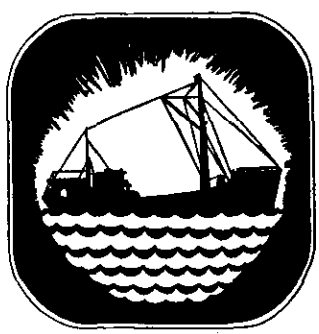
INTERNATIONAL COMMISSION

FOR THE

NORTHWEST ATLANTIC FISHERIES



ANNUAL PROCEEDINGS

Vol. 7

for the year

1956-57

Issued from the Headquarters of the Commission
Halifax, N.S., Canada
1957

ROLPH-CLARK-STONE, MARITIMES, LIMITED
HALIFAX, N. S.
OCTOBER, 1957

CONTENTS

FOREWORD

The Commission's publications have been established in two annual series since 1953; 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 (new revised list in this Ann. Proc.).

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 Statistical Bulletins Vol. 1-3 dealt with the more important groups of groundfish. The Statistical Bulletins from vol. 4 (year 1954) also deal with the other fishes and with shellfish, however in a more summarized form.

The Statistical Bulletin for the year 1956 will be published in the beginning of 1958.

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

At the 1957 Annual Meeting the Commission decided to publish a "Sampling Yearbook" including in tabular form length measurements, age determinations and possibly other data relating to the stocks of commercial fish species, and collected by the member countries in ports or on board fishing vessels or research vessels.

The first volume of the "Yearbook" including data from 1955 and 1956 is expected to be published (by an off-set method) in 1957/58.

Erik M. Poulsen,
Executive Secretary.

Halifax, 31 October, 1957

PART 1

Administrative Report for the Year ending 30 June 1957

BY THE EXECUTIVE SECRETARY, ERIK M. POULSEN

1. Germany Becomes Member of the Commission.

The Federal Republic of Germany deposited on June 27, 1957, the ratification of its adherence to the International Convention for the Northwest Atlantic Fisheries with the Depositary Government.

By this action Germany has, as of that date, become a member of the International Commission for the Northwest Atlantic Fisheries.

According to the decision taken at the 1957 Annual Meeting Germany following its ratification of adherence becomes, as from July 1957, a member of Panel 1 (see Chairman's Report, this Proceedings page 10).

Close cooperation between Germany and ICNAF has already existed for some years. German observers have participated in our Annual Meetings, Germany has reported its researches and statistical data from its fisheries in the Convention Area, and research programs have been exchanged between Germany and the member countries. This cooperation can now be extended to the mutual benefit of all eleven member countries.

2. Officers during the Year.

Chairman of Commission—Captain Tavares de Almeida, Portugal

Vice-Chairman of Commission—
Mr. Klaus Sunnanå, 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.

3. Panel Memberships 1956/57

Country	Panel No. 1	2	3	4	5	Total
Canada		+	+	+	+	4
Denmark	+					1
France	+	+	+	+		4
Iceland	+					1
Italy	+	+	+	+		4
Norway	+					1
Portugal	+	+	+	+		4
Spain	+	+	+	+		4
United Kingdom	+		+			2
United States			+	+	+	3
TOTAL	8	5	7	6	2	28

4. Newsletters.

Newsletters were distributed from headquarters in order to circulate information relevant to Commission's activities and interests on 1 Sept. 1956, 3 Dec. 1956, and 29 April 1957.

5. Commission's Publications.

The Annual Proceedings, vol. 6, for the year 1955-56 was issued in October, 1956.

The Statistical Bulletin, vol. 5, for the year 1955, was issued in March, 1957.

6. 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 1956 by Dr. Jón Jónsson (Iceland). Mr. G. R. Clark (Canada) represented ICNAF at the Annual Meeting of the North Pacific Fisheries Commission in November, 1956. Dr. Å. V. Tåning was replaced by Mr. Helge Thomsen Mag. sc. (Denmark) as representative of ICNAF at the Meeting in Göteborg of the CSAGI (International Geophysical Year 1957/58). Dr. L. A. Walford (U.S.A.) represented ICNAF in a meeting in March, 1957 with representatives of FAO and ICES for the planning of the joint Workshop on Population Dynamics and Gear Selection in Lisbon in May-June 1957.

7. Co-operation with Non-Member Countries.

Observers from the Federal Republic of Germany and from the U.S.S.R. attended the 1956 Annual Meeting in Halifax and the 1957 Annual Meeting in Lisbon. Co-operation with the German Fisheries Institutes covering the collection of statistics and the planning of and reporting on research work has been continued.

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

8. Research Programs.

According to Commission's decision, research programs for 1957 were forwarded to the Secretariat during December 1956 - February 1957 from a number of member countries and from Germany. They were—together with a summary—distributed within the Commission during the same months. The summary with particulars of the hydrographic plans was also sent to the CSAGI (International Geophysical Year 1957/58), and to the International Ice Patrol, U.S.A.

9. Research Summaries.

Research summaries for the year 1956 were received in the Secretariat from the various member countries and from Germany during the first months of 1957 and distributed as documents for the 1957 Annual Meeting.

10. Sampling.

Following a decision of the 1956 Annual Meeting samples of commercially fished cod and haddock have been reported from a number of member countries, while other countries have reported some sampling in connection with their research summaries. The reported samples were circulated in a summary form. The original complete reports are filed in the Secretariat. According to decision by the Commission the sample data will be published in a "Sampling Yearbook."

11. Collection of Statistics.

The Commission's collecting of statistics and the compilation of the data in the Secretariat has been continued according to Commission requirements.

The reporting of statistical data is being extended to include the collection of data on the quantity of fish discarded at sea. The data on fishing effort and catches is in part being broken down according to the species sought. However in both cases the collection of the data is not complete.

Following the recommendation of the Committee on Research and Statistics the use of I.B.M. punched cards in processing the statistical data has been investigated over the past year. It was found that the Statistical Bulletin could be prepared in much less time than previously and that the I.B.M. punched card method was very useful for preparing all the necessary summary tables. The use of the I.B.M. cards also facilitated the re-arrangement of the detailed data on fishing efforts and landings into the more accessible arrangement by subdivisions and months used in Statistical Bulletin, vol. 5, which was recommended by the Committee on Research and Statistics.

12. Collection of Information on Mesh Sizes.

In accordance with decision by the Standing Committee on Research and Statistics various information on trawl mesh sizes and on dimensions of trawls have been received from a number of member countries. The information is being compiled in the Secretariat for distribution within the Commission.

13. Collection of Information on Fishing Vessels.

Lists of the vessels of over fifty gross tons fishing in the Convention Area in 1956 have been submitted by most member countries. These lists give for each vessel—the name, date built, gear used, gross tonnage, length, registration number, home port, engine and fuel, horse power, number of crew, subareas fished and whether radio, radar, echosounder, echoranger or loran are carried. It is expected that these lists will be published shortly with a summary.

14. Seventh Annual Meeting.

The Seventh Annual Meeting was convened in Lisbon, Portugal 20-25 May, 1957 on the invitation of the Portuguese Government. It was preceded by meetings of the Standing Committee on Research and Statistics 17-18 May, and followed by a Workshop on Population Dynamics and Gear Selectivity held as a joint meeting by FAO, ICES and ICNAF from 27 May to 3 June, 1957 (see Chairman's Report, Part 2).

15. Other Matters.

In October, 1956 the Biologist/Statistician visited the Dominion Bureau of Statistics in Ottawa where he was assisted in the preparation of an I.B.M. system for use with ICNAF's statistical data and with the processing of some of the data. The information and advice obtained on this visit was of considerable benefit in the preparation of an I.B.M. system suited to ICNAF's needs.

In December, 1956 the Executive Secretary and the Biologist/Statistician participated as observers in a meeting held in Portland, Maine, by scientists from Canada and U.S.A. After the meeting the Executive Secretary travelled to the laboratories in Woods Hole and St. Andrews where he discussed various matters connected with the Commission's work, mainly problems concerning the reporting of samples of commercially caught fish.

In February-March, 1957 the Biologist/-Statistician attended a two weeks course on Population Dynamics in Lowestoft, England. In this connection he visited the fishery laboratories in Lowestoft, England and Aberdeen, Scotland for discussions of matters connected with the Commission's work.

The French Government sent Captain Michelet to Canada and U.S.A. to study the various means by which the problem of securing the trawl during hauling (chafing gear) is being solved by the fishing industries of these two countries. The arrangements for his studies, including trips on research vessels and commercial fishing vessels, were made by representatives of the Canadian and U.S.A. fisheries authorities. Captain Michelet's mission lasted for about a month and a half (March-April, 1957).

