.2	10.7	77.9
1944	XI	3.1	72.8	1.3	83.0	2.9	80.3
1943	XII	3.7	75.6	3.7	77.5	2.5	82.6
1942	XIII	10.5	81.2	6.4	81.8	5.7	84.6
1941	XIV	2.6	78.5	1.3	85.0	1.4	89.8
1940	XV	—	—	—	—	1.4	97.5
1939	XVI	—	—	1.3	110.0	0.7	83.0
1938	XVII	0.5	136.0?	1.3	84.0	0.7	94.0
1937	XVIII	—	—	—	—	—	—
1936	XIX	1.0	87.5	—	—	0.4	103.0
1935	XX	0.5	94.0	—	—	0.4	102.0
1934	XXI	0.5	103 0	—	—	0.4	89.0

The position of the samples from Subarea 1 are indicated on the Fig. 1, centre. The exact positions are given in Table 1.

(a) Composition of Samples by Age Groups Sex Ratio.

Fiskenaes Bank. Age-group VIII is dominating (54.0%); and age-groups XIII and X are represented by respectively 16.0% and 13.0%. Age-group V is practically non-existent (1.0%). There is a clear predominance of females (56.0%).

Fyllas Bank. In the samples from the dory vessels age-group VIII predominates (56.0%); Gr. X constitutes 10.2% and Gr. XIII and Gr. VII are represented in nearly the same

TABLE 2 (con't)

Year Class	Age	St. Hellefiske Bank, 9, 19/20-7, 1955, 173 spec. (52% ♂♂) %	M.Length (cm.)	St.Hellefiske Bank, 10, 25-7, 1955, 50 spec. (48% ♂♂) %	M. Length (cm.)	St.Hellefiske Bank, 11, 29-7, 1955, 50 spec. (48% ♂♂) %	M.Length (cm.)	St.Hellefiske Bank, 12, 27-7, 2/3-8, 1955, 300 spec. (46% ♂♂) %	M.Length (cm.)
1951	IV	0.6	47.0	—	—	—	—	0.6	50.5
1950	V	5.2	55.0	4.0	58.0	10.0	58.2	11.3	54.5
1949	VI	4.6	61.0	6.0	57.8	6.0	64.0	5.7	58.9
1948	VII	10.9	69.0	10.0	65.9	4.0	69.5	10.0	67.1
1947	VIII	56.6	71.9	52.0	71.2	54.0	69.9	48.6	70.4
1946	IX	4.0	75.2	6.0	77.6	8.0	73.0	5.3	73.8
1945	X	7.5	83.5	4.0	90.0	8.0	72.0	4.6	77.0
1944	XI	2.3	79.5	—	—	6.0	78.3	3.6	81.5
1943	XII	0.6	87.5	4.0	81.0	—	—	3.0	81.6
1942	XIII	5.2	88.7	10.0	86.0	2.0	85.0	2.7	85.2
1941	XIV	0.6	97.0	2.0	85.0	—	—	1.7	86.1
1940	XV	0.6	88.0	—	—	—	—	0.7	92.0
1939	XVI	0.6	95.0	2.0	96.0	—	—	0.7	92.0
1938	XVII	—	—	—	—	2.0	100.0	0.6	92.0
1937	XVIII	—	—	—	—	—	—	—	—
1936	XIX	—	—	—	—	—	—	0.3	94.0
1935	XX	—	—	—	—	—	—	0.3	83.0
1934	XXI	—	—	—	—	—	—	—	—

TABLE 2 (con't)

Year Class	Age	St. Hellefiske Bank 13, 5/11-7, 1955, 349 spec. (44% ♂♂) %	M.Length (cm.)	St. Hellefiske Bank 14, 23-7, 1955, 105 spec. (51% ♂♂) %	M.Length (cm.)	St. Hellefiske Bank 15, 13/14-7, 1955, 249 spec. (41% ♂♂) %	M.Length (cm.)
1951	IV	—	—	—	—	—	—
1950	V	12.6	55.4	21.9	54.1	7.6	56.0
1949	VI	1.7	62.0	3.8	63.8	1.2	60.5
1948	VII	7.2	65.1	18.1	66.1	9.6	68.9
1947	VIII	49.3	70.0	36.2	69.2	41.0	71.5
1946	IX	4.6	76.3	5.7	74.2	6.4	77.2
1945	X	9.2	78.4	5.7	74.5	9.6	81.5
1944	XI	4.9	81.3	1.9	77.0	6.0	85.5
1943	XII	2.0	81.2	1.9	79.0	2.8	84.0
1942	XIII	6.3	85.3	1.9	78.5	11.2	88.5
1941	XIV	0.6	88.5	0.9	99.0	2.8	91.8
1940	XV	0.3	83.0	0.9	90.0	0.4	98.0
1939	XVI	—	—	0.9	88.0	0.4	86.0
1938	XVII	—	—	—	—	—	—
1937	XVIII	0.3	94.0	—	—	—	—
1936	XIX	0.6	94.0	—	—	0.4	85.0
1935	XX	—	—	—	—	—	—
1934	XXI	0.6	91.5	—	—	0.4	114.0

proportions (around 8%). Gr. V constitutes only 3.4%. There is a slight predominance of females (52.3%).

Age-group VIII is equally dominating in the samples from the trawlers (43.2%). Of the other groups, Gr. X is a little better represented (14.8%) than was the case in series G (L) 2-3-5. Gr. V, VII, and XIII are practically of the same size (8.6, 8.6 and 9.3%).

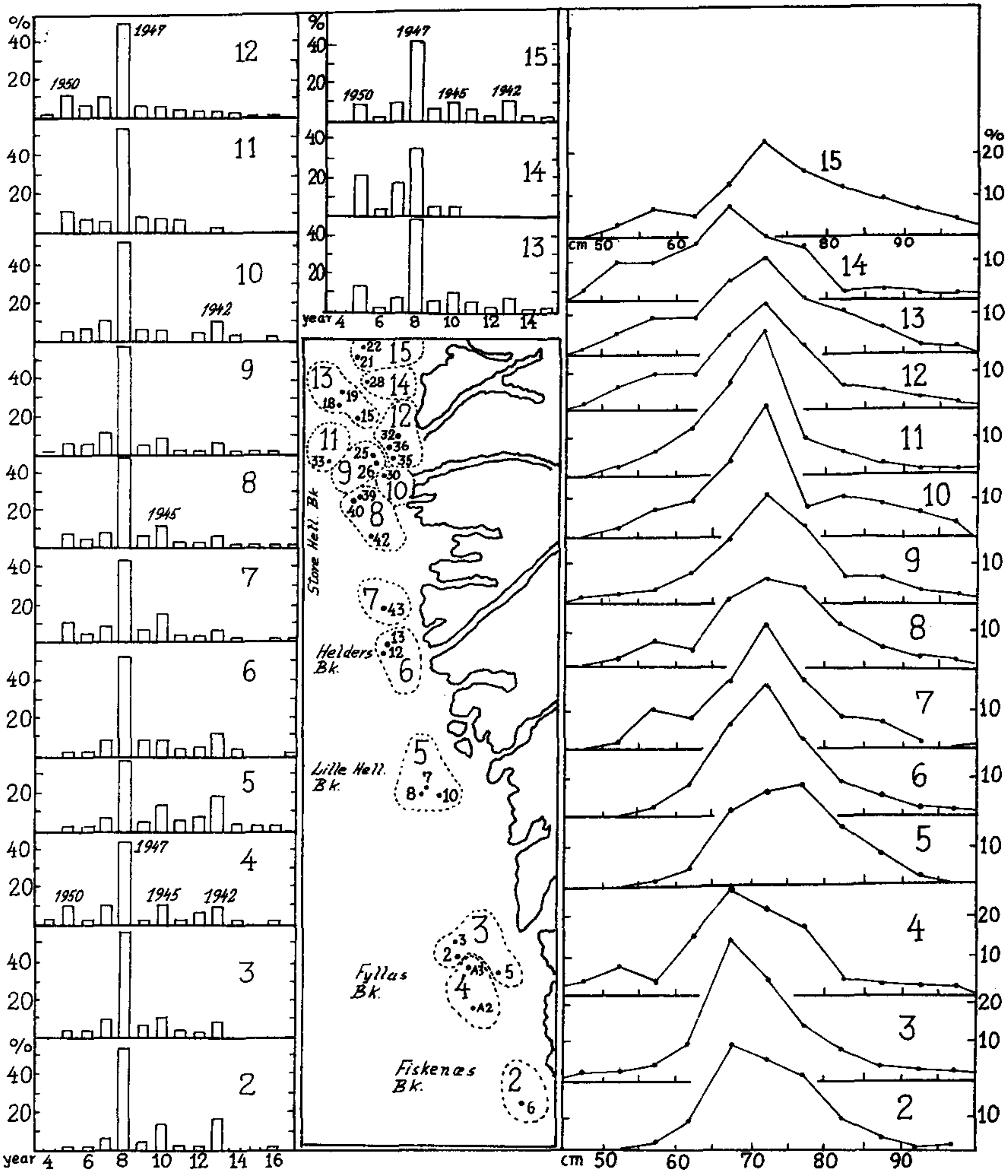


Fig. 1. **Age and length distribution of samples of cod caught by Portuguese dory vessels and trawlers in West Greenland waters (Subarea 1) in summer 1955. Left of and above the map—age distribution, right—length distribution in frequency percentages. Small figures on map indicate no. of sample (see Table 1). Large figures on map and on graphs indicate sample groups.**

The samples from Fyllas Bank are unique among the samples from the whole subarea in that the males are more abundant than the females, reaching a percentage of 61.1. It is possible that this is caused by the selectivity of the gears used as the trawlers normally catch smaller fish.

Lille Hellefiske Bank. Gr. VIII is less numerous than in the previous samples (37.1%). Gr. XIII is more abundant (18.2%); Gr. X reaches 13%; Gr. VII 6.2%; Gr. V is practically non-existent (1.3%). The females are slightly dominating (52.4%).

Helders Bank. The samples were divided in two sample groups, the first from 30-VI/2-VII-55 and the second from 13-VIII-55.

In the first group the most abundant age-groups are VIII (51.8%) and XIII (10.5%). The other age-groups are less abundant, Gr. X and Gr. VII with around 6-8%. Gr. V is nearly lacking (0.5%). The females dominate the samples (56.4%).

In sample G (L) 43 the frequency of the various age-groups is of the same order with the exception that Gr. V is more strongly represented 10.1%). The proportion between males and females is rather even (50.6% and 49.4%).

Store Hellefiske Bank. The samples were for the study divided into 8 groups.

In the samples from this bank Gr. VIII continues to be the dominant one (40-46%) with the exception of sample G (L) 28 in which it amounts to only 36.2%. Gr. X varies between 4 and 10%. Gr. XIII is practically non-existent in some samples (2% in G (L) 33 and 28), but in others has values around 11%. Gr. VII varies in most of the samples between 4 and 10%, being however 18% in G (L) 28. Gr. V has lower values, below 10% in four samples, in sample G (L) 28, however, it reaches 21.9%. In all samples there is a dominance of the females (52-59%), except in G (L) 28 in which the sex ratio is even (50.5% males, 49.5% females) which can be caused by a stronger representation of Gr. V, as already mentioned.

Summary of all samples. The frequency of age-group VIII (the 1947 year-class) is high, however less rich in the northern than in the southern part of the subarea. The frequencies of age-groups VII, X and XIII are somewhat irregular but always weak. As to the sex ratio, there is a slight dominance of the females, except in the sample from trawlers on Fyllas Bank.

Table 3

MALES

Age. Gr. when caught	Area	Age-Gr. at first Spawning VI	VII	VIII	IX	X	XI	imm.	No. of Spec.	?	Tot. No. of Spec.
VII	South		7.1					92.8	28	0	28
	North		2.3					97.7	44	5	49
VIII	South	5.1	50.2	14.0				30.7	215	9	224
	North	5.2	45.8	15.7				33.3	306	21	327
X	South	8.2	38.8	40.8	10.2			2.0	49	2	51
	North	9.1	43.6	30.9	9.1	1.8		5.4	55	2	57
XIII	South	13.6	54.2	25.4	5.0		1.7	0	59	0	59
	North	23.7	50.0	18.4	5.3	2.6		0	38	2	40

FEMALES

Age Gr. when caught	Area	Age-Gr. at first Spawning VI	VII	VIII	IX	X	XI	imm.	No. of Spec.	?	Tot. No. of Spec.
VII	South		20.0					80.0	40	6	46
	North	3.5	10.5					86.0	86	10	96
VIII	South	3.8	33.8	30.8				31.6	237	23	260
	North	2.7	26.6	32.8				37.9	372	44	416
X	South	3.5	17.5	56.1	22.8			0	57	2	59
	North	4.5	28.4	40.3	22.4			4.5	67	2	69
XIII	South	11.7	48.3	20.0	18.3	1.7		0	60	1	61
	North	2.1	47.9	35.4	12.5		2.1	0	48	3	51

(b) Age at First Maturity.