The data from a hydrographic section across the Labrador Sea taken by the International Ice Patrol, U.S.A. was placed at the disposal of the Commission, and circulated within the Commission on 15 October, 1956 (Ser. No. 425).

A list of annotated papers relevant to Commission's work was circulated on 15 October, 1956 (Ser. No. 424).

The annual addition to the Guide to ICNAF Papers covering the period 1955/56 was circulated on 1 October, 1956 (Ser. No. 421).

A guide to sampling of commercially caught fish was distributed within the Commission on 1 October, 1956 (Ser. No. 422).

A prescribed form for the reporting of data on Mesh Sizes of Trawls was circulated within the Commission on 5 October 1956 (Ser. No. 423).

16. Financial Statements for the Fiscal Year ending 30 June, 1957.

The accounts of the Commission for the year ending 30 June, 1957 show an appropriation of $ Can. 40,216.00 and a total expenditure of $37,298.74, leaving an unobligated balance of $2,917.26.

The audit of the Commission's finances for the fiscal year ending 30 June, 1957, was made by the Auditor General's Office of the Government of Canada in July, 1957.

The report from the Auditor General's Office, of August 9, 1957 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 depositary.

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 appropriation for the year ended 30 June 1957

Purposes of Appropriations	Appropriated by Commission	Transfers approved by Commission	Amended Appropriations	Obligations incurred	Unobligated Balances of Appropriations
Personal Services	$21,966	+$137.33	$22,103.33	$22,103.33	$
Travel	6,550	— 137.33	6,412.67	5,740.16	672.51
Transportation of things	400		400.00	127.00	273.00
Communication services	1,000		1,000.00	826.98	173.02
Rent and utility services	300		300.00		300.00
Other contractual services, including printing	6,000		6,000.00	5,352.33	647.67
Supplies and materials	2,000	— 243.73	1,756.27	1,025.09	731.18
Equipment	800		800.00	750.59	49.41
Annual Meeting	1,200	+ 243.73	1,443.73	1,373.26	70.47
	$40,216		$40,216.00	$37,298.74	$2,917.26

Statement 2

Statement of income and expenditure for the year ended 30 June 1957

Income:		
Members' contributions assessed—		
Canada	$ 5,221.72	
Denmark	1,701.35	
France	5,221.72	
Iceland	1,699.46	
Italy	5,221.72	
Norway	1,700.42	
Portugal	5,221.72	
Spain	5,221.72	
United Kingdom	2,874.19	
United States	4,047.96	
		$ 38,131.98
Unobligated balances of 1955-56 appropriations		2,083.99
Credit due Iceland re overpayment 1955-56	.96	
Less: Underpayment by Denmark 1955-56	.93	.03
		40,216.00
Miscellaneous income		
Proceeds from sales of Commission publications		499.87
		40,715.87
Deduct: Obligations incurred (Statement 1)		37,298.74
Excess of income over obligations carried to Surplus Account		3,417.13

Statement 3

Statement of assets and liabilities as at 30 June 1957

Assets				Liabilities	
GENERAL FUND					
Cash at bank			$ 5,350.86	Credits due to Member States:	
Contributions receivable:					
				From 1952-53 contributions of Italy	$ 3,704.86
Iceland 1956-57		1,699.46			
Italy:					
1953-54	$ 8.14			Due to Working Capital Fund	5,260.00
1954-55	55.76				
1956-57	5,221.72				
		5,285.62			
United States 1956-57		46.05	7,031.13	Surplus Account	3,417.13
			12,381.99		12,381.99
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 Seventh Annual Meeting

20 - 25 May, 1957

BY THE CHAIRMAN — TAVARES DE ALMEIDA

1. Time and Place of Meeting.

The Seventh Annual Meeting of the Commission was convened in Lisbon, Portugal, 20th May 1957, and continued in Estoril, Portugal, May 21-25 inclusive. The Annual Meeting was preceded by special meetings of the Standing Committee on Research and Statistics on 17th and 18th May, and followed by a Joint Workshop by FAO, ICES and ICNAF on Population Dynamics and Selectivity of Fishing Gear 27th May to 3rd June.

2. Participants (Appendix I)

Commissioners, most of them accompanied by advisers and experts, 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 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, and International North Pacific Fisheries Commission.

3. Opening of the Meeting.

The opening session was convened at the Palacio das Galveias, Campo Pequeno, Lisbon, 20th May at 10:00 a.m. The meeting was presided over by the Chairman with the attendance of the Portuguese Ministers of Marine and Economy and other Government representatives, members of the Diplomatic Corps of the member countries, representatives of fisheries and of scientific departments. Also present were the members

of the delegations of the ICNAF countries and observers from other countries and from international organizations.

The Chairman opened the meeting welcoming the guests, observers and participants, and introduced the Minister of Marine.

The Minister of Marine, His Excellency Admiral Americo Tomaz, addressed a welcome to the Commission. He expressed his government's pleasure in being host to this important Commission at its first Annual Meeting in a European member country. He hoped and trusted that this meeting would be successful and of great benefit to the fishing industries operating in the Convention Area.

The heads of the delegations of the member countries responded to the Minister's address, expressing their thanks for the invitation to convene this Annual Meeting in Portugal, one of the first countries to harvest the rich resources of the Northwest Atlantic.

With thanks to all present, the Chairman declared the adjournment of the opening meeting.

4. **The Agenda** (Agenda item 2, see Appendix II)

The First Plenary Session reconvened in Hotel do Parque, Estoril, where the Chairman addressed a welcome to the meeting participants.

The agenda, which had been circulated more than sixty days in advance of the meeting, was adopted on a motion by Denmark, seconded by France. It was understood that items could be dealt with out of their numerical order if necessary, and 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 Meeting** (Agenda Item 3)

The Chairman informed the Plenary that the Portuguese Government had provided the services of Mr. L. Nunes and Mr. M. Aguas. On the Chairman's proposal a committee consisting of the Commission's Chairman and Vice-Chairman and the Chairmen of the Standing Committees on Finance and Administration and Research and Statistics was appointed to work with the press officers and to approve press releases.

6. **Review of Panel Memberships** (Agenda Item 4)

The German observers informed the Plenary that Germany would wish to take a membership in Panel 1 from the date on which it became a member of the Commission. Upon recommendation by Panel 1, as well as by the two standing committees, the Commission agreed that Germany be admitted to membership in Panel 1 on receipt of notification from the Depositary Government that the adherence of Germany had been deposited.

7. **Report on Staff Matters, etc.** (Agenda Items 5 and 6)

Upon recommendation by the Standing Committee on Finance and Administration the Commission approved the Auditor's Report for 1955/56, and expressed its gratitude to the Auditor General of Canada for carrying out the audit. The Commission further, on the recommendation of the Standing Committee on Finance and Administration, approved the Administrative Report for 1956/57 (up to 30 April, 1957) and the provisional financial statements for 1956/57 (up to 30 April, 1957) including transfers of $137.33 from item Travel to item Personal Services, and of $243.73 from item Supplies and Materials to item Annual Meeting.

The Commission agreed, upon recommendation by the Standing Committee on Finance and Administration, to establish in the Secretariat a new position of typist as of 1 July, 1957.

8. **Budget** (Agenda Items 7 and 8)

The Commission approved the recommendation of the Committee on Finance and Administration to appropriate $45,175.00 for the year 1957/58 for the following purposes:

1. Personal Services	
a. Salaries	$25,070.00
b. Superannuation	2,255.00
2. Travelling	2,600.00
3. Transportation of Things	200.00
4. Communication Services	1,200.00
5. Rent and Utility Services	1,800.00
6. Other Contractual Services, including printing	8,000.00
7. Supplies and Materials	1,800.00
8. Equipment	1,800.00
9. Annual Meeting	450.00
	$45,175.00

The Commission noted that the Committee had adopted a budget estimate for the year 1958/59 of $48,500.00 to be used for the following purposes:

1. Personal Services	
a. Salaries	$25,220.00
b. Superannuation	2,280.00
2. Travelling	4,500.00
3. Transportation of Things	300.00
4. Communication Services	1,200.00
5. Rent and Utility Services	1,800.00
6. Other Contractual Services, including printing	8,000.00
7. Supplies and Materials	2,000.00
8. Equipment	2,500.00
9. Annual Meeting	700.00
	$48,500.00

The United States registered a negative vote on this forecast.

9. Superannuation Plan for Staff Members
(Agenda Item 9)

Following Commission's decision in earlier Annual Meetings, the Canadian and U.S.A. Commissioners had elaborated a plan for superannuation for staff members; the details of the plan were given by Mr. Clark (Canada) as follows:

The plan presented is in line with the general pattern of pension plans in Canada and the United States. The plan is available to ICNAF and if acceptable to the Commission and its employees could be put into effect on September 1st, 1957.