The study of the age at first maturity is based on the most abundant age-groups in the material (Grs. VII, VIII, X and XIII) and by observation of the spawning ring in the otoliths (Tab. 3, Fig. 2). The observations are from the Store Hellefiske Bank in the north, and from Helders Bank, Lille Hellefiske Bank, Fyllas Bank and Fiskenaes Bank in the south. All individuals with questionable determination of age at first maturity were omitted, their numbers are indicated under ? in Table 3.

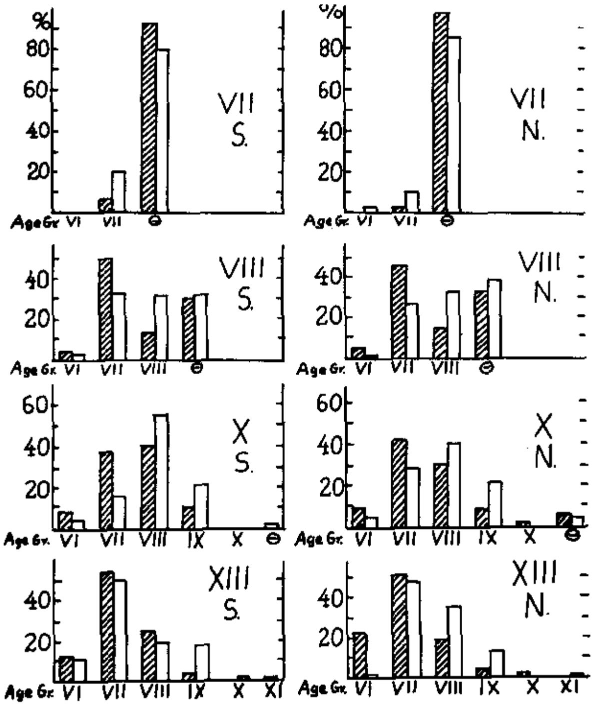


Fig. 2. Percentage number of individuals (males—striated columns, and females—white columns) spawning for the first time at various ages (Age-Gr.) of the abundant age-groups (VII, VIII, X and XI); from spawning mark observations on otoliths collected in 1955. S = Helders, Lille Hellefiske, Fyllas, and Fiskenaes B. N = Store Hellefiske B. ⊖ Indicates no spawning mark.

Age-Group VII (1948 year-class). Most of the individuals (more than 80%) have not reached the first maturity, they are still immature. The males, contrary to what normally is the case, seem to show a certain retardation in relation to the females, in particular in the northern zone (3.5% of females with a first spawning in the sixth year).

Age-Group VIII (1947 year-class) The first spawning is spread over the sixth to eighth year; only ca. 30% have not yet spawned. The majority of the males spawned for the first time in their seventh year, and a slightly higher percentage is found for males than for females in the sixth year.

Age-Group X (1945 year-class). Practically all individuals of this age-group have had at least one spawning period, except a small percentage (5%) in the northern zone. A greater precocity of males is found in both zones.

Age-Group XIII (1942 year-class). The first spawning is noted from the sixth to eleventh year. In the southern zone the first maturity seems to come at the same age for both males and females. In the northern zone the males, however, show a slightly greater precocity than the females.

(c) Size and Ratio Length-Weight.

The ratio length-weight for the different size groups was studied in a certain number of specimens. The results obtained by 5 cm. groups are shown in Table 4. No appreciable difference between the weights of males and of females within this subarea for the size groups studied (50-100 cm.) was found.

TABLE 4. Cod, West Greenland, June.Aug. 1955. Ratio length (5 cm. groups) and weight (Kgs.).

Length-Group (cm.)	— Males — No. Spec.	Kgs.	—Females— No. Spec.	Kgs.
52	10	1.296	—	—
57	25	1.789	21	1.700
62	19	2.136	32	2.348
67	64	2.696	55	2.753
72	77	3.337	97	3.300
77	40	3.919	63	3.944
82	19	4.644	32	4.864
87	18	5.877	22	6.231
92	—	—	12	6.666
97	—	—	8	7.835

(2) **Subarea 2, Labrador** (Table 5).

Of the four samples, all from trawlers (mean size of meshes of cod-end around 117 mm.) two were studied for the determination of age through use of otoliths. The localities of these samples are as follows:

Sample	Date	Lat.	Long.
L(A)-1	30-X-55	54°19'N	54°11'W
L(A)-2	31-X-55	54°35'N	54°40'W
L(A)-3	1-XI-55	54°30'N	54°30'W
L(A)-4	2-XI-55	54°28'N	54°31'W

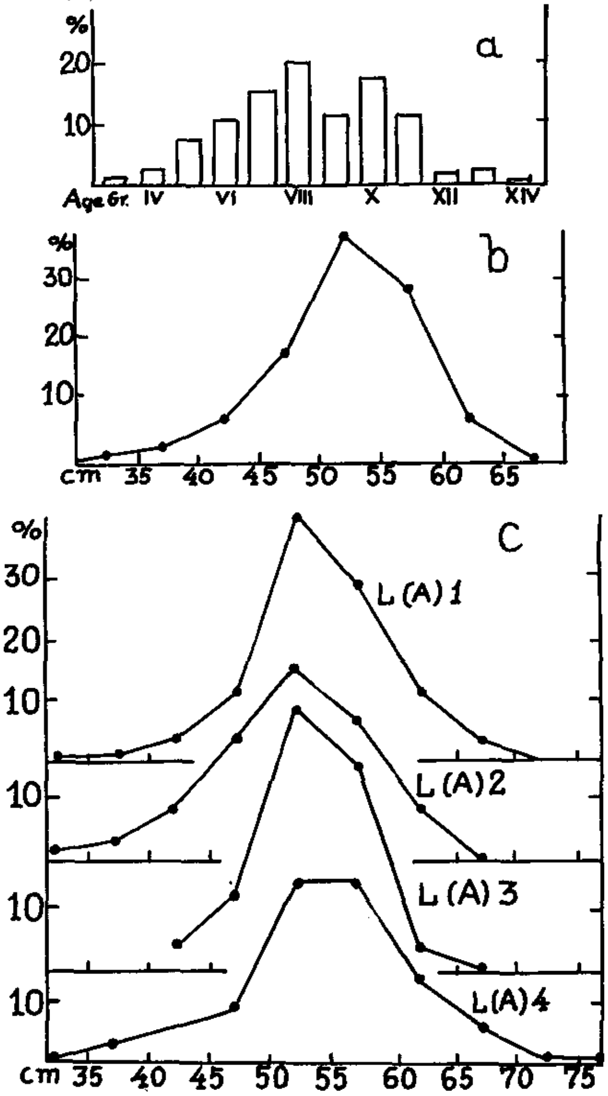


Fig. 3. Samples of cod caught 30 Oct.-1 Nov., 1955 by Portuguese trawlers in the Hamilton Inlet Bank Area (Subarea 2). a and b—age and length composition (Frequency %) of two samples (L(A) 2-3, 249 spec.); c—length composition of all 4 samples, L(A) 1—446 spec., L(A) 2—149 spec., L(A) 3—100 spec., L(A) 4—350 spec.

(a) **Composition of Samples as to Age, Sex-Ratio.**

Two samples from Hamilton Bank were studied (Tab. 5, Fig. 3a and b).

Age-groups VIII (19.7%) and X (17.3%) are predominating; Gr. VII is represented with 15.3%. Grs. VI and IX are represented by practically the same percentage (around 10%). All the remaining age-groups are very poorly represented or nearly non-existent (Grs. III, IV, XII, XIII and XIV).

The proportion of males (58.6%) is superior to that of the females, this being contrary to what is observed in Subarea 1.

The size curve shows a pronounced peak around 50-55 cm.

(b) **Growth, Ratio Length-Weight.**

The growth in Subarea 2 is rather slow (Table 5), the growth over a period of ten years being around 24 cm. in total (age-group III, 32.5 cm.; age-group XIII, 56.5 cm.). From age-group X and upwards, growth is very much reduced, almost at a standstill.

The average individual weight by 5 cm. groups was for the groups 47, 52, and 57 cm.:

Length	Males		Females	
Group (cm.)	No. Spec.	Kgs.	No. Spec.	Kgs.
47	10	1.033	—	—
52	21	1.339	22	1.247
57	17	1.533	15	1.596

The ratio was of the same order as in Subarea 1 for the 52 cm. length group (males, Greenland = 1,296 kgs; Labrador = 1.339 kgs.). In the 57 cm. size group the ratio is, however, higher than in Greenland (males, Greenland = 1.789 kgs., Labrador = 1.533 kgs.; females, Greenland = 1.700 kgs., Labrador = 1.596 kgs.).

(c) **Size Distribution.**

The size distribution by 5 cm. groups is shown for the four Labrador samples in Fig. 3, c.

TABLE 5. Age distribution and mean lengths of cod from Hamilton Inlet Bank, trawlers: L (A) 2, 31-X-55, 54°35'N. 54°40'W, and L (A) 3, 1-XI-55, 54°30'N, 54°30'W.

Year Class	Age	—Males— %	M.Length (cm.)	—Females— %	M.Length (cm.)	—Males and Females— Total	%	M.Length (cm.)
1952	III	100.0	32.5	—	—	2	0.8	32.5
1951	IV	80.0	38.7	20.0	39.0	5	2.0	38.9
1950	V	72.2	44.8	27.8	43.0	18	7.2	44.0
1949	VI	59.2	46.6	40.8	47.6	27	10.8	47.1
1948	VII	50.0	50.1	50.0	51.2	38	15.3	51.0
1947	VIII	63.3	52.4	36.7	53.1	49	19.7	52.8
1946	IX	57.1	54.4	42.9	55.0	28	11.2	54.7
1945	X	53.5	55.3	46.5	55.2	43	17.3	55.3
1944	XI	48.3	55.2	51.7	58.8	29	11.6	57.0
1943	XII	100.0	56.2	—	—	4	1.6	56.2
1942	XIII	60.0	56.6	40.0	56.5	5	2.0	56.6
1941	XIV	100.0	48.0		—	1	0.4	48.0
% in Sample			58.6%		41.4%	Obs.249		

VIII. Spanish Research Report, 1955.

A. REPORT ON THE CRUISE BY THE SPANISH VESSEL "CIERZO" IN THE WATERS OFF NEWFOUNDLAND, JUNE-JULY 1955

BY OLEGARIO RODRIGUEZ MARTIN.

Introduction

This report deals with the third scientific cruise carried out by Spain in the waters off Newfoundland, in accordance with the ICNAF Research Program.

The area investigated is the southern part of the Grand Banks of Newfoundland (Subarea 3), between 44°50′ to 44°20′ N and between 51°31′ and 50°02′W. The cruise took place in June and July 1955. The otter trawler "CIERZO" was used for the investigations. This vessel has a length of 56 m., and the holds carry 1,000 tons of fish. It is equipped with radio telegraphy and radio telephony, goniometer, echo sounder and fish lupe down to 600 m.

The trawl used was a Vigneron-Dahl trawl with slight modifications. The meshes in the trawl were measured during the cruise; a calibrator Kleinschak Industries, Model 28, Serial No. 10, with a pressure of ten lbs. was used. The size of the cod end meshes (used and wet) was 113 mm, the opening of the trawl 40 m. [1]).

([1] The trawl used equals in dimensions and in mesh-sizes that used during the Spanish researches in 1954. (Ex. Scer.)

The **cod** (*Gadus callarias* L.) and the **haddock** (*Melanogrammus aeglefinus* (L.) were studied.