It was stated by Mr. Clark that because the underwriting insurance company would be a Canadian one and subject to Canadian laws, the Canadian legal authorities had ruled that since the Commissions themselves did not have legal authority to enter into a contract, Canada was prepared to establish a corporation under the Canadian Companies Act which would enter into a contract with the insurance company on behalf of the Commissions. The corporation would be at no cost to the Commission whether for incorporation or operating expenses. Any member country of the Commission, if it so desired, could have representation on the corporation's Board of Directors.

The Committee considered the superannuation plan presented and the statement with regard to the corporation. After giving opportunity to the staff members of the Commission to study the plan and decide if it met with their approval, 75 percent of the staff members reported they were prepared to accept the plan with the possibility that all staff members would accept.

The Committee then gave further consideration to the matter and recommended:

1. That the plan for superannuation of Commission employees as submitted by Mr. Clark (Canada) be approved and accepted by the Commission and that the necessary funds for the Commission's share of the plan be provided in the budget each year.
2. That the plan be effective as from September 1, 1957.
3. That the offer of Canada for incorporation of a company to administer and supervise the superannuation plan be accepted with thanks.
4. That the following resolution be adopted by the Commission:

   "The International Commission for the Northwest Atlantic Fisheries respectfully request that the Canadian corporation proposed in the report of this Committee, when incorporated, apply to the Sun Life Assurance Company of Canada for a superannuation plan for the Commission's employees in accordance with the general terms presented."

Upon recommendation by the Standing Committee on Finance and Administration the Commission adopted this plan.

10. The Commission further adopted the following recommendations by the Standing Committee on Finance and Administration:

(a) That the date of billing should be 1 July, 1957.

(b) That employees of the Commission who are not citizens of the country in which the headquarters of the Commission are located and who were not residents of that country at the time of their first appointment shall be entitled to home leave every two years. Such home leave shall include the wife of the employee and dependent children up to the age of 18 years.

The Commission shall determine from time to time those employees who qualify for home leave. (Agenda Item 10)

(c) That travel on the part of the staff should be tourist class when by air, and first class when by other means of transportation.

(d) That the Working Capital Fund should be increased to $ Can. 10,000.00 as of July 1, 1958. U.K. reserved its position. (Agenda Item 11)

(e) That the 1958 Annual Meeting should be held at Halifax, Canada, beginning on June 9, 1958. (Agenda Item 17)

11. Consideration of the Distribution of ICNAF Publications (Agenda Item 16)

The queston of how to publish and distribute the Commission's publications had been considered by the Standing Committees on Research and Statistics and on Finance and Administration. The Commission adopted the following recommendation by the Standing Committee on Finance and Administration:

(a) That the current Proceedings and Statistical Bulletins should be printed as in former years, and that the Biarritz Report and the sampling data should be reproduced by the offset method.

(b) That 1500 copies each of the Annual Proceedings and the Statistical Bulletin be printed.

(c) That 250 copies of Sample Data and 2500 copies of the Biarritz Report be published.

12. Proceedings from the meetings of the Standing Committee on Finance and Administration (Nos. 2, 5, 11, and 13)

These were adopted by the Commission, and the Plenary noted with satisfaction that Mr. J. Howard MacKichan, Canada, had been re-elected Chairman for the ensuing year. (Agenda Item 19)

13. Matters of Administration and Management (Agenda Items 14 and 15)

An ad hoc Committee with Mr. K. Djurhuus in the chair considered these matters and made the following recommendations:

1. That the Commissioners of the member countries should be asked to furnish on behalf of their Governments, and in a form requested by the Executive Secretary:

   (a) The texts (with English translations) of the national laws or regulations giving effect to the mesh regulations prescribed by the Commission, with a statement of the penalties applicable to infractions in so far as these are not embodied in the laws or regulations.

   (b) Information on the measures taken to make known to the fishermen the requirements of the mesh regulations and on the systems of inspection and enforcement which each country is applying.

   (c) An annual return showing what inspections have taken place and with what results.

2. That the Chairman of the Commission at this Meeting appoint a committee of three to assist the Executive Secretary in preparing the form of annual return.

3. That the proposed information to be provided under 1 (a), (b), (c) above should be circulated by the Executive Secretary to Commissioners for consideration at the Annual Meeting in 1958.

4. That the Commission should appoint at the 1958 Annual Meeting an ad hoc Committee to study the information provided.

5. That further study should be given to the question of appointing a Standing Committee for the purpose of studying the technical and practical aspects of the mesh regulations and any other conservation measures that may be proposed from time to time under Article VIII of the Convention.

The Commission accepted these recommendations, and on the Plenary's advice the Commission's Chairman appointed the following to the "Committee of three": Mr. G. R. Clark, Canada; Mr. L. Audigou, France; the third member, from Norway, to be appointed later upon proposal by Norway.

14. Report of the Standing Committee on Research and Statistics (Agenda Items 12, 13, 15, and 18)

The Standing Committee on Research and Statistics met on May 17, 18, 20, 22, and 23 with Dr. L. A. Walford, U.S.A. in the chair. Several ad hoc committees met during the same days.

A. The Committee studied the following questions:—

1. Is sufficient evidence available to recommend to the Commission regulation of the Subarea 1 cod fishery?
It was concluded that regulation of the fishery cannot be indicated until the factors affecting growth rate are known.

2. Should the mesh size for the Subarea 4 cod fishery be increased to $5\frac{1}{2}$ inches?
The Committee considered it worthwhile to study the consequences of such an increase, and the matter was referred to Subarea 4 scientists.

3. Is sufficient evidence available to recommend to the Commission a mesh regulation for the Subarea 5 redfish fishery?
The Committee believed that mesh regulation for the Subarea 5 redfish fishery is premature.

In the consideration of each of these questions appropriate lines of research were suggested.

4. Is there need to continue the small mesh study vessel program for the haddock fishery in Subarea 5?
The Committee **recommends** that the small mesh study vessel program be suspended pending analysis of available data.

B. The Committee gave careful consideration to the use of chafing gear in regulated trawl fisheries, and **recommends** that:

1. The use of chafing gear on the top of the cod-end is not desirable in principle, but because of the practical problem involved, chafing gear should be permitted on the top of the cod-end so long as it conforms to the following specifications:—

   a. The chafing gear must be made from one continuous layer of netting and must not be of a mesh size less than that prescribed for the cod-end.

   b. Chafing gear shall be attached at the forward end no more than four meshes in advance of the splitting strap.

   c. The width of the chafing gear must be at least one and a half times the number of meshes of the cod-end to be covered.

   d. The chafing gear may be attached to the cod-end along the lateral edges but not at its rearward edge.

   e. The chafing gear must terminate at least four meshes in advance of the most rearward mesh of the cod-end.

2. No special consideration need be given to the matter of attaching a piece of netting of six rows of meshes around the cod-end under the splitting strap if the meshes are of the same size as those of the cod-end and are superimposed exactly over the cod-end meshes.

3. The member countries should report upon the use of chafing gear at the next Annual Meeting.

4. The Committee on Research and Statistics should solicit information, on the forms of chafing gear which are used in regions of the North Atlantic outside the Convention Area.

5. Studies should be carried out to determine if some substitute method of protection for the top of the cod-end can be devised.
Dr. MacCracken (Canada), and Mr. Clark (U.S.A.), were asked to undertake the tasks indicated in 4 and 5, and communicate their findings concerning chafing gear to the member countries during the year through the Secretariat.

Reports were received from each country on the administration of regulations of trawl fisheries in Subareas 3, 4, and 5.

C. The Committee agreed that the general systematics of redfishes must be understood before a program of rational fishing can be designed. It **recommends** that an interim workshop meeting, to evaluate information on the systematics of Atlantic redfishes, and to plan further research on these species, should be held in October, 1959, preferably in Copenhagen, Denmark, where there are fine study collections. Dr. Lundbeck was elected organizer and chairman of this meeting.

D. The Committee recognized the need for advising plankton and hydrographic research workers about major fishery problems in these fields. The distribution and survival of eggs and young, and the movements of adults of commercial species, and the abundance and distribution of food can be understood only in the light of oceanographic knowledge.

The Committee accordingly **recommends** that the countries concerned be urged to arrange for their appropriate hydrographers to prepare assessments of mass transport from data already accumulated. With the intensive program of the IGY in mind, it **recommends** that the Commission should also urge on countries the great value to the Commission of a speedy assessment of the corresponding data to be obtained during the IGY program.