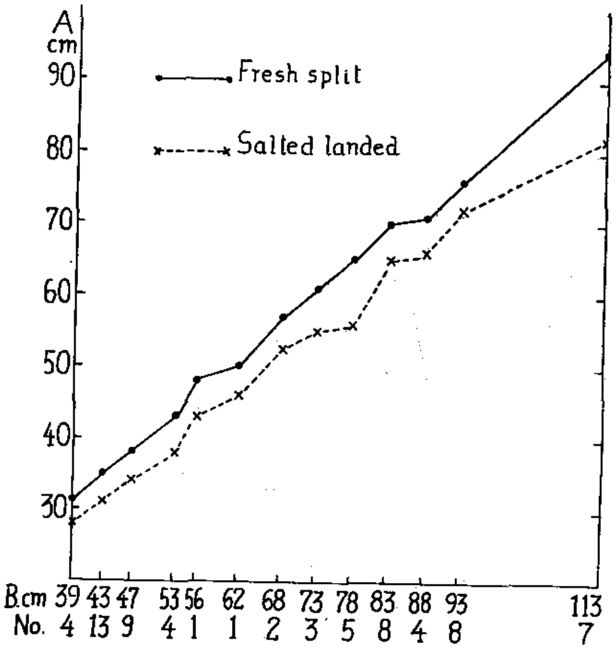


Fig. I. Relation between length of fresh split cod and salted cod (A) and total length of round fresh cod (B).

Relation between the Length of the Fish as Fresh Round and the Dimensions of the Bacalada (Split Cod) Fresh and Landed

The curves in Fig. 1 show the relation between the length of the fish as fresh round and the dimensions of the bacalada fresh and landed. The total length of the bacalada suffers a notable decrease during salting. This decrease amounts to 3-5 cm. according to the length of the fish.

Cod.

Size. In March-April, 1953, the cod captured were in general small. 600 specimens were measured, from the point of the snout to the hind margin of the tail fin. The dominating sizes were from 36-55 cm., the most common size being from 41-50 cm.

In June-July, 1954, the measurements were taken from the extreme anterior point of the snout to the central point of the hind margin of the tail fin (2,590 specimens).

If the observations from 1954 are compared with those from 1953 an increase of 10 cm. is observed in the average size of the cod caught. The real difference is a little more than the 10 cm. found, because in 1953 the measurements were taken to the extreme posterior margin of the caudal fin, whereas in this cruise the measurements were made to the central point of the hind margin, in order to comply with the norms used by the member countries of ICNAF.

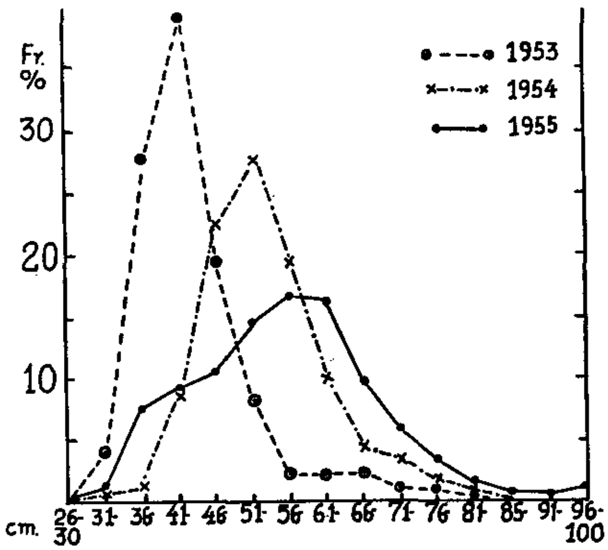


Fig. 2. Cod, Grand Bank, curves of length frequency percentages for the years 1953 (March-April 600 spec.), 1954 (June-July 2590 spec.), and 1955 (June-July 2475 spec.).

In June-July 1955, the measurements were taken as in 1954. 2,475 specimens were measured. The maximum frequencies of sizes are found within the 55-65 cm. group.

In Fig. 2 these observations are compared with those from the cruise in March-April 1953, and June-July 1954. A remarkable increase is observed in the average size of the cod caught from 1953 to 1955.

The minimum commercial size of the cod is around 40 cm.

The following table gives the length in 5 cm. groups:

cm.	freq.	%
26-30	4	0.16
31-35	44	1.17
36-40	184	7.4
41-45	227	9.1
46-50	277	11.1
51-55	359	14.5
56-60	416	16.8
61-65	402	16.2
66-70	235	9.7
71-75	147	5.9
76-80	79	3.2
81-85	40	1.6
86-90	20	0.8
91-95	13	0.52
96-100	4	0.16
101-105	10	0.4
106-110	6	0.24
111-115	8	0.32
	2,475	

Age. The otoliths were used for the study of age. In the fishing campaign of 1955, the 6 year old fish, born in 1949, are dominant, making up 29% of the total catch (Fig. 3). In 1954 the 5 year old fish were dominant, making up 32.7% (born in 1949). In 1953 this year class was second in importance, making up 18% of the total catch.

The fact that the 1949 year-class is the abundant one in the three years (1953-1954-1955) explains the increase in average size of the cod caught.

Stage of Maturity. By the end of June a significant part of the large cod had already spawned; all individuals of stage V are cod of a size of 50 cm. or more.

The spawning principally takes place in April and May.

In a sample of 292 specimens (Table 1) the proportions of males and females differed somewhat; respectively 133 and 159 specimens 45.5% and 54.5%).

Food. In 1953 (March-April) the stomachs contained crustaceans, molluscs, and various species of fish, mainly haddock, flatfish and small cod. In the small cod the stomachs were often filled with capelin.

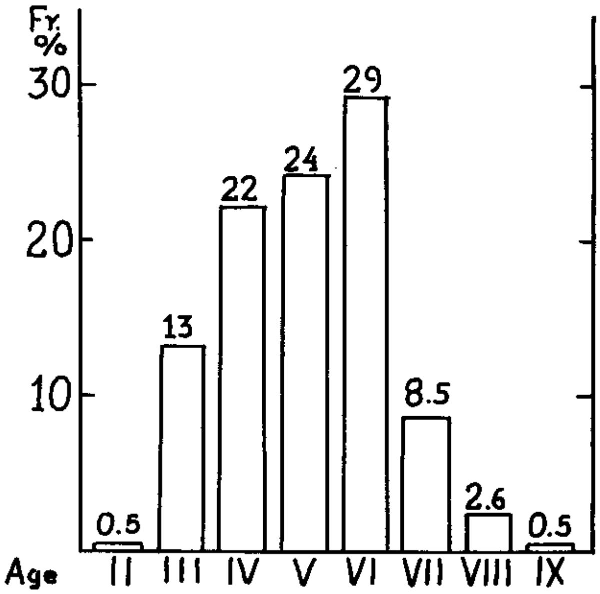


Fig. 3. Cod, Grand Bank, June-July 1955 (187 spec.). Age distribution in frequency percentages.

TABLE 1. COD-SIZE, SEX AND STAGE OF MATURITY

Stage of Maturity and Sex	I		II		III		IV		V		VI		TOTALS		
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	Total
26-30		3												3	3
31-35	2	6											2	6	8
36-40	8	9											8	9	17
41-45	13	13	1		1								15	13	28
46-50	9	21	3	3	1		1						14	24	38
51-55	16	15	4	5	1		1		1		4	4	27	24	51
56-60	4	3	4	11	4	3	1		3		7	15	23	32	55
61-65	1			1	3	2	3		6	3	8	13	21	19	40
66-70				1	1				5	1	1	10	7	12	19
71-75						1	1	1	4	3	2	4	7	9	16
76-80					1		2		1		3	1	7	1	8
81-85									1	1		4	1	5	6
86-90										1				1	1
101-105									1			1	1	1	2
TOTALS	53	70	12	21	12	6	9	1	22	9	25	52	133	159	
	123		33		18		10		31		77		292		292

In 1954 and 1955 (June-July), the stomachs of the cod were found to be filled with capelin, which at this season of the year are completely mature and in spawning schools. This is in contrast to what was found in March-April, 1953.

Temperature of Water.

In the first Spanish research cruise (March-April, 1953) it was found that 2°-3° C. was the optimum temperature for the cod, and 5°-6° the optimum temperature for the haddock.

In the second cruise (June-July, 1954) the temperatures varied between 3.9° and 4.2° C., that is, they varied only three tenths of a degree.

In the third cruise (June-July, 1955), at the bottom, where the fisheries is carried out, the temperatures varied between 2.5° and 5° C.

	Date	Temp°.
1953	(March-April)	0.1°—6.2° C.
1954	(June-July)	3.9°—4.2° C.
1955	(June-July)	2.5°—5.0° C.

B. RESEARCHES ON THE HADDOCK STOCK IN SUBAREA 3.

BY ALFONSO ROJO

a. Size Distribution.

The haddock is the object of a considerable fishery by Spanish vessels. The marketable size of haddock is from 40 cm. upwards.

In the years 1954 and 1955, several cruises have been made, each of about one month and all in Subarea 3 (the Grand Bank of Newfoundland). The subdivisions sampled were 30, 3P and 3N. From Subdivision 3N the data are from the summer of 1954 and 1955 and from the winter of 1955.

TABLE 2. Haddock, length - distribution in 3 cm. groups in Subdivisions 3N, 3P and 30, 1954-55.

Subdivision	3N June-July 1954		3P March-April 1955		30 April 1955		3N August 1955		3N December 1955	
cm.	%	No.	%	No.	%	No.	%	No.	%	No.
23	—	—	0.1	1	—	—	0.3	19	0.5	2
26	0.3	3	0.1	1	—	—	2.3	139	0.3	1
29	0.6	6	0.2	3	—	—	4.2	257	8.9	35
32	0.1	1	0.2	4	—	—	14.2	877	11.6	46
35	1.0	10	0.3	5	0.8	4	8.1	496	22.5	89
38	8.8	92	4.8	93	6.9	36	7.9	486	9.4	37
41	20.3	212	19.5	380	32.7	171	27.0	1,664	15.9	63
44	16.1	168	29.4	575	33.3	174	21.4	1,320	19.2	76
47	10.3	108	19.4	379	15.1	79	6.6	404	7.8	31
50	12.8	134	12.9	251	7.1	37	2.4	147	3.0	12
53	12.5	131	5.2	102	2.3	12	1.6	99	0.3	1
56	9.4	98	1.9	38	0.6	3	1.8	109	0.5	2
59	4.6	48	2.6	50	0.4	2	1.2	73	—	—
62	2.1	22	1.4	28	0.4	2	0.8	48	—	—
65	0.9	9	1.2	24	0.4	2	0.2	13	—	—
68	0.2	2	0.6	12	0.2	1	0.1	6	—	—
71	0.1	1	0.4	7	—	—	+	1	—	—
74	—	—	—	—	—	—	+	2	—	—
TOTAL	—	1,045	—	1,953	—	523	—	6,160	—	395

The numbers and frequency percentages for each 3 cm. size group are presented in Table 2.

The measurements were made to the half centimeter below, and from the extreme anterior point of the snout to the fork of the hind margin of the caudal fin.

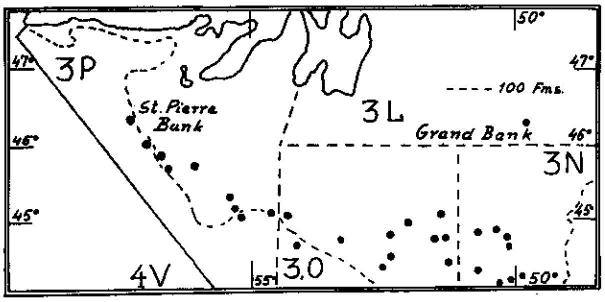


Fig. 4. Map showing localities from where haddock catches were sampled.

In the present paper only data from specimens caught by the trawl are used. (The localities from where samples were taken are shown in Fig. 4.) Other individuals caught accidentally in plankton nets or recovered from stomachs of greater fish have been discarded.

The size-distribution curves (Fig. 5) show two size peaks which correspond to two year-classes. In the curves that correspond to summer and winter of 1955 the two size peaks are displaced 3cm. to the right. This 3 cm. displacement indicates the increase in length during the months of summer and autumn. However, in the curve from 1954 the two peaks belong to larger (and older) individuals. These peaks can be explained by varying strength of recruitment due to yearly changes in climatic conditions for the

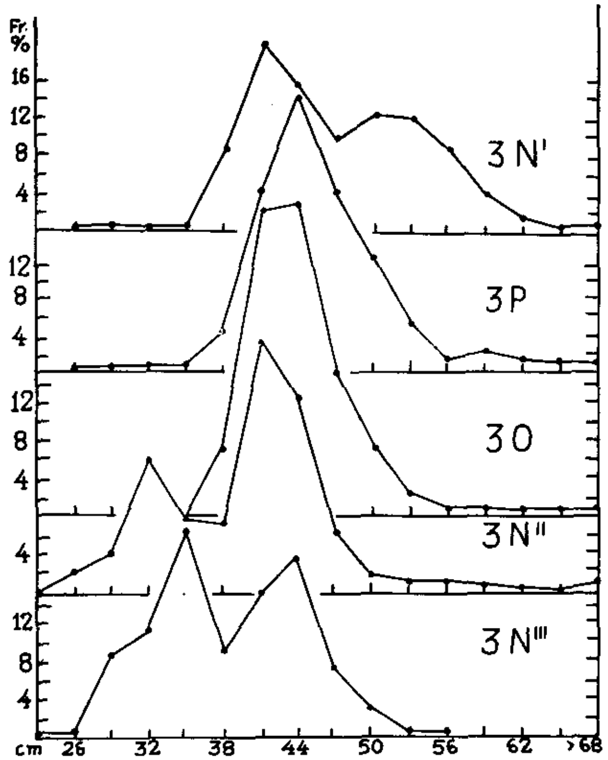


Fig. 5. Haddock, Subarea 3, 1955. Size distribution in frequency % by subdivisions. 3N'-June-July, 1954 (1,045 spec.), 3P-March-April, 1955 (1,096 spec.), 3O-April-1955 (523 spec.), 3N''-Aug., 1955 (6,152 spec.), 3N'''-Dec., 1955 (395 spec.).

larvae. Any of the curves can serve as a means of describing the biology of the species, but as the intensity of the fishery varies from year to year each curve has its own special value varying from year to year.

From subdivision 3N there are for the summer of 1955, frequency curves for successive days (Fig. 6). From these it appears that the curves vary somewhat in form from day to day, however preserving the same main pattern. The two peaks of the size curves are clearly apparent.

In Subdivision 30 one of the year-classes which predominates in 3N disappears, and only one peak is found which in 1955 corresponds to the size between 40 and 45 cm.

A case nearly analogous occurs in Subdivision 3P. Here the peak is also around 45 cm. leaving the year-classes corresponding to other sizes much reduced in frequency percentage.

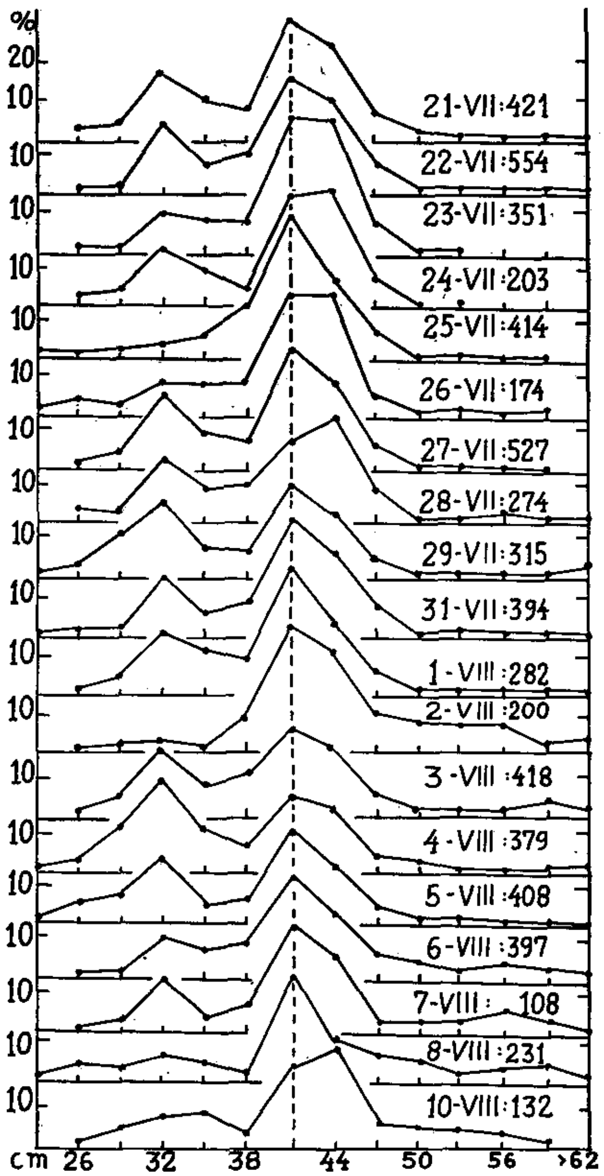


Fig. 6. Haddock. Size distribution on subsequent days, 21 July to 10 Aug., 1955, Subdivision 3N.

In Fig. 7 the frequency percentages of sizes in successive days are shown for Subdivision 3P. From these cruises, as well as from corresponding data for the cod, it becomes apparent that the various shoals of these fishes do not stay for a long time in that same place, and that there are various stocks migrating to and fro.

Finally in Fig. 8 the length distribution for all samples from the various subdivisions is summarized in 1 cm. classes. As there is a far greater material from Subdivision 3N, the general curve for the whole subarea resembles very much the curves characteristic for that subdivision.

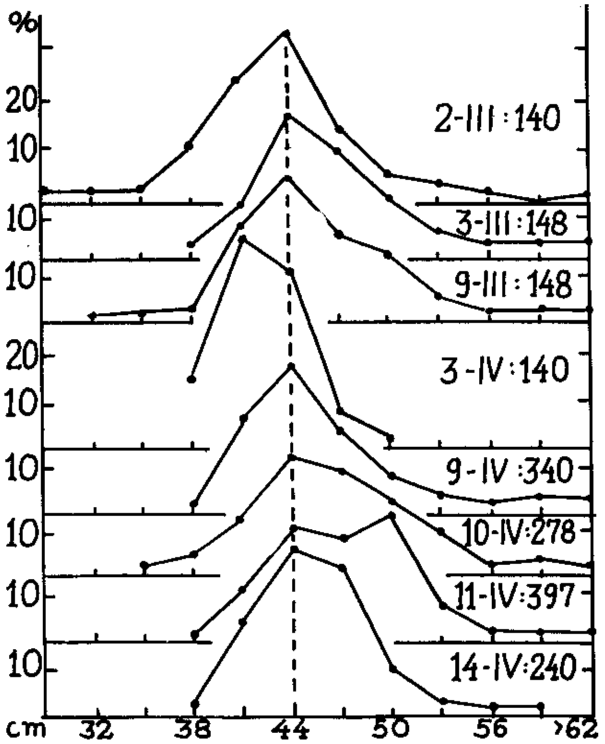


Fig. 7. Haddock. Size distribution on subsequent days, 2 March to 14 April, 1955, Subdivision 3P.

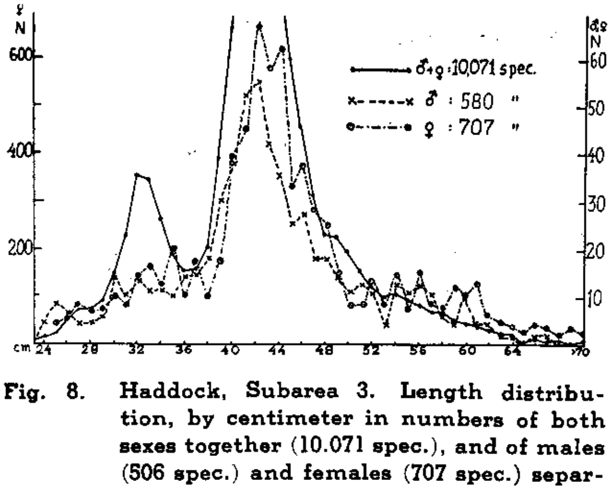


Fig. 8. Haddock, Subarea 3. Length distribution, by centimeter in numbers of both sexes together (10.071 spec.), and of males (506 spec.) and females (707 spec.) separately. (The curve for both sexes reaches for 42 cm. 950 spec.).

The smallest male found was 22 cm., the largest 71 cm. The smallest female was 22 cm., the largest 74 cm. Fig. 8 also shows the size distribution of males and females by cm. groups. The individual captures for both sexes are distributed in the same way according to length. The number of males and females are, as mentioned earlier practically the same. Therefore the curves for the females and for the males are parallel. This combined with the fact that sexual maturity for both sexes is attained at nearly the same age relieves us of the problem found for some other species, that the same size of meshes causes a different selection of males and of females.

b. Age and Growth. The scales were used for the study of age. The various subdivisions, 3N, 30, and 3P, were sampled separately, a small sample of 19 individuals from 3L (adjacent to 3N) was included in the material from 3N.

The mean length for each age group and for the three subdivisions is shown in Fig. 9a. The growth is largest in 3P, somewhat smaller in 30. The growth in 3N is just below that in 30.

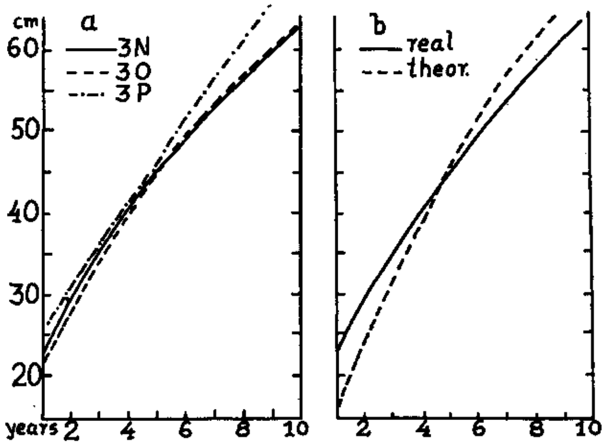


Fig. 9. Growth curves for haddock sampled in 1955 in Subarea 3; a—Subdivision 3N (732 spec.), 3O (339 spec.), and 3P (174 spec.); b—for the three subdivisions together (bold curve); the stipled curve shows the theoretic growth as calculated from the width of the zones in the scales.

Fig. 9 b summarizes the growth data for all three subdivisions (the bold line). The figure also shows a comparison of this actually observed growth (the bold line) with the "theoretic" growth, i.e. the growth calculated from the width of the zones in the scales. This therozetic growth is inferior to real growth up to an age of 5 years, thereafter superior.

Fig. 10 shows for 30 and 3N the size distribution (number of individuals for each 3cm. group) for each of the age groups II to X.

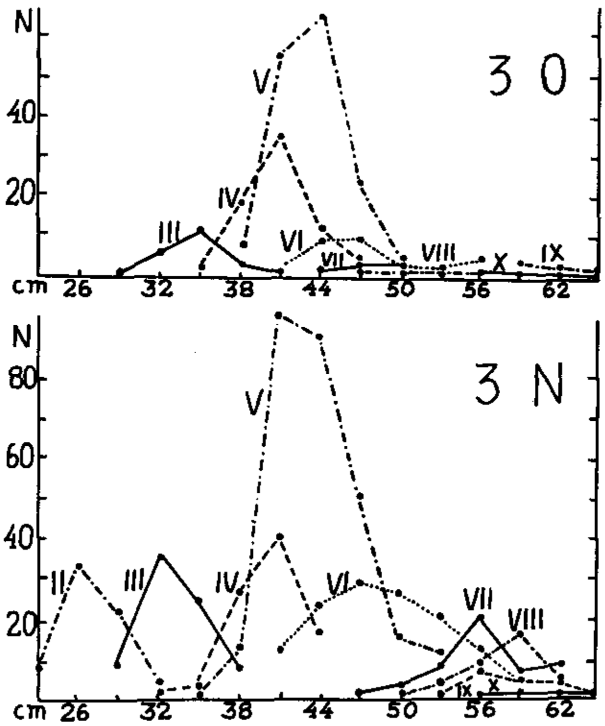


Fig. 10. **Size distribution of separate age-groups (II-X) of haddock from Subarea 3 (1955), Subdivision 30 above and 3N below.**

c. Year Class Distribution. The year-class distribution of haddock sampled from Spanish trawlers in 1955 is shown in Fig. 11 separately for the three subdivisions 3N, 30, and 3P.

A decided dominance of the 1950 year-class (Age-Gr. V.) is apparent, followed by 1951 and 1949. This especially holds good for the Grand Bank (3N and 30). For the St. Pierre Bank area (3P) the 1950 year-class is only slightly dominating, followed rather closely by the 1951 and 1952 year-classes.