E. The Committee affirmed the desirability of having all organizations working in the North Atlantic use a uniform measurement and a uniform grouping of sampling data, and decided to discuss at the 1957 Joint Meeting of ICES/FAO/-ICNAF the possibility of achieving this.

F. The Committee also recognized the value of standardization of fishery statistics and **recommends** that the Commission should encourage FAO to convene a meeting of experts to develop a plan of standardization and to prepare for this by studying methods used in the various countries concerned.

G. Mr. J. A. Gulland described a plan for a manual of statistical methods for fishery workers, projected under the auspices of the FAO and of the Fishery Laboratory at Lowestoft. The manual will be written as simply as is possible for such a technical subject: it will include many examples from fishery studies all over the world, illustrating the treatment of problems that have been encountered in all types of fisheries, pelagic as well as demersal.

The Committee affirmed the need of such a manual, and complimented the sponsors for undertaking the project.

H. The Commission's problems of publication were examined. The Committee **recommends** that the scientific papers prepared for the Commission should be published in the Annual Proceedings; that the Statistical Bulletin should be reproduced by a photolith process to save cost; that an Editorial Board should be established; that the Executive Secretary should prepare estimates of publication costs by various processes; and that the preparation of annotated lists of publications pertinent to the Commission's work should be continued for another year.

The Committee **recommends** that the Biarritz Report should be reproduced by a photolith process. Since there will be continual need for publishing a comparable volume of material annually in the future, the Committee **recommends** that the Commission should explore the economy of equipping and staffing the office of the Secretariat to do the photolith processing of all publications.

I. The Committee reviewed the Research Reports for the year 1956, and noted that they show a gratifying advance in the magnitude of the Commission's research program. This increase has resulted largely from the interest of the several countries in the problems of the Convention Area. It is particularly gratifying to note the increasing amount of co-ordination of research through meetings and exchange visits of scientists and through joint investigations of the international problems with which the Commission is concerned. Special

meetings such as the one held at Biarritz in 1956, and that which is to take place in Lisbon in 1957 have elicited enthusiastic response by scientists of distant parts of the world as well as by those of the member countries. The contributions to these meetings have advanced not only the Commission's program but fishery science in general.

J. The Committee is particularly gratified to report that the early effects of mesh regulation on Subarea 5 haddock conform with predictions that a $4\frac{1}{2}$ inch mesh would be beneficial. A study of the 1952 year-class of haddock shows that:

(a) The number of fish discarded at sea by regulated vessels was negligible.

(b) The sizes of fish landed increased (about 15% heavier).

(c) This year-class contributed a greater yield than earlier year-classes of comparable size (20 to 40%).

(d) Selectivity of large mesh nets was precisely as predicted. (50% retention length at 38 cm.)

(e) The efficiency of the new gear increased (about 5%).

The Committee recognized that many more year-classes must be studied to determine the full effects of mesh regulation.

Thus the first attempt at management has been successful, and has served as an example for further steps to increase the yield of the fisheries from the Convention Area.

K. Dr. L. A. Walford was elected Chairman for the ensuing year.

The report was adopted by the Commission, with reservation in regard to the recommendation "H" on publication.

15. Reports of Meetings of Panels 1 to 5
(Agenda Item 20)

The Commission approved the reports of Panels 1 to 5 and the joint report of Panels 3, 4, and 5.

Panel 1 met once. The panel agreed to accept Germany's application for membership in Panel 1 and expressed its pleasure in seeing Germany taking an active part in the panel's work. The panel noted that no marked changes in stocks or in fishing activity had occurred during the year, that there had been a considerable increase in research work, and that Spain would commence researches in Subarea 1 in the near future. The panel asked the Executive Secretary to thank the International Ice Patrol, U.S.A. for placing the data from its 1956 Labrador Section at the disposal of ICNAF. Captain Tavares de Almeida, Portugal, was elected Chairman for the two ensuing years.

Panel 2 met once. It was noted that Canadian landings from Subarea 2 had decreased owing to decreased efforts; other countries e.g. France reported increased landings. A further increase of researches was to be expected from Canada, Italy, Portugal and Spain. It was the general consensus that although more hydrographic research work was desirable, this should not be sought at the expense of biological researches. Mr. A. Carusi, Italy, was elected Chairman for the two ensuing years.

Panel 3 met separately and jointly with Panels 4 and 5. The countries reported on the status of their fisheries and research. Reports were received on the enforcement of the trawl regulations for cod and haddock. Canada and Spain had enforced the regulations; Italy and Portugal were preparing to do so; U.K. will enforce the regulations from 1 January, 1958—her trawlers already observe the regulations voluntarily; U.S.A. only fish for redfish, but will promulgate a regulation at the appropriate time; France's position was still dependent on the possible decisions as to use of chafing gear. Italy reported that plans for improving her statistics breakdown and for commencing hydrographic research were in progress. The researches by Canada, France, Portugal and Spain would continue along the same lines as in 1956. Italy and U.K. planned to gather data from their trawler catches. Dr. J. Ancellin, France, was elected Chairman for the two ensuing years.

Panel 4 met separately and jointly with Panels 3 and 5. Reports were received on landings in 1956, which in general had been a little higher than in 1955. Spain had only landed small quantities; Italy reported no landings. All member countries, with the exception of Italy

and Spain, reported research work. The trawl regulations are now in effect for Canada and Spain, and are expected to be in effect for France by 1 January, 1958. The other countries reported progress in implementation of the regulations. The research programs indicated increased research work. Italy would commence hydrographic researches, and Spain would carry out special researches on pair trawlers. Canada and U.S.A. would try to determine the effects of larger mesh sizes in Subarea 4 (and 5).

The panel agreed that investigations should be carried out to determine the measures required to obtain greater sustained yields of cod and haddock; the problem was referred to the Scientific Advisers of the Panel. The Advisers to Panels 4 and 5 reported that more information was needed and recommended researches as follows:

Effects of $4\frac{1}{2}$ inch mesh

1. Continue to study the effects of mesh regulations on Subarea 5 haddock.
2. Develop methods of measuring the effects of regulations on mixed fisheries for cod and haddock in Subarea 4.

Statistics

3. Study European log records to determine quantities of fish taken from Subarea 4 since 1939.
4. Review statistics of incidental catches of other species caught during fishing for cod and haddock.

Sampling

5. Arrange an intensive sampling at sea, in the spring of 1958, of the size compositions of fish caught and discarded.

Selection

6. Shift emphasis in gear selection studies from meshes to other problems such as hooks.

Co-ordination

7. Visits by scientists and gear experts to the laboratories and fishing vessels of other countries should be encouraged.

Meetings

8. Scientific Advisers to Panels 4 and 5 propose to meet for three days immediately prior to the 1958 Annual Meeting to review results and co-ordinate programmes of research.
9. Scientific Advisers to Panel 5 propose to meet about December, 1957, possibly in Quebec, to study:
   a. The effects of a $5\frac{1}{2}$ inch mesh for cod and haddock on the fisheries of Subarea 5. The extent and duration of the initial effect on landings and the long-term effects.
   b. The value of study boats.
   c. The need for conservation of Georges Bank scallops.

   European countries participating in Panel 4 should be invited to send scientists to this meeting (Point 9).

The Panel elected Mr. F. W. Sargent as Chairman for the two ensuing years.

Panel 5 met separately and jointly with Panels 3 and 4. Reports on the status of fisheries and researches were received. U.S.A. redfish landings were stable, landings of haddock and flatfishes showed some increase; landings of "other species", mainly red hake for industrial purposes, had doubled. Canada reported increased fishing effort for scallops and outlined collaboration with U.S.A. on researches. The panel recommended:

(a) That the Commission obtain the opinion of the Depositary Government, as to whether sea scallops fall within the terms of jurisdiction of the Commission; and point out that co-operative study of this international fishery is advantageous.

U.S.A. reported fully on the effects of the haddock trawl regulations. Substantial savings of small haddock had resulted, size by age for haddock landed is larger, increase in yield is calculated to be 30-40% for year-classes exploited by the large mesh trawls. The small mesh study boat program had now yielded valuable results, and the panel recommended:

(b) That the study boat program in Subarea 5 be suspended, pending analysis of available data.

The panel considered the definition of Subdivision 5Y of the 1953 Annual Meeting and recommended:

(c) That Subdivision 5Y be amended to read:

That portion of the Subarea lying between the coasts of Maine, New Hampshire, and Massachusetts from the border between Maine and New Brunswick to 70° W. longitude on Cape Cod (at approximately 42° north latitude) and a line described as follows: beginning at a point on Cape Cod at 70° W. longitude (at approximately 42° north latitude) thence due north to latitude 42° 20′ north, thence due east to longitude 67° 40′ west at the boundary of Subarea 4 and 5, thence along the boundary to the boundary of Maine and New Brunswick.