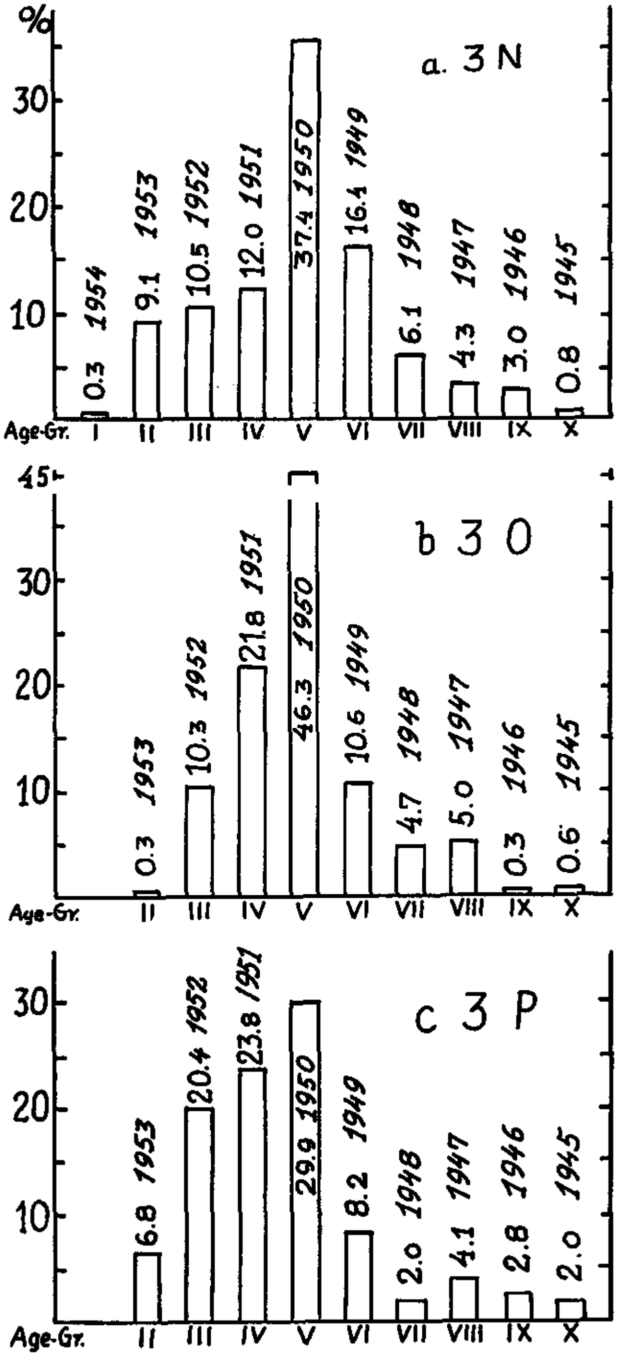


Fig. 11. **Haddock 1955. Age-distribution (frequency-%) for Subdivisions 3N, summer 1955—740 spec., 30, summer 1955—399 spec., and 3P, spring 1955—147 spec.**

d. Methods of age reading. The present investigation is based on scale readings. In order to find another method of age determination parts of the skeleton were investigated, and it was found that the hypural bone could be used for age-readings. In this bone concentric lines for each year of age are marked. A comparison between hypural bone and scales shows in a sample of 52 specimens 37 (or 71%) agreements.

e. Sex and Cycle of Maturity. Of 2,081 specimens 1,003 or 48.2% were males. The number of eggs (in the opaque stage) were counted in 19 spec. The results are shown in Fig. 12 for the various age groups and in Fig. 13 for the various 3 cm.-size-groups. The bold curves refer to the Grand Bank, the stipled curves show for comparison results from the North Sea (Raitt). There is a clear and true relation between fecundity (no. of eggs) and size and age. The comparison with the North Sea haddock shows that the North Sea haddock becomes mature at a somewhat earlier age than the Grand Bank haddock. For the same age group the numbers of eggs are higher for the Grand Bank than for the North Sea.

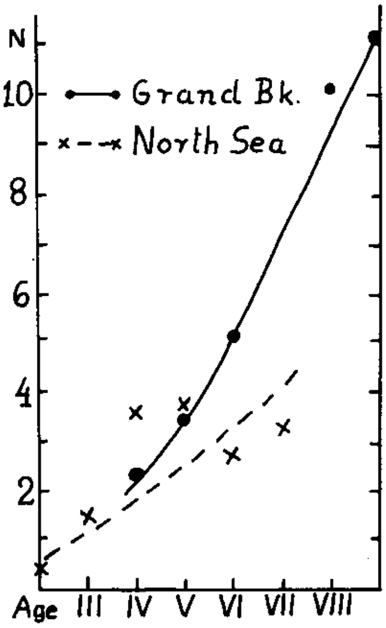


Fig. 12. Mean number of eggs, in 100,000, for individuals of various ages (Gr. II-IX); comparison Grand Bank—North Sea.

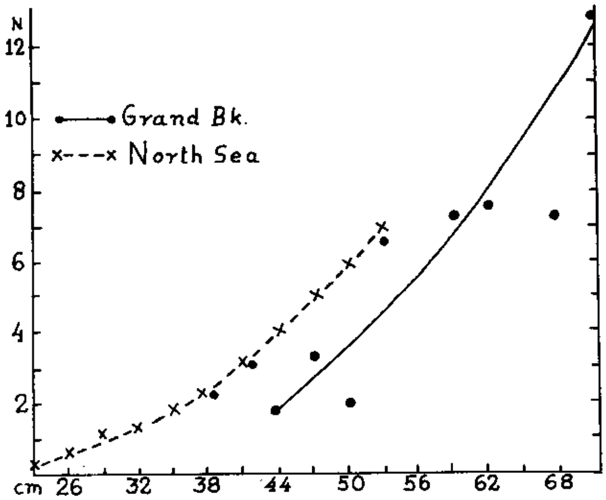


Fig. 13. Mean number of eggs, in 100,000, for individuals of various sizes (3 cm.-groups); comparison Grand Bank—North Sea.

In Fig. 14 is shown the percentage of immature specimens (males and females together at various ages. At an age of 3 years only very few are mature; at an age of 5 years near to 90% are mature.

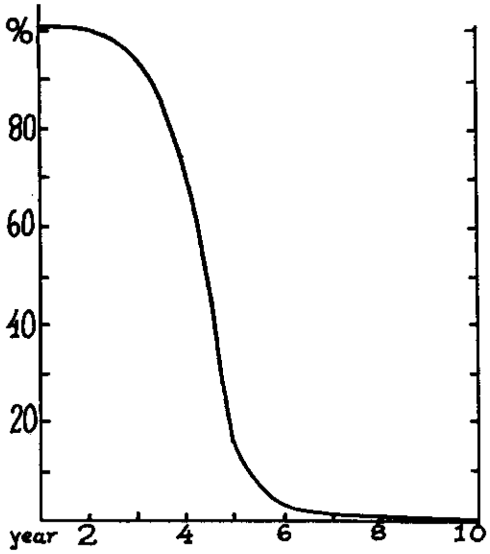


Fig. 14. Haddock, Subarea 3. Percentage of immature individuals for various ages.

The spawning period for haddock on the Grand Bank is from February to June, with the maximum spawning occuring in May.

f. Relation Weight-Size. The haddock used for this study were collected from Spanish vessels trawling on the Grand Bank in 1955. The number of specimens weighed and measured was 1583. Fig. 15 shows the curve for the relation weight-length.

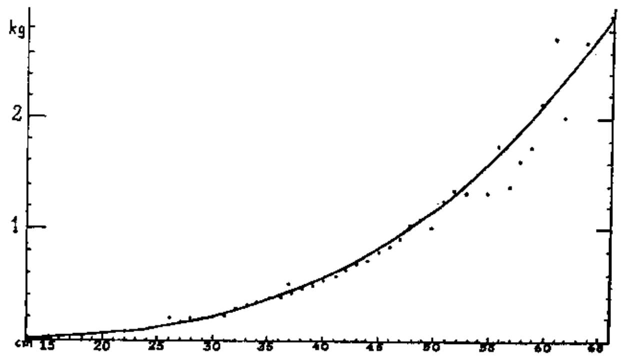


Fig. 15. **Relation weight-size of haddock from Subarea 3, 1955, 1583 spec.**

In addition to the here reported researches investigations on the conversion factor for haddock caught by Spanish trawlers were carried out. The conversion factors found in a material of 137 specimens were as follows (I = conversion factor from ready for salting to round fresh, II = conversion factor from landed weight to round fresh).

	Spring		Summer	
	I	II	I	II
1953	1.60	3.10	—	—
1954	—	—	1.49	2.82
1955	1.50	3.03	1.58	3.10

The experiments further show that once dehydration has taken place (after 1 to 1½ months in the hold) no change in conversion factor appears from a prolonged stay in the holds.

IX. United Kingdom Research Report for the Year 1955.

BY C. E. LUCAS AND R. S. WIMPENNY

The fishing effort of first-class trawlers based on English and Welsh ports visiting the south-west coast of Greenland (Subarea 1) was lower than in previous years, most probably on account of the good fishing obtainable on the Iceland and Barents Sea grounds. Landings from Subarea 3 increased, however, as a result of the operations of a special trawler which processed its catch on board. The distribution of trawler voyages and their landings were as follows:

	Voyages	Metric tons
Subdiv. 1F	18	2,755
Subdiv. 1D	2	550
Subarea 3	4	3,627

From the landings in Subarea 1 a small number of length measurements were made and sampling of otoliths was begun, using a system of uniform selection. Although both are insufficient for any deductions as to the importance of year-classes or length composition, they are reported here as they may be useful for supplementing material collected by other countries.

Cape Farvel-Danas Bank waters, 1955

Length-distribution 751 spec.		Age distribution, 26-VIII to 19-X (38 specimens)		
cms.	Fr. %	Age Group	Fr. %	M. lgth. cm.
45-49	1.4	IV	3	51
50-54	8.0	V	18	54
55-59	11.0	VI	10	59
60-64	15.6	VII	5	67
65-69	16.5	VIII	24	69
70-74	11.0	IX	0	—
75-79	12.2	X	24	36
80-84	9.6	XI	8	80
85-89	9.6	XII	0	—
90-94	4.3	XIII	5	74
95-99	0.8	XVI	3	123

The size and age distribution is shown in Fig. 1.

There were no landings by vessels based on Scottish ports from ICNAF subareas during 1955; consequently, neither sampling nor measurements of catches were necessary, although observation is being maintained on stocks, particularly halibut, in the waters between East Greenland and Iceland.

The second special cruise to investigate waters to the east of Greenland was made between 22nd April and 21st May in 1955, with special attention being paid to the distribution of halibut eggs and larvae, hydrography and line fishing for halibut. A report on this cruise will be appearing in the "Annales Biologiques" of the International Council for the Exploration of the Sea, Volume XII (Distant Northern Seas section) by A. D. McIntyre and J. H. Steele.

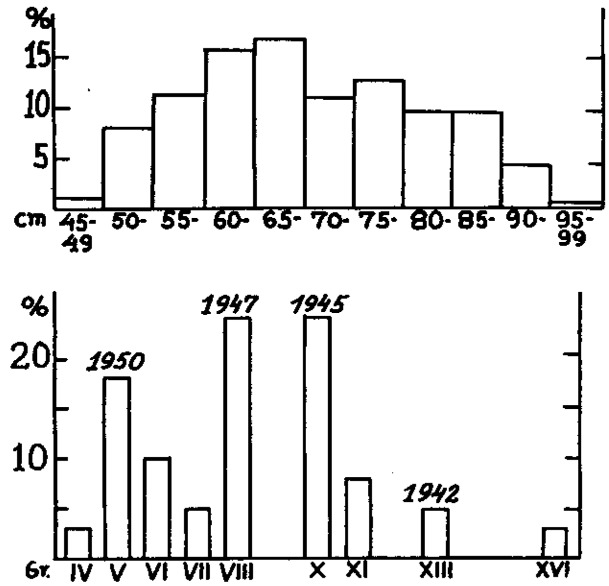


Fig. 1. **Size and age distribution in frequency % of cod caught by British Trawlers in the area Cape Farvel-Danas Bank, 1955.**

X. United States Research, 1955

BY HERBERT W. GRAHAM

CHIEF, NORTH ATLANTIC HERY INVESTIGATIONS,
FISH AND WILDLIFE SERVICE, WOODS HOLE, MASS.