The panel elected Mr. G. R. Clark, Canada, as Chairman for the two ensuing years.

In a joint meeting Panels 3, 4, and 5 dealt with the problem of saving gear arising from the proposal by France of amendments to the Section IV of the mesh regulations for Subareas 3, 4, and 5. The panels recommended:

That Section IV (b) of the Mesh Regulations for Subareas 3, 4, and 5 adopted at the Fifth Annual Meeting (Annual Proceedings Vol. 5, 1954-55, page 12) be amended to read as follows:

"This netting may be fastened to the cod-end only along the forward and lateral edges of the netting and at no other place in it, and shall be fastened in such a manner that it extends forward of the splitting strap no more than four meshes and ends not less than four meshes in front of the cod line mesh."

The Commission adopted the reports of the separate meetings and the joint meetings of Panels 3, 4, and 5, and so also the therein included recommendations.

16. Acknowledgements.

The observers for the Federal Republic of Germany, the Union of Soviet Socialist Republics, the Food and Agriculture Organization of the United Nations, the International Council for the Exploration of the Sea, and the International Fisheries Convention of 1946 thanked the Commission for the opportunity of attending. The Chairman stressed how much the Commission appreciated the attendance at the Annual Meeting of the observers from these countries and international organizations. He further thanked the participating delegations for their excellent work during the Meeting, and he expressed the Commission's thanks to the Portuguese Government and Fishing Organization, to the press officers, to the Secretariat, and to the additional staff. Finally he expressed his thanks to all for the support given to him during the past two years. Mr. Suomela, U.S.A. thanked the Chairman for his wonderfully skillful guidance of this Meeting, and expressed the Commission's great appreciation of the hospitality and support rendered during the Annual Meeting by the Portuguese Government as well as by the City of Lisbon and the Portuguese fishing organization.

17. Election of Chairman and Vice-Chairman (Agenda Item 21)

At its Final Plenary Session, the Commission on a motion by Mr. G. R. Clark, Canada, seconded by Comm. H. F. Barbier, France, elected Mr. K. Sunnanå, Norway, Chairman for the next two years. On a motion by Dr. Ruivo, Portugal, seconded by Dr. A. Rojo, Spain, the Commission elected Mr. A. J. Suomela, U.S.A., Vice-Chairman for the same period. Mr. K. Sunnanå and Mr. A. J. Suomela expressed their gratitude for the honour bestowed upon them.

18. Adjournment (Agenda Item 23)

On a motion by Captain Almeida, Portugal, seconded by Mr. Carusi, Italy, the Seventh Annual Meeting was adjourned.

APPENDIX I

LIST OF PARTICIPANTS

CANADA:

Commissioners:

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

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

Mr. J. H. MacKichan, General Manager, United Maritime Fishermen Ltd., 210 Roy Building, Halifax, Nova Scotia.

Advisers:

Mr. A. Fleming, Fisheries Research Board of Canada, Biological Station, St. John's, Newfoundland.

Dr. F. D. McCracken, Fisheries Research Board of Canada, Biological Station, St. Andrews, N. B.

Dr. W. R. Martin, Fisheries Research Board of Canada, Biological Station, St. Andrews, N. B.

Mr. D. W. Munroe, Member, Industry Advisory Committee for Canada, Fishery Products Ltd., St. John's, Nfld.

Mr. J. E. Paloheimo, Fisheries Research Board of Canada, Biological Station, St. Andrews, N. B.

Mr. D. Pyke, Member, Industry Advisory Committee for Canada, Lunenburg, Nova Scotia.

Dr. W. Templeman, Director, Fisheries Research Board of Canada, Biological Station, St. John's, Newfoundland.

DENMARK

Commissioners:

Mr. B. Dinesen, Departementschef, Ministry of Fisheries, Borgergade 16, Copenhagen.

Mr. K. Djurhuus, Chairman, Local Government, Thorshavn, Faroe Islands.

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

Advisers:

Mr. N. Bjerregaard, Danish Fishermen's Association, Frederikshavn.

Dr. Å. Vedel Tåning, Danmarks Fiskeri- og Havundersøgelser, Charlottenlund Slot, Copenhagen.

FRANCE

Commissioners:

M. Alloy, Directeur des Pêches Maritimes au Ministère de la Marine Marchande, 3 Place de Fontenoy, Paris (7ème).

Dr. J. Ancellin, Chef du Laboratoire, Institut Scientifique et Technique des Pêches Maritimes, Boulogne sur/Mer.

Comm. H. F. Barbier, Administrateur en Chef de l'Inscription Maritime, Chef du quartier d'Inscription Maritime, Cherbourg.

Advisers:

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

M. Jacquier

ICELAND

Commissioner:

Mr. Jón Jónsson, Atvinnudeild Háskólans Fiskideild, Borgartun 7, Reykjavik.

ITALY

Commissioner:

Conselheiro A. Carusi, Ministry of Merchant Navy, Rome.

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. Sunnanå, Director of Fisheries, Directorate of Fisheries, Bergen.

Advisers:

Mr. G. S. Saetersdal, Fiskeridirektoratets Havforskningsinstitutt, Bergen.

PORTUGAL

Commissioners:

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

Comm. S. Tenreiro, Delegado do Governo Junto das Organizações das Pescas, Lisbon.

Advisers:

Dra. G. Quartin, Assistant, Comissão Consultiva Nacional das Pescarias do Noroeste do Atlantico, Gabinete de Estudos das Pescas, Lisbon.

Dra. L. Nunes-Ruivo, Curator, Museu de Historia Natural, Lisbon.

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

Dr. A. Duarte Silva, Director, Portuguese Fishing Organization, Lisbon.

Dr. Luis Torres, Assistant, Gabinete de Estudos das Pescas, Lisbon.

Observers:

Comm. M. de Carvalho, Comissão Consultiva Nacional das Pescarias do Noroeste do Atlantico, Gabinete de Estudos das Pescas, Lisbon.

Captain Sa Linhares, Director das Pescarias, Ministerio da Marinha, Lisbon.

SPAIN

Commissioner:

Mr. J. Traspaderne y Zarranz, Jefe de la Primera Sección de la Dirección General de Pesca Maritima, Madrid.

Advisers:

Mr. P. Diaz de Espada, Director Tecnico de Pesquerias y Secadoros de Bacalao de España, Aguirre Miramon 2, San Sebastian.

Dr. O. Rodriguez M., Biologo de la Dirección General de Pesca Maritima, Calle Alarçon 1, Madrid.

Dr. A. Rojo Lucio, Biologist, Spanish Cod Fishing Industries Assoc., St. John's, Newfoundland, Canada.

UNITED KINGDOM

Commissioners:

Dr. C. E. Lucas, Director, Marine Laboratory Scottish Home Department, Aberdeen.

Mr. G. C. Trout, Fisheries Laboratory, Lowestoft, Suffolk.

Mr. R. G. R. Wall, Fisheries Secretary, Ministry of Agriculture, Fisheries and Food, London.

UNITED STATES

Commissioners:

Mr. B. Knollenberg, Chester, Connecticut.

Mr. F. W. Sargent, Commissioner, Massachusetts Department of Natural Resources, State House, Boston.

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. W. C. Herrington, Special Assistant to the Under Secretary for Fisheries and Wildlife, Department of State, Washington, D.C.

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

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, D. C.

Assistant Advisers:

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

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

Mr. L. Rosen, Usen Trawling Co., Boston, Mass.

Mr. M. B. Schaeffer, Scripps Oceanographic Institute, LaJolla, California.

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

FEDERAL REPUBLIC OF GERMANY

Observers:

Dr. Claussen. Vorsitzender der Deutschen Wissenschaftlichen Kommission für Meeresforschung, Bonn.

Direktor Freyberg, Verband der Deutschen Hochseefischereien, Bremerhaven.

Dr. G. Hempel, Biologische Anstalt Helgoland, Hamburg.

Dr. J. Lundbeck, Forschungs-Bundesanstalt für Fischerei, Institut für Seefischerei, Hamburg 36.

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

Dr. Minnemann, Universität Hamburg.

Dr. Nicolai, Bundesministerium für Ernährung, Landwirtschaft und Forsten, Bonn.

Dr. D. Sahrhage, Forschungs-Bundesanstalt für Fischerei, Institut für Seefischerei, Hamburg 36.

UNION OF SOVIET SOCIALIST REPUBLICS

Observers:

Dr. T. F. Dementjeva, Chief, Section of Commercial Fish Stocks, U.S.S.R. Research Institute of Marine Fisheries and Oceanography, V. Krasnoselskaja 17, Moscow.