SUBAREA 5.

Haddock (*Melanogrammus aeglefinus* (L.))

Georges Bank Population in 1955. Scrod landings were considerably lower than in 1954 but still were dominant over large haddock landings as in the previous five years. The very successful 1952 year-class was dominant again, as it had been in 1954, and was landed as large haddock and as large sized scrod.

Haddock were abundant but the total landings were lower than in 1954 due to decreased effort. The landings consisted of 81 million pounds, of which 46 million were scrod and 35 million were large haddock.

The 1953 and 1954 year-classes appear to be relatively scarce. It is too early to measure the strength of the 1955 year-class. A period of relatively low abundance is expected next year due to the poor contributions of the year-classes entering since 1952.

Effects of Mesh Regulation. The study boat program was continued throughout the year. Six vessels were licensed to fish with the old small mesh nets to provide an index of abundance of incoming year-classes comparable with that obtained before regulation. At the same time these vessels furnish valuable information on the sizes and quantities of fish saved by the larger mesh.

The sea sampling program was also continued throughout the year. Two observers were employed to make regular trips on the commercial trawlers, both regulation and licensed vessels, in order to record the numbers and sizes of fish discarded as well as to make other observations relevant to the assessment of the mesh regulation.

The nets with larger mesh cod ends continued to release under-sized haddock but caught more large fish than the nets with small mesh—

a continued indication of the greater efficiency of the large mesh gear as a fishing device.

A study of the effect of saving the small haddock, the conservation value of the regulation, was continued. The relative abundance of each incoming year-class was determined, and the pounds landed per unit of effort throughout the life of each year-class were recorded. The 1952 year-class promises to provide information needed to give the first preliminary estimate of the values of saving the small fish. This is the first large year-class to enter the fishery under the protection of the large mesh gear. The landings of three-year-old fish from this brood (1955 landings) compared with landings of three-year-old fish from earlier broods of similar initial strength should tell us whether the abundance of the 1952 year-class is now greater than it would have been if subjected to small mesh fishing during its first two years of life. This test will by no means be conclusive. Some three-year-old fish are released by large mesh gear. Consequently, the full conservation effect is not achieved until the fish are four or more years old. Furthermore, it will be necessary to follow several year-classes completely through the fishery to obtain results which are statistically reliable.

The Problem of Exemptions. A small fleet of trawlers fishing primarily for species other than haddock do land some trips of haddock in excess of 5,000 pounds although their annual catch of haddock is less than ten percent. Since small mesh is alleged to be necessary for profitable trips of redfish this fleet has petitioned for relief in the form of an annual exemption. A study of the effects of such exemptions on the conservation of the Georges Bank haddock was initiated. A report was submitted at the 1956 annual meeting.

Certification of Nets. The practice of certifying new cod ends was continued during 1955. Under certain atmospheric conditions there is a shrinkage of twine during storage. For this reason some cod ends manufactured as 5-$\frac{5}{8}$ inches (between knot centers) were not passing the certification test. To insure certification of all nets shipped, most manufacturers voluntarily increased the mesh size of manila (4/50 double) to sizes between 5-11/16 and 6 inches. As a result the after use size (inside, wet) averaged 4-11/16 inches instead of the required 4-1/2 inches.

Certification of a few cod ends made of other materials such as lighter manila, cotton, certain synthetics, and treated twines was also carried out. A large share of this certification was experimental in order to provide information for conversion factors for these types of twine.

Food Habits. An examination of the diet of haddock on Georges Bank was continued. This year the studies were broadened to include collections of bottom fauna on haddock grounds as well as collections of material actually ingested by the fish. Present studies are designed to shed light on the problem of possible selectivity of the haddock in its feeding habits.

Fingerling haddock caught in an Isaacs-Kidd mid-water trawl were feeding principally upon planktonic *Calanus*, not an important food for the bottom living adult haddock. Bottom stages on Georges Bank live almost entirely on bottom living invertebrates. The variety of species eaten would suggest that haddock are not selective feeders. Another important point to be investigated is the relative nutritive value of the common species in the diet. The prime question to be answered by the studies, however, is the extent to which distribution and abundance of food organisms influence the migrations and aggregating of haddock during non-spawning seasons.

Drift of Eggs and Larvae. The program of study of the relation of environmental conditions to year-class strength of haddock initiated in 1953 was resumed in 1955. Four plankton-hydrographic cruises were conducted in the spring by the *Albatross III* over the general area of the Gulf of Maine and Georges Bank. Temperature, salinity, and wind observations were made and drift bottles released.

In the fall months collections were made on the bottom to determine the distribution of fingerlings resulting from the spring spawning. Comparison of all these observations with commercial landings over a five year period will shed light on the factors responsible for the fluctuations in year-class strength on Georges Bank.

Cod (*Gadus callarias* L.).

Although cod is of secondary importance to the United States it is the most important species in the Convention Area from the standpoint of the Commission as a whole. Upon the insistence of the Commission the United States started a study of cod biology in Subarea 5. This is at present in a preliminary stage and no results can be reported. A tagging program was initiated designed to determine the relation of the cod stocks off New Jersey in winter (the southernmost limit of the species) with the stocks found in Subarea 5 in the summer. Over 500 fish were tagged in this initial phase of the program.

Silver Hake (*Merluccius bilinearis* (Mitchill))

An investigation of the biology of this species in Subarea 5 was initiated during the year. Attention was focused first on systematics. It was soon found that *M. bilinearis* is the only species now commercially exploited. The next problem was the division of stocks within this species. Material has now been collected from all the exploited stocks. Analysis of these collections is under way. A tagging technique has been developed which will afford a means of testing conclusions regarding distribution of stocks within the area.

Data have been collected on growth, mortality, and abundance. A method of age determination has been developed. These studies are designed to determine the extent of the silver hake population in Subarea 5, the degree to which it is fished today, and the fishing pressure which the stocks can withstand.

Flounder Studies.

Work is continuing on the biology of the yellowtail flounder (*Limanda ferruginea* (Storer)). Since this species is now less available than other species of flounders work was started on such others as the summer flounder (*Paralichthys dentatus* (L.) and blackback flounder (*Pseudopleuronectes americanus* (Walbaum).)

Industrial Fishery.

An investigation of the processing industry in New England reveals that the principal species now being exploited for meal and oil is the red hake (*Urophycis chuss* (Walbaum).) A study of the biology of this species has been initiated to determine how much pressure the population can withstand. This so-called "trash" fishery takes other species as well and all of these are receiving some attention.

Redfish (*Sebastes marinus* (L.)).

Abundance Studies. The recording of landings and fishing effort for all areas fished (Commission Subareas 3, 4, and 5) was continued routinely at the three major U.S. redfish ports (Rockland and Portland, Maine; and Gloucester, Mass.). Catch per unit effort was computed for all areas.

Results of these studies are presented in the following table:

Comparison of Preliminary 1955 Catch Per Day Estimates With 1954 Data

	1954		1955	
	Landings 1000 lbs.	C/D 1000 lbs.	Landings 1000 lbs.	C/D (Approx.) 1000 lbs.
Gulf of Maine	28,632.0	7.42	26,770.7	8.1
Nova Scotia Banks	48,728.0	24.24	28,309.7	20 +
Gulf of St. Lawrence	40,652.4	25.00	77,412.1	26
Grand Banks	68,939.6	38.60	26,154.3	30

Much effort in the Gulf of St. Lawrence was on virgin stocks of redfish. The reduction in catch per day on the Grand Banks has been the most spectacular feature of the abundance study. It would appear that a level of equilibrium at 20-25 thousand pounds per day is likely in another two or three years. High was 67 thousand pounds per day in 1951.

Age and Growth. With the validity of age determinations accepted, the program was expanded to obtain age compositions of populations, especially of pre-commercial sizes. Age determination of fishes from the Grand Bank is more difficult than of fishes from the Gulf of Maine.

Breeding Habits. Sex ratios, sizes at maturity, time of spawning, fecundity, and lengths of gestation periods were routinely recorded from commercial landings. Essential knowledge of the breeding habits of stocks in the Northwest Atlantic is slowly accumulating.

Racial Studies. Important work on the problem of racial differentiation has been conducted. Only in the Gulf of St. Lawrence is there any indication of two groups of fish and this lead requires further testing.

SUBAREA 4.

Haddock.

The U.S. completed its study of the haddock in Subarea 4. Growth rates were determined for two stocks, Browns Bank and Sable Island, and provisional computations of population dynamics of these stocks were made. Canada and the U. S. have now set up a cooperative study of the haddock in Subarea 4, Canada sends the U. S. data and specimens collected in Subdivision 4X while the U. S. sends Canada data and specimens collected in the other subdivisions of the Subarea. Otoliths and scales are read by each country.

Redfish.

See under Subarea 5.

SUBAREA 3.

Redfish.

See under Subarea 5.

Hydrography.

U. S. Coast Guard participating in International Ice Patrol examined the physical oceanography of the Grand Banks Region and the Labrador Sea during April, May, June and July including one cruise from Flemish Cap to the tail of the Bank, two cruises over the N.E. slope of the Grand Banks north of the latitude of Flemish Cap and the usual post season cruise from the Bonaventure triangle to Cape Farewell. This material is in press, and will be published in the U. S. Coast Guard Bulletin No. 41.

The U. S. Fish and Wildlife Service (N.A. section) in connection with surveys of haddock eggs and larvae has collected temperature (bathythermograph) and surface salinity data in Subarea 5 during the period, late February to end of May and again in September. Nearly 3,400 drift bottles were released in the course of the spring surveys. The results of the 1953 field season are nearly ready for publication.

The Woods Hole Oceanographic Institution commenced in July a three year study of the waters of the continental shelf south of New England. One cruise was made in August.

PART 3.

B. Compilation of Research Reports by Subareas, 1955.

BY ERIK M. POULSEN

Summaries of researches carried out in 1955 were reported by the following countries: Canada, Denmark, France, Germany, Iceland, Norway, Portugal, Spain, United Kingdom and United States. The table below shows the distribution of researches by subareas and countries (+ + indicates researches from special research vessels, + only observations made by observers or on other state vessels or on commercial fishing vessels):

Subarea	1	2	3	4	5
Canada		++	++	++	
Denmark	++	++			
France	+	+	+	+	+
Germany	+				
Iceland	+				
Italy					
Norway	+				
Portugal	+	+	+		
Spain			+		
United Kingdom	+				
United States	+	+	+	++	++

Of the researches carried out by France only the extent and not the results have been reported up to date.

Subareas 1 and 3 are those in which more extensive research work has been carried out by more than one country and therefore those mainly to be considered in this compilation. The extensive researches in Subarea 5 are all (apart from some observations of surface temperatures made by France) carried out by United States. (Vide U.S.A. Research Report page 64).

SUBAREA 1.

Research vessel "Dana" (Denmark), July-August.
Research cutters "Adolf Jensen", "Tornaq" and "Immanuel" (Denmark), over the year.
Frigate "Aventure" (France), summer.
Research vessel "Anton Dohrn" (Germany), September-October.
Commercial fishing vessel (Iceland), summer.
Commercial fishing vessel (Norway), summer.
Hospital ship "Gil Eannes" (Portugal), June-September.
Commercial fishing vessels (Portugal), summer.
Commercial fishing vessel (U K.).
Hydrographic observations (U.S. Coast Guard).

A. Hydrography.

6 sections from the coast between Frederikshåb and Hare Island across the fishing banks to 58-59°W Long. July (Denmark).
1 section Cape Farvel-Hamilton Inlet Bank. July (Denmark).
1 section Faroes-East Greenland. July (Denmark).
1 section Cape Farvel-Iceland. August (Denmark).
1 section across the Davis Strait (66°N), observations of surface temperatures up to 68°N (France); results not yet reported.
8 sections off the West coast of Greenland (Germany); results not reported.
3 sections across Fylla Bank, S, and N, and Lille Hellefiske Bank. August (Norway).
Hydrographic observations Newfoundland-Kap Farvel (U.S.A), results not reported.

All reports state the ice conditions to be unusually severe in 1955. The Danish sections accordingly show comparatively low temperatures on and near Fyllas Bank. Farther north (Lille and Store Hellefiske Bks.) temperatures about normal or even a little higher than normal were found.

This change in hydrographic conditions from 1954 to 1955 is illustrated by Figures 1 and 2.