Dr. V. I. Travin, Polar Institute of Marine Fisheries and Oceanography, Koljskaja Str., Murmansk.

Dr. A. I. Treschev, Chief, Laboratory of Fishing Techniques, Research Institute of Marine Fisheries and Oceanography, V. Krasnoselskaja 17, Moscow.

Mr. M. Riazanov, Interpreter.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Observers:

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

Mr. F. Popper, Economics and Statistics Branch, FAO, Rome.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA

Observer:

Dr. Å. Vedel Tåning, Vice-President, ICES, Charlottenlund Slot, Copenhagen, Denmark.

INTERNATIONAL FISHERIES CONVENTION 1946

Observers:

Dr. C. E. Lucas, Director, Marine Laboratory Scottish Home Department, Aberdeen.

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

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Observer:

Mr. G. R. Clark, Chairman, INPFC, University of British Columbia, Vancouver 8, B. C.

PRESS

Mr. J. M. Aguas, Deputy Press Officer.

Mr. L. Nunes, Press Officer.

SECRETARIAT

Dr. Erik M. Poulsen, Executive Secretary.

Mr. Ronald S. Keir, Biologist/Statistician.

Miss Theresa H. Devine, Secretary.

Miss Jean Maclellan, Clerk-Stenographer.

CLERICAL ASSISTANTS

Miss A. M. Rovara Belo

Miss Jane Doyle

Miss Rose Marie Folke

Miss Hazel C. Jones

Mr. Humberto L. N. Ribas

Mr. J. C. Santos (Interpreter)

Mr. M. T. L. de Sousa, (Interpreter)

APPENDIX II

AGENDA

1. Opening 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 1956/57 and financial statements for 1956/57.
6. Presentation of Auditor's Report for the financial year 1955/56 (vide Ann. Proc. Vol. 6, p. 7-8).
7. Consideration of budget estimate for 1957/-58.
8. Consideration of advance budget estimate for 1958/59.
9. Consideration of superannuation plan for staff members.
10. Consideration of the rules for refund of home leave fares for staff members and dependents.
11. Size of the Working Capital Fund, also in the light of possibility of new countries entering the Commission (vide Financial Regulations for the Commission Section VI. 2).
12. Review of progress in the study of the feasibility of the use of a 10% annual exemption to the haddock-cod regulation in Subarea 5 (vide Rec. No. 1 and 2 of Panel 5, Chairman's Report of 1956 Annual Meeting—Ann. Proc. Vol. 6, p. 15).
13. Reports on experiments by France and other countries to study the problem of the use of multiple codends in trawl fishery (vide Chairman's Report of 1956 Annual Meeting, Item 11—Ann. Proc. Vol. 6, p. 15).
14. Consideration of the setting up of a permanent committee to deal with administrative and management matters (vide Chairman's Report of 1956 Annual Meeting, Item 11—Ann. Proc. Vol. 6, p. 15).
15. Consideration of how to deal with matters which overlap between panels and committees, and clarification of the respective responsibilities.
16. Consideration of the distribution of ICNAF publications, and of papers published by the member countries on researches carried out to meet the program and the wishes of ICNAF.
17. Date and place of Annual Meeting, 1958.
18. Report on meetings of Standing Committee on Research and Statistics, May 1957.
19. Report on meetings of Standing Committee on Finance and Administration, May 1957.
20. Reports on meetings of Panels 1-5.
21. Election of Commission's Chairman and Vice-Chairman for the two ensuing years.
22. Other business.
23. Adjournment.

PART 3

Summaries of Research 1956

A. Summaries by Countries

I. Canadian Researches, 1956

SUBAREA 2. BY W. TEMPLEMAN

Examination of samples of redfish, from depths of from 150 to 300 fathoms, east of Hamilton Inlet Bank, Labrador, showed that only a very few very large common redfish, *Sebastes marinus marinus* (L.), were present while over 99% of the redfish were of the deep-water type *Sebastes marinus mentella* Travin.

The customary hydrographic section from near shore off Seal Islands, Labrador, to beyond the 500 metre line, east of Hamilton Inlet Bank, was taken by the *Investigator II*, August 4 to 6, 1956 (Fig. 1).

Temperatures in the upper warmer layer and in the intermediate cold layer were very similar

to those of 1955. The volumes of water with temperatures below -1°C. and below 0°C. were similar inshore but offshore this cold water was a little greater in volume and extended more deeply in 1956 than in 1955. Bottom temperatures and temperatures in the offshore deep water, on the other hand, were higher (usually about 0.3°C.) than in 1955. Salinities were very similar to those of 1955.

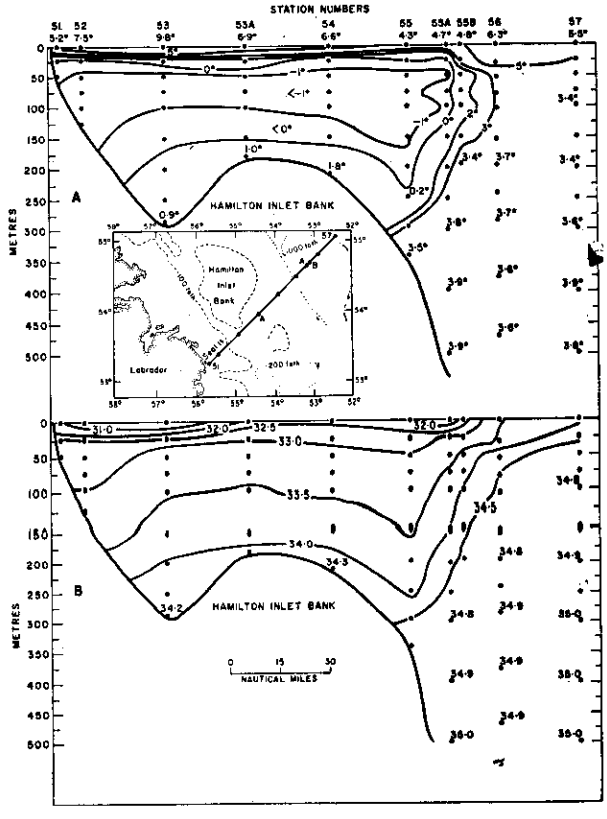


Fig. 1. **Hydrographic section off Seal Islands, Labrador, August 4-6, 1956(A—Temperature °C; B—Salinity °/₀₀.**

SUBAREA 3. BY W. TEMPLEMAN

The Fisheries Research Board continued to gather information on the location of catches and on catch per unit effort by the offshore groundfish fleet. The offshore commercial catches of groundfish were sampled for size and age, and the inshore cod catches were similarly sampled at Bonavista, St. John's and Burin.

Haddock *Melanogrammus aeglefinus* (L.). An otter-trawl survey for haddock and cod was carried out by the *Investigator II* on the Grand Bank in April and May and on St. Pierre Bank in early June. A few good haddock catches were made on the Grand Bank but only very small catches of haddock were obtained on St. Pierre Bank. On St. Pierre Bank there was excellent haddock fishing during the winter and early spring of 1956 when the fish were concentrated in deep water below 100 fathoms. By June the fish had apparently spread from the deep water over a great part of the bank area and were not found in commercial quantities by the research vessel either in June or in a later survey carried out in October. Also, except for occasional sporadic catches, there was very little commercial fishing for haddock on St. Pierre Bank in 1956 after the winter and early spring. The very numerous 1949 year-class, on which the fishery has depended since the autumn of 1953, evidently has become too scarce to sustain an extensive fishery.

On the Grand Bank the numerous 1949 year-class provided almost all the haddock of commercial size, and two fairly numerous year-classes 1952 and 1953, were approaching commercial size. Although the years 1950, 1951 and 1954 produced no significant survival of young haddock, there was evidently good survival of the 1955 year-class.

On St. Pierre Bank almost all the haddock of commercial size were from the 1949 year-class. There was no evidence of significant survival of young haddock of the 1950 to 1954 year-classes but there was a fairly good survival of the 1955 year-class. In the further survey of St. Pierre Bank in October there was preliminary evidence, also, of a good survival of the 1956 year-class of haddock. The 1955 year-class will not produce significant quantities of commercial fish before the autumn of 1959 or the spring of 1960.