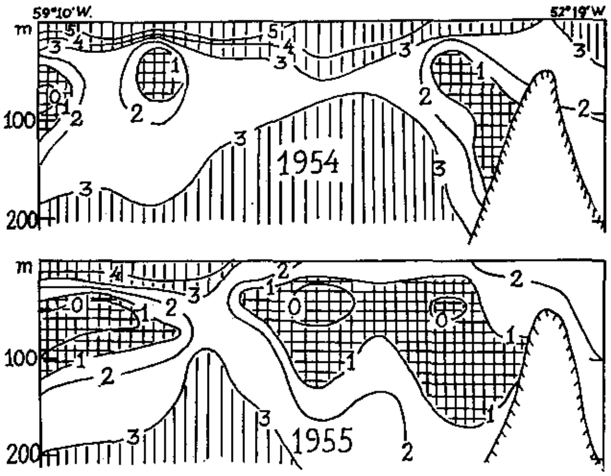


Fig. 1. Comparison 1954 to 1955 of temperatures in the upper 200 m. of the Danish Fylla Bank section. Temp. over 3°C. vertically striated, temp. below 1°C. double striated.

Fig. 1 shows for the upper part of the Danish Fylla Bk. section the temperatures in the water layers down to 200 m. on 21 July 1954 and on 21 July 1955. The water layers with temperatures of more than 3°C. (3-5°) are vertically striated, the layers with temperatures below 1°C. (-0.2 to +1°) are doubly striated.

In 1954 water with temperatures from 3 to 5° covered most of the surface layer down to ca. 40 m. depth and also the area over deep water to the west of the bank up to ca. 75-200 metres. In 1955, surface water of more than 3° was only found in the western part of the section. In the eastern and central part the temperature was only from 1 to 2.8°. Over the deep, west of the bank, water masses of more than 3° were far less extensive in 1955 than in 1954. In 1954 cold water, 0 to +1°, was only found as a tongue on the western slope of the bank. In 1955 such cold water was found between 30 and 150 m. over a large area westwards from the bank. In 1954 the cold Labrador current just touched the western part of the section; in 1955 it reached farther east nearly reaching the bulk of cold water (below +1°) stretching west from the bank. This indicates that the decrease is due not only to an increase of the Arctic component of the E. Greenland current, but also to an eastward expansion of the Labrador current. The question of the expansion of the Labrador current cannot be studied more closely, as hydrographic observations have not been reported from the region off the Canadian east coast, north of Hamilton Inlet Bank.

Fig. 2 from the Norwegian section over the N. part of Lille Hellefiske Bank, shows that in this more northern region the temperature is not lower in 1955 than in 1954. Lower temperatures were found in two small patches of surface water and in a small patch close to the bottom.

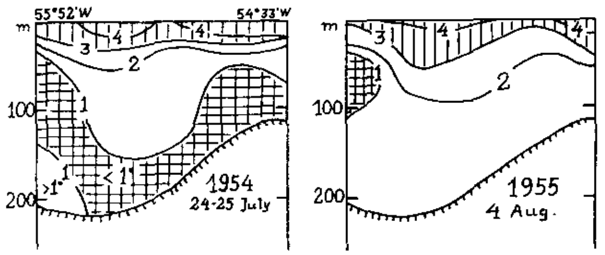


Fig. 2. Comparison 1954 to 1955 of temperatures in the Norwegian section across N. part of Lille Hellefiske Bank. Temp. over 3°C. vertically striated, temp. below 1°C. double striated.

Everywhere else the temperature was a little higher in 1955 than in 1954.

B. Cod. The numbers of cod *larvae* (caught in July by 2m. stramin net from "Dana") were very small, as in the previous year. The numbers caught per 30 minutes were as follows for the years 1950-1955:

	1950	1951	1952	1953	1954	1955
No. per 30 min.	8	?	1.6	4.1	1.3	1.3

It is in good accordance with these variations in amount of larvae that within this period, the year-classes 1950 and 1953 are (according to the Danish Research Report) rich year-classes.

Special Danish researches on the abundance of young cod in near coastal waters and in fjords showed that among the *youngest year-classes* the 1953 year-class is rich. It might be of interest to have these investigations with small meshed gears expanded to include part of the bank areas.

As in previous years, a most efficient sampling of cod was carried out. Samplings were reported by Denmark, Germany, Iceland, Norway, Portugal and United Kingdom.

From the Danish report it is of interest to note that the rich 1950 year-class now is strongly represented in the catches, especially in the northern area. In the Portuguese samples this young year-class still is scarce, however less in the north than in the south. In all the Norwegian samples the 1950 year-class is scarce. The dominant year-class in the Icelandic, Norwegian and Portuguese fisheries is the 1947, followed by the 1945 and 1942. In the Icelandic catches the 1949 year-class is also well represented. In the German samples from off the central west-coast the 1947 year-class predominates. Off the southwest coast the 1945 year-class is the richest followed by the 1950, 1949, and 1947 year-classes.

Figure 3 shows the age-distribution of cod sampled in 1955 (ca. 11,000 spec.) in the various subdivisions (A-F) of Subarea 1. The figure is compiled from the separate samples reported by Denmark, Iceland, Norway and Portugal (the other countries sampling the subarea have not reported data permitting a division by subdivisions.)

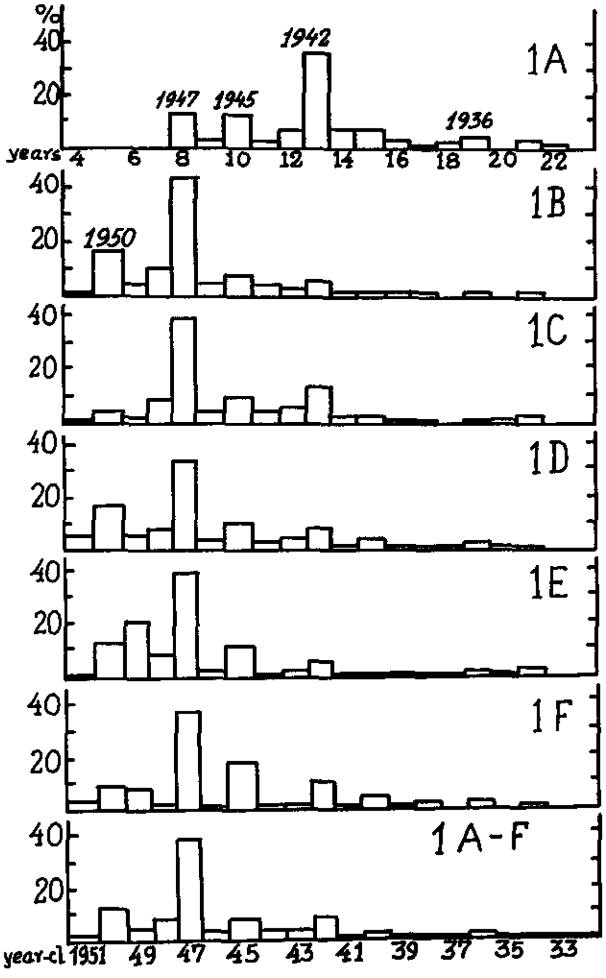


Fig. 3. Age distribution of cod in the various subdivisions of Subarea 1, and in the whole subarea in 1955. Compiled from the Danish, Icelandic, Norwegian and Portuguese samples.

Subdivision 1A, the most northern subdivision, differs from the other subdivisions by the very pronounced dominance of the old, rich 1942 year-class, which still makes up 36%; in the other subdivisions it does not exceed 13%.

In the other subdivisions the rich 1947 year-class dominates (30-40%); it is followed by the 1950, 1945 and 1942 year-classes. The young rich 1950 year-class is especially rich in Subdivisions B and D. It is of interest to note that the 1949 year-class is the next rich one in Subdivision E; for the other subdivisions it must be noted as poor. Its high percentage in this subdivision is caused by a high frequency percentage in two samples from near coastal waters.

The diagram of the age distribution from the whole Subarea 1 shows the absolute predominance of the 1947 year-class (38%), next comes 1950 with 12%, 1942 and 1945 with respectively 9.3 and 8.9%.

C. In accordance with decision of Panel 1, *halibut* researches have been commenced in Subarea 1, and a number of taggings have been carried out by Norway.

SUBAREA 2.

Research vessel "Investigator II" (Canada), July-August.
Research vessel "Dana" (Denmark), July.
Frigate "l'Aventure" (France), summer.
Commercial fishing vessel (Portugal), autumn.
Hydrographic observations (U.S. Coast Guard).

A. Hydrography.

1 section across Hamilton Inlet Bank, July-August (Canada).
1 section Hamilton Inlet Bank-Cape Farvel, July (Denmark).
Hydrographic observations in offshore waters (France).

On the Hamilton Inlet Bank and closer to the coast, the volume of water below 0°C. was much smaller in 1955 than in 1954. (See Fig. 4). Also the Danish section from the first half of July shows a considerably smaller mass of cold water over the eastern slope of the bank in 1955 than in 1954.

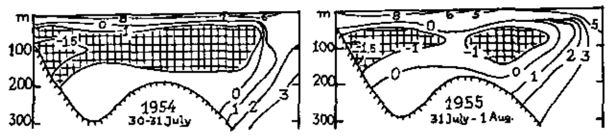


Fig. 4. Comparison 1954 to 1955 of temperatures in the Canadian section of Hamilton Inlet Bank. Temp. below minus 1°C. double striated.

The only country which has reported biological work from Subarea 2 is Portugal. Four samples of cod were collected from trawlers. The 1947 and 1945 year-classes dominate in the samples, i.e. year-classes which also are rich in W.

Greenland waters; however the difference between richer and poorer year-classes is far less pronounced in Subarea 2 than in 1.

Fig. 5 shows a comparison of the age distribution of the trawl-caught cod in 1955 from Hamilton Bank with trawl-caught cod from Subarea 1 (Fyllas Bank) also by Portuguese vessels, and from Subarea 3 (southern Grand Bank), Spanish vessel.

The length-distribution curve shows a peak between 50 and 55 cm., in W. Greenland waters the peak is between 70 and 75 cm. This indicates

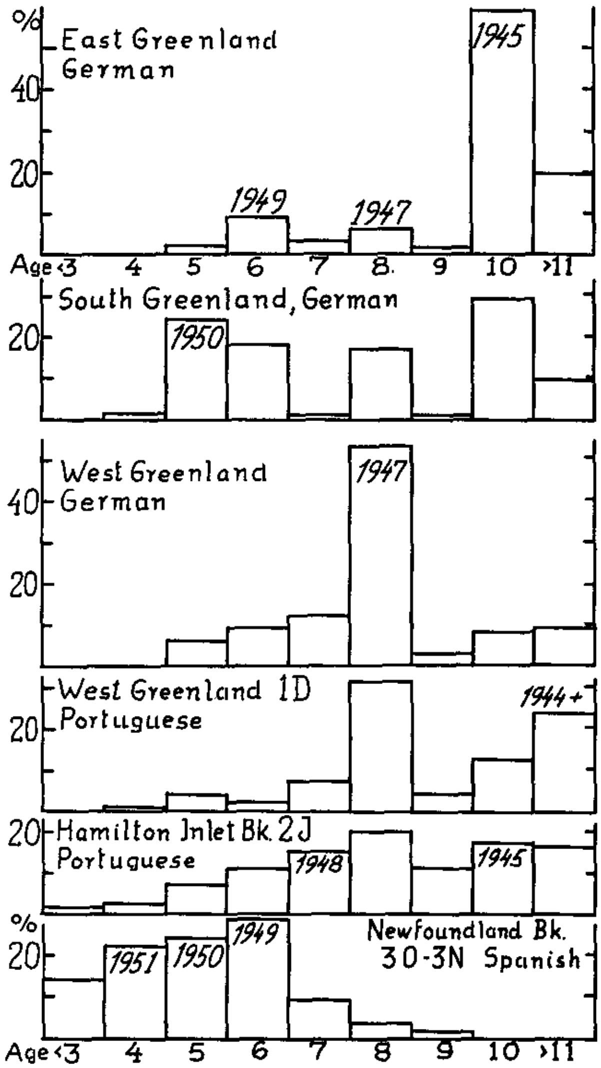


Fig. 5. Age distribution in frequency % of cod caught in trawl in various parts of the Convention Area in 1955.

a far slower growth in the waters off Labrador than in those off W. Greenland. This also appears from a comparison of mean lengths of age-groups (from Portuguese samples):

		W. Greenland	Labrador
Age Group VIII	(year-class 1947)	68-71 cm.	52.8 cm.
Age Group X	(year-class 1945)	75-80 cm.	55.3 cm.