Redfish *Sebastes marinus* (L.). Deep-water dragging. The *Investigator II* carried out deep-water explorations for redfish at depths from 100 to 400 fathoms north of Flemish Cap and off the southwest Grand Bank. A No. 3/4 35 otter-trawl with a 39-foot headrope and a 50-foot footrope, and with otter doors of 400 pounds each, was used on a single wire. North of Flemish Cap the average redfish catches per half-hour's dragging were as follows:

100	fathoms	—	0 lb.
150	,,	—	150 ,,
200	,,	—	700 ,,
250	,,	—	1300 ,,
300	,,	—	500 ,,
350	,,	—	100 ,,
400	,,	—	0 ,,

These were only half-hour drags with a very small net and with the inefficient single-wire type of fishing. The redfish were of moderate commercial size, the bottom was smooth, and it is indicated that good commercial fishing possibilities exist between 200 and 250 fathoms in this newly explored area.

On the southern part of the southwest slope of the Grand Bank the average catches of redfish per half-hour's dragging were as follows:

100	fathoms	— 1170	lb.
150	,,	— 890	,,
200	,,	— 920	,,
250	,,	— 640	,,
300	,,	— 190	,,
315-360	,,	— 20	,,

In this area sizes increased with increasing depth.

Two subspecies. In 1956, for the first time, our biologists have observed that two varieties of redfish, *Sebastes marinus marinus* and *Sebastes marinus mentella*, are present in the Newfoundland area. The scarcer *marinus* type is usually orange yellow or golden yellow, possesses no beak or a rounded beak on the chin, has small eyes, and is different from *mentella* in a number of body proportions. The deep-water or *mentella* type is usually red to deep red, possesses a sharp and in older specimens often a long chin beak and has relatively large eyes. These, and other distinctions between the two forms, were noted in June in Hermitage Bay and in July at Flemish Cap. The *marinus* form was the shallower and the *mentella* form the deeper and by far the more abundant; the commercial fishery in the subarea depends almost entirely on the *mentella* form. In the European and Icelandic area, on the other hand, *marinus* appears to be the more usual type in the commercial fishery. At Flemish Cap the *marinus* form was more abundant than the *mentella* in the small numbers of redfish secured at 150 fathoms. At 200 fathoms most of the redfish were *mentella* and a few, all the largest specimens, 43 to 53 cm. were *marinus*. At 250 fathoms, where the best catches were obtained, all were *mentella*, and at 300 fathoms all were very typical *mentella*. In Hermitage Bay, Newfoundland, only an occasional *marinus* type is present among the very numerous *mentella*. No evidence of *marinus* was found in redfish catches on the southwest slope of the Grand Bank, but some are present south of Green Bank.

Other studies of redfish. Studies are being carried out on sexual maturity, fertilization and spawning, and on body proportions of redfish from various localities. Preliminary tagging experiments have been done, and researches on age and growth, ecology, food, and on other features of redfish life history have been continued.

Flatfishes. Research has been renewed on the American plaice, *Hippoglossoides platessoides* (Fabr.) and the witch flounder, *Glyptocephalus cynoglossus* (L.). The present effort, which began in May for the plaice and in August for the witch flounder, has been concerned mainly with age and growth studies.

From the tagging of 1,000 plaice on the northern Grand Bank in October, 1954, 26 were recovered in 1955 and 4 in 1956. Most of these were recaptured within a radius of about 30 miles from the tagging site. The greatest migration was by a fish recaptured in October, 1955, on the eastern slope of the Grand Bank, 120 miles from the tagging area.

There has been some new work on body proportions of plaice in different areas. It is planned to extend the scope of the flatfish work in 1957.

Cod *Gadus callarias* L. Cod investigations were devoted mainly to age and growth and other population studies. In the otter-trawling surveys of the *Investigator II* on the southern half of the Grand Bank the first four age groups of cod could be recognized from the length frequencies alone. This will allow an excellent check on age determination in this southern Grand Bank area for which age reading in cod is difficult.

Plankton. Zooplankton was collected on hydrographic cruise 34 of the CNAV *Sackville* during September 15 to 30, 1956. Vertical tows were made with a 3/4 metre net (No. 10 mesh) from a depth of 50 metres. Generally, high zooplankton production (to 40 cc./20 m3) was shown near Cabot Strait, over the Grand Banks and in Trinity Bay; and very low production over the Laurentian Channel, south of the banks, near the Newfoundland south coast and off Trinity Bay. Fish larvae included capelin at four stations on the Grand Bank and six stations in Trinity Bay, and American plaice, witch flounder, Greenland halibut, *Reinhardtius hippoglossoides* (Walb.) and silver hake, *Merluccius bilinearis* (Mitch.) in Trinity Bay, mostly taken in oblique tows with a high-speed all metal plankton sampler.

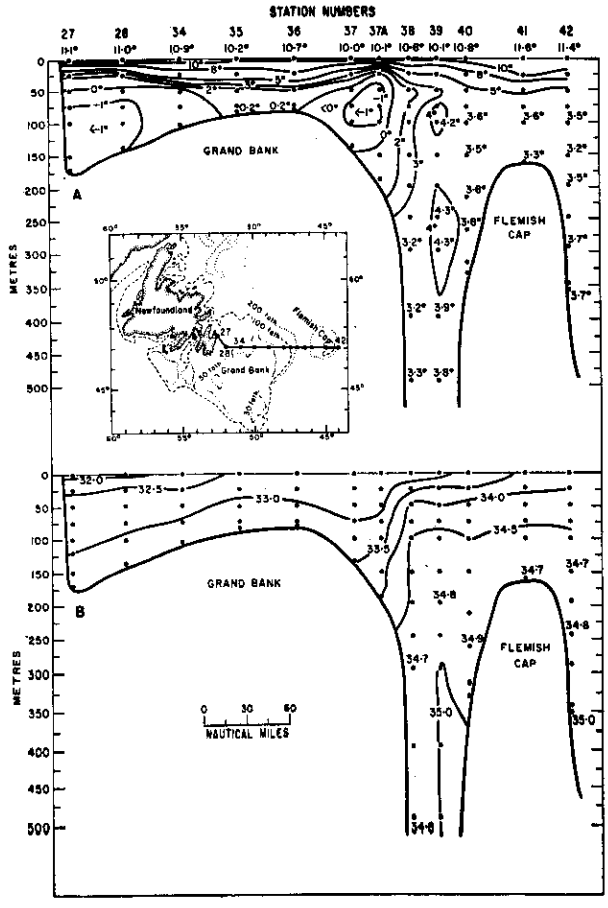


Fig. 2. **Hydrographic section, St. John's-Grand Bank-Flemish Cap, July 25-August 1, 1956; A-Temperature °C; B—Salinity °/₀₀.**

Hydrography. In July and August the regular five sections were taken from Bonavista to the southern slope of the Grand Bank. In addition once or twice a month throughout the year the station 5 miles off Cape Spear, in 176 metres was occupied. Daily surface temperatures were taken in St. John's harbour. Considering the whole water column down to 500 metres, temperatures were not greatly different from those of 1955.

In the Flemish Cap section, July 25-August 1 (Fig. 2), the volume of water below -1°C. was approximately the same as in 1955 and the volume below 0°C. slightly less. The top of the Grand Bank was covered with slightly warmer water and there was also a greater volume, than in 1955, of water above 3°C. in the channel between the Grand Bank and Flemish Cap. Salinities also were significantly higher than in 1955 in the Grand Bank-Flemish Cap channel.

SUBAREA 4. BY W. R. MARTIN

Tagging. Cod, *Gadus callarias* L., and haddock, *Melanogrammus aeglefinus* (L.), were tagged in Subdivision 4T during 1956 to provide additional information about movements, mixing of stocks, growth, and the proportion of stocks being taken by the fisheries. Otter-trawl caught fish were tagged for the first time in this area. In May, 733 cod were tagged off northern Cape Breton in 40 to 100 fathoms. In July and August, 1775 cod were tagged off northern New Brunswick in 30 to 50 fathoms. In September and October, 994 haddock were tagged in the eastern Northumberland Strait region in 20 to 30 fathoms.

A large proportion of the tags attached to cod and haddock in the years 1953 to 1955 have been recovered. Disk tags have given higher returns than hydrostatic tags. The high percentages of recaptures from inshore Nova Scotia taggings (50 to 60% for disk-tagged cod and 37% for disk-tagged haddock) demonstrate that the fishery takes a high proportion of the stocks on these grounds. The lower percentage recovery from Gulf of St. Lawrence cod tagging is consistent with the lower total mortality there, as determined from age analyses.

Cod tagged in the Gulf of St. Lawrence moved about more than those of inshore Nova Scotia waters. Tag returns have shown that the Gulf stocks support two main fisheries: one in the western Gulf of St. Lawrence during summer by Canada, the other in the Cabot Strait area in winter mainly by European fleets.