SUBAREA 3.

Various research vessels (Canada), over the year.
Frigate "l' Aventure" (France), spring, autumn.
Hospital ship "Gil Eannes" (Portugal), spring-autumn.
Commercial fishing vessels (Portugal), spring-autumn.
Commercial fishing vessel (Spain), June-July.
Samplings and hydrographic observations (U.S.A.), over the year.

A. Hydrography.

Sections across S. Grand Bank and St. Pierre Bank, April, and 5 sections from the coast across the Grand Bank, July-August (Canada); data from one of these reported to the Commission.
Observations on the Grand Bank (France), over the year.
Observations in connection with commercial fishery (Spain), June-July.

Close to the Newfoundland east coast (Avalon Channel) and on the central part of the Grand Bank, temperatures were not as low as in 1954. Along the N.E. and S.W. slope of the Bank there were greater amounts of cold water in 1955 than in 1954.

These differences between the two years are illustrated by Fig. 6 in which the Canadian sections St. John's-Flemish Cap, for the years 1954 and 1955, are shown together. The water mass below minus 1°C. in the Avalon Channel (the coastal branch of the Labrador current) is somewhat larger in 1954 than in 1955, reaching farther east and closer to the surface. Over the east slope of the Grand Bank the branch of the Labrador current (temperature from -1 to +1°) stretches

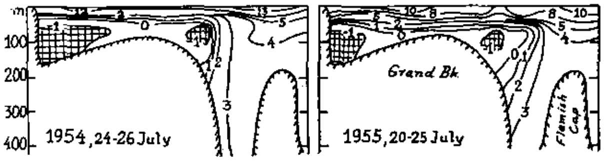


Fig. 6. Comparison 1954 to 1955 of temperatures in the Canadian section across the Grand Bank. Temp. below minus 1°C. double striated.

a little farther east in 1955 than in 1954. The waters of the surface layer are, however, decidedly colder in 1955 (8-11°) than in 1954 (12-13°). It seems that the weakening of the Labrador current in coastal waters is followed in 1955 by a spreading of cold water towards the east. This expanding to the east of the Labrador current was also observed in 1955 in Subarea 1.

B. Haddock.

The rich 1949 year-class still dominates the catches of the Canadian fishery. The 1952 year-class was plentiful on the S.E. Grand Bank and moderate numbers of the 1953 year-class were present here. (Spanish samplings).

C. Cod.

Considerable tagging experiments were carried out by Canada.

Commercial samples of cod from the southern part of the Grand Bank were measured and aged by Spain. The size-curve shows a peak between 56 and 65 cm. The 6-year-old fish, the rich 1949 year-class, made up the bulk of the cod (29%), just as it did in 1954 (33%); in 1953 it was the next rich year-class (18%). Accordingly the cod caught by the Spanish vessels has increased in size over the last three years:

1953	—	43.7 cm.
1954	—	54.4 cm.
1955	—	57.2 cm.

The age-distribution of the Spanish sample is shown in Fig. 5 together with corresponding samples from Subareas 1 and 2. In the samples from Subareas 2 and 3 that striking difference in strength of year-class known from Subarea 1 was not found. The sample from the Grand Bank shows almost the same frequencies for the age-groups IV, V and VI. The mean age of the cod in the Spanish sample from the Grand Bank is far below that in the samples from Subareas 1 and 2.

A series of samples have been taken on board Portuguese dory vessels and trawlers; the results have not yet been reported.

D. Redfish.

Considerable samplings of redfish have been carried out from Canada. Special samplings of quite small redfish over two years have verified the very slow growth:

Dec. 1953	— 7.1 cm.
Dec. 1954	— 9.0 cm.
Oct.-Nov. 1955	—11.8 cm.

Thus the growth is only ca. 2 cm. a year. The group sampled was born either in 1951 or in 1952.

E. American Plaice.

Recaptures from a large Canadian tagging experiment in 1954 show only inconsiderable migrations.

SUBAREA 4.

Various research vessels (Canada), over the year.
Various commercial vessels (Canada), over the year.
Frigate "l 'Aventure" (France), over the year.
Various research vessels (U.S.A.), over the year.
Various commercial vessels (U.S.A.), over the year.

A. Hydrography.

Three seasonal surveys of Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Canada). Results from the Scotian Shelf (section off Halifax) reported to the Commission.
Analyses of surface water at six coastal stations (Canada), over the year.

Over the Scotian Shelf the surface layer was warmer than in 1954, but the temperature of the cold water below was lower in 1955 than in 1954. (Fig. 7). It appears from the figure that the

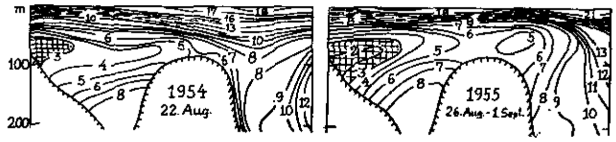


Fig. 7. **Comparison 1954 to 1955 of temperatures in the Canadian section off Halifax. Temp. below 3°C. double striated.**

water mass close to the coast with a temperature of below 3°C. stretches farther down and farther east in 1955 than in 1954. However, in the eastern part of the section the rather cold bank water (7-8°) did not, in the summer of 1955, as in 1954, penetrate eastwards between the sunheated surface layer and the Gulf Stream water.

B. Haddock.

The Canadian researches were centred on the study of the validity of the otolith method for ageing. Its validity was proven also by the observation that the rich year-classes can be followed from year to year as peaks on the size-distribution curves.

C. Cod.

Population studies (Canada) showed that the post-war change from line-fishing to trawl-fishing has caused a decrease in size of cod, which now is below the optimum for maximal landings.

The taggings were continued. The results from the last years taggings are reported in table form. They show the following percentages of recoveries:

after $1\frac{1}{2}$ years — 25, 34, 36, 43, 45 and 48%
after $2\frac{1}{2}$ years — 30, 35, 55, and 65%.

Studies of mesh selection and of effect of chafing-gear were carried out for cod and haddock.

D. Redfish.

Growth and maturity were studied (Canada), especially the Gulf of St. Lawrence. Growth is faster for females than for males.

E. Halibut.

Landing statistics were studied. A considerable number of small halibut are caught by vessels fishing for other species. Through reduction of these catches of small halibut, it may be possible to increase total halibut landings.

The study of the halibut fisheries and the stocks has now been initiated over wide regions of the Convention Area (Subareas 1 and 4). A co-ordination of the methods in use by the various nations would be advisable in order that results can be reached which could form a base for an adequate protection of the stocks.

F. Fish eggs and larvae.

Studies of the distribution of fish eggs and larvae were continued by Canada in most of Subarea 4.

As a negative feature of the research reports has to be mentioned, that none of the European countries fishing in Subarea 4 have sampled their commercial catches. As the European fleets fish a considerable part of the cod in Subarea 4, it is desirable that such sampling be carried out, to be compiled and compared with Canadian samples, when reported.

SUBAREA 5.

Researches in this subarea were carried out only by U.S.A. They were, as in earlier years, centred on haddock and redfish, but considerable attention was also paid to hake and flounder. Special researches were made on the distribution of fish eggs and larvae. Experimental fishing for the location of new stocks of marketable fish was carried out in deeper water in the subarea.

As no other country undertakes researches in the subarea, no compilation is necessary.
The U.S.A. Research Report p. 64.

ALL SUBAREAS.

Fig. 5 shows age distribution, summer 1955, of commercially sampled cod in the area from East-Greenland and West Greenland to Newfoundland. Off East Greenland the 1945 year-class is as dominating as the 1947 year-class is off West Greenland. The South Greenland area is intermediary between East and West, however, with the 1945 year-class rather dominating. The South Greenland area is distinctive from the two other areas by the rather strong 1949 and 1950 year-classes. In Subarea 2 (Labrador) the 1947 year-class is slightly dominating followed closely by the 1945 and 1948 year-classes. On the Grand Bank (Subarea 3) the young 1949 to 1951 year-classes make up the bulk of the sample investigated.

Hydrography of the Whole Area and of Adjacent Areas

Fig. 8 shows the temperatures (°C.) in 50 metres depth over the Convention Area. The figure is compiled from sections taken in July-August and reported by Canada, Denmark and Norway.

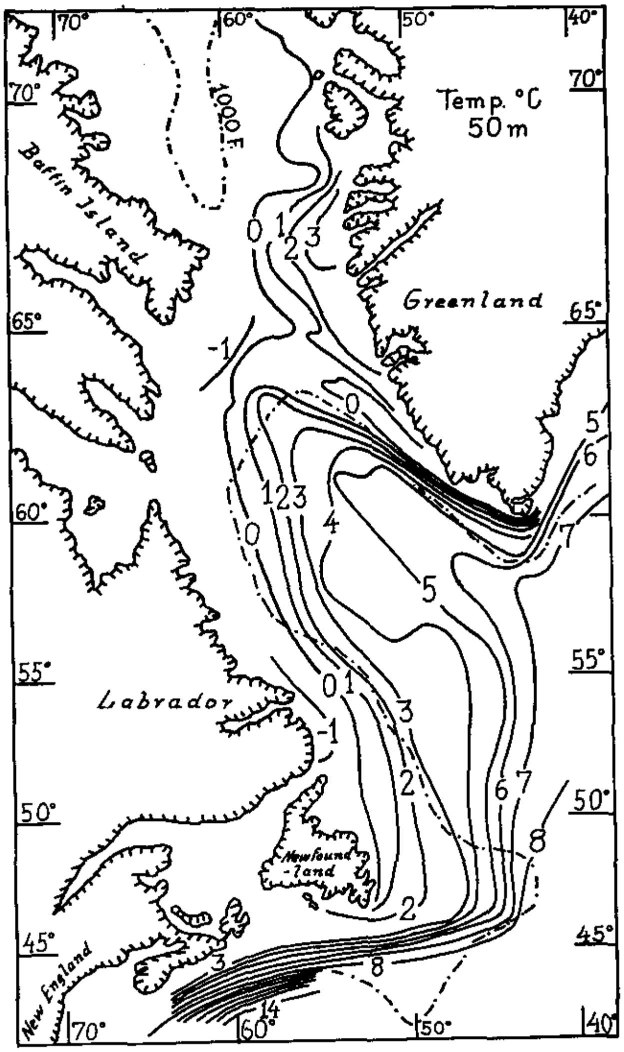


Fig. 8. Isotherms in 50 m. depth in the Convention Area July-Aug., 1955, compiled from the Canadian, Danish, and Norwegian sections.

Off the south and SE coast of Greenland the temperature at 50 m. was decidedly lower in 1955 than in 1954 (see Fig. 9). The 7° isotherm is farther away from Cape Farvel in 1955 than in 1954. An appreciable tongue of below zero water

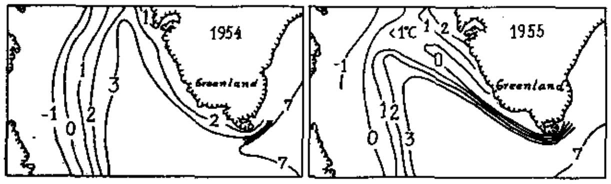


Fig. 9. The situation of the 50 m. isotherms off SW Greenland in 1954 and 1955.

penetrated in 1955 from Cape Farvel in offshore water north to off Godthåb in an area where in 1954 temperatures between 2 and 3° were found. Further in 1954 the cold waters of the Labrador current and those of the Greenland coastal waters were separated by a mass of water over +2°C. This mass was absent in 1955 and water below +1° "unites" the two water masses.

Included in the Danish Research Report are figures showing temperature and salinity of two trans-Atlantic sections, from the Faroes to SE Greenland and from Cape Farvel to the English Channel.

The research report states that the Polar current to the SE of Greenland is of greater volume in 1955 than usual, and that the sharp front between the cold sub-Arctic water and the warmer Atlantic water is - as in 1954 - situated in the SW part of the trough between the Reykjanes Ridge and the Mid-Atlantic Ridge at about the same longitude as in 1954.

Thus one may conclude that the decrease in water temperature off S and SW Greenland is a more local phenomenon, caused by a strengthening of the East Greenland Polar current and possibly also the Labrador Current, and not by changes in the Mid-Atlantic Gulf Stream area. We might, therefore, hope that it is just a yearly oscillation and not an indication of a widely ranged climatic change.