Preliminary results of haddock tagging in the southern Gulf of St. Lawrence indicate a similar seasonal movement out of the Gulf in the autumn to Nova Scotia grounds.

Haddock Ageing. Canada and the United States continued their joint study of haddock age reading. Age determinations for 973 haddock revealed differences between scales and otoliths. Disagreement in age readings per sample increased with increasing age and averaged 40%. In general, disagreements were randomly spread up to 8 years. However, above 8 years the otolith age readings were a year or more higher than the corresponding scale readings. Independent estimates of growth from tagging supported earlier conclusions that the use of haddock otoliths is valid for age determinations. Canadian and U.S. biologists have now agreed to use the otolith method for ageing Subarea 4 haddock.

High Cod Landings. In 1956 cod fishing in Subdivision 4T was exceptionally good (Fig. 3). Landings of cod in the provinces of Quebec, New Brunswick and Prince Edward Island totalled 118 million pounds, gutted weight, the largest landings on record. Individual as well as total catches were large. The average landings per week for "Gloucester" class draggers increased from 21 thousand pounds in 1955 to 27 thousand pounds in 1956.

The cod landed by draggers at Caraquet, N. B., were considerably larger (average weight 5.8 lb.) than those landed in 1955 (average weight 4.2 lb.) and the average age increased from 6.3 years in 1955 to 7.2 years in 1956.

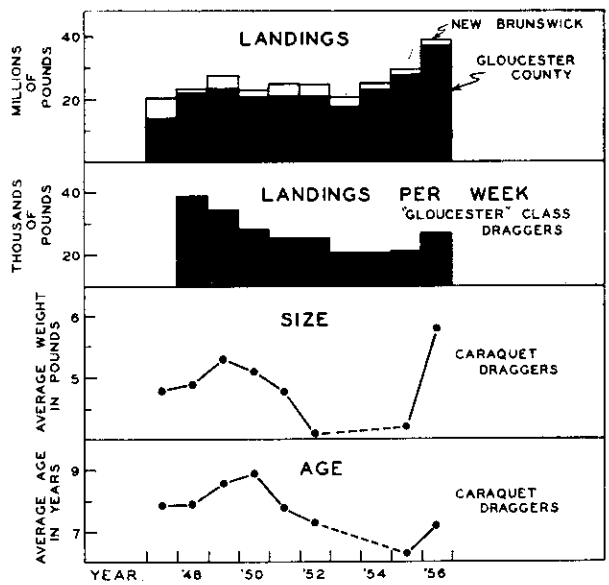


Fig. 3. **Annual variation in landings, landings per week, sizes and ages of cod landed, in northern New Brunswick from Subdivision 4T during the years 1947-56.**

The growth rate of these cod was much higher in 1955-56 than in the period 1947-52. This was particularly true for the larger fish-eating cod. Seven to nine-year-old fish were about 2 pounds heavier than formerly. It appeared that the faster growth was brought about by the increased availability of moribund herring during an epidemic of fungus disease (*Ichthyosporidium hoferi*). Reduced density of cod also may have contributed to the increased growth rate.

The landings of Gulf cod did not increase in numbers in 1956, but the larger sizes of cod produced a substantial increase in landings by weight.

Discarded Cod. Seven trips on commercial draggers in the southern Gulf of St. Lawrence (Subdivision 4T) provided data on the sizes and numbers of cod discarded at sea (Fig. 4). Three-inch mesh manila nets were used. Small draggers of about 25 gross tons working in 20 to 45 fathoms of water discarded 55% by number and 14% by weight. Larger draggers of about 40 tons working on larger fish in 30 to 125 fathoms discarded 18% by number and 4% by weight of the fish caught. The 4½-inch mesh now required by regulation would have reduced the numbers of cod discarded at sea in 1956 by about half. In order to reduce the observed wastage of cod to a minimum, the mesh size would have to be about 5½ inches, inside, stretched, wet, used measure.

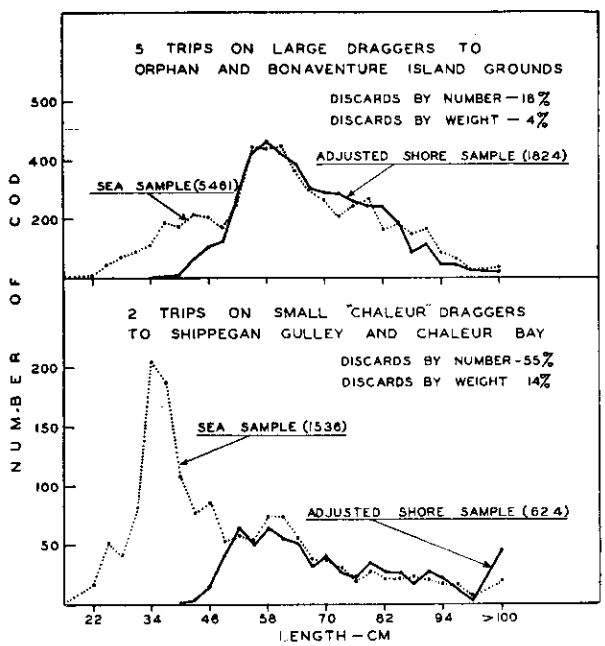


Fig. 4. **Numbers and sizes of cod caught and landed by commercial draggers fishing from northern New Brunswick ports in Subdivision 4T during the period 30 May to 5 September, 1956. Shore sample adjusted to give equal numbers of cod to sea sample above 49cm.**

Mesh Selections. Three experimental trips on commercial otter trawlers during 1956 provided information which is pertinent to the

implementation of mesh regulation in Subarea 4:

(1) Tests have shown that a short piece of "chafing gear" on top of the codend, when applied as specified by ICNAF recommendations, does not reduce the escapement of haddock and cod through a large-mesh codend. However, a long piece of chafing gear does reduce escapement.

(2) The use of double codends greatly reduced the sizes and numbers of small fish which would escape from a single codend of the same mesh size. The results showed that additional strength in codends should be obtained from increased size or strength of twine rather than from double codends if mesh selection is to be effective (in releasing small fish).

(3) Field studies with double-strand, 80-yard, braided nylon codends showed that a mesh size of $4\frac{3}{8}$ inches was equivalent to $4\frac{1}{2}$-inch manila in releasing fish. In these studies the sizes of haddock released from the codends were smaller than the sizes of cod released from the same codends (selection factors—3.8 for cod and 3.3 for haddock.).

(4) The suitability of large-mesh manila codends for incidental redfish catches was tested in the Gulf of St. Lawrence. A $4\frac{1}{2}$-inch mesh codend released about 50% of the 28 cm. redfish. With this large-mesh codend a very small proportion of the sizes of redfish now landed in Canada were released, and meshing of redfish was less serious than generally predicted.

Plankton. Analyses of plankton studies carried out in 1954 and 1955 showed that both seasonally and annually, in surface waters, heavy zooplankton concentrations (900 c.c. per tow) were associated with low temperatures (9-14°C.) and light concentrations (200 c.c. per tow) with high temperatures (17-19°C.).

Hydrography. The long-term program of seasonal surveys, initiated in 1950, covering a network on the Scotian Shelf, the entrance to the Bay of Fundy, and the Gulf of St. Lawrence has been continued by the Atlantic Oceanographic Group. The section off Halifax, N. S., was surveyed three times (Fig. 5, attached). The surface layer was colder in the summer 1956 by an average of 2°C. The minimum temperature in the cold-water layer was lower in 1956 than in 1955 by an average of 0.5°C.

At shore stations, continued observations of surface water temperatures revealed a general decrease in 1956 as compared to the previous year. It was the third consecutive year of general cooling.

The circulation pattern on the Scotian Shelf based on temperature and salinity observations since 1950, shows certain persistent features. The net flow is always found to be southwesterly around Cape Breton varying in magnitude seasonally, from a minimum in the early spring to a maximum during the summer months. The flow is normally to the southwest all along the Atlantic Coast of Nova Scotia, until it reaches Cape Sable. In this area, the flow is evidently divergent with part moving northward towards the Bay of Fundy and part moving southward. The region of divergence appears to fluctuate somewhat in in position with volume transport proportions in each branch varying markedly.

Observations in the central Gulf of St. Lawrence, during the summer, have shown that the Gaspé Current is in part continuous along the southern edge of the Laurentian Channel as far as Cabot Strait. Another portion spreads out over the Magdalen Shallows.

A reasonable correlation has been found between the ratio of haddock to cod landings in ICNAF Subarea 4 and a reliable index of water temperatures over the area. This is in agreement with the known difference in temperature preferences of the two species. This relationship may be of use in forecasting groundfish landings on the basis of temperature trends.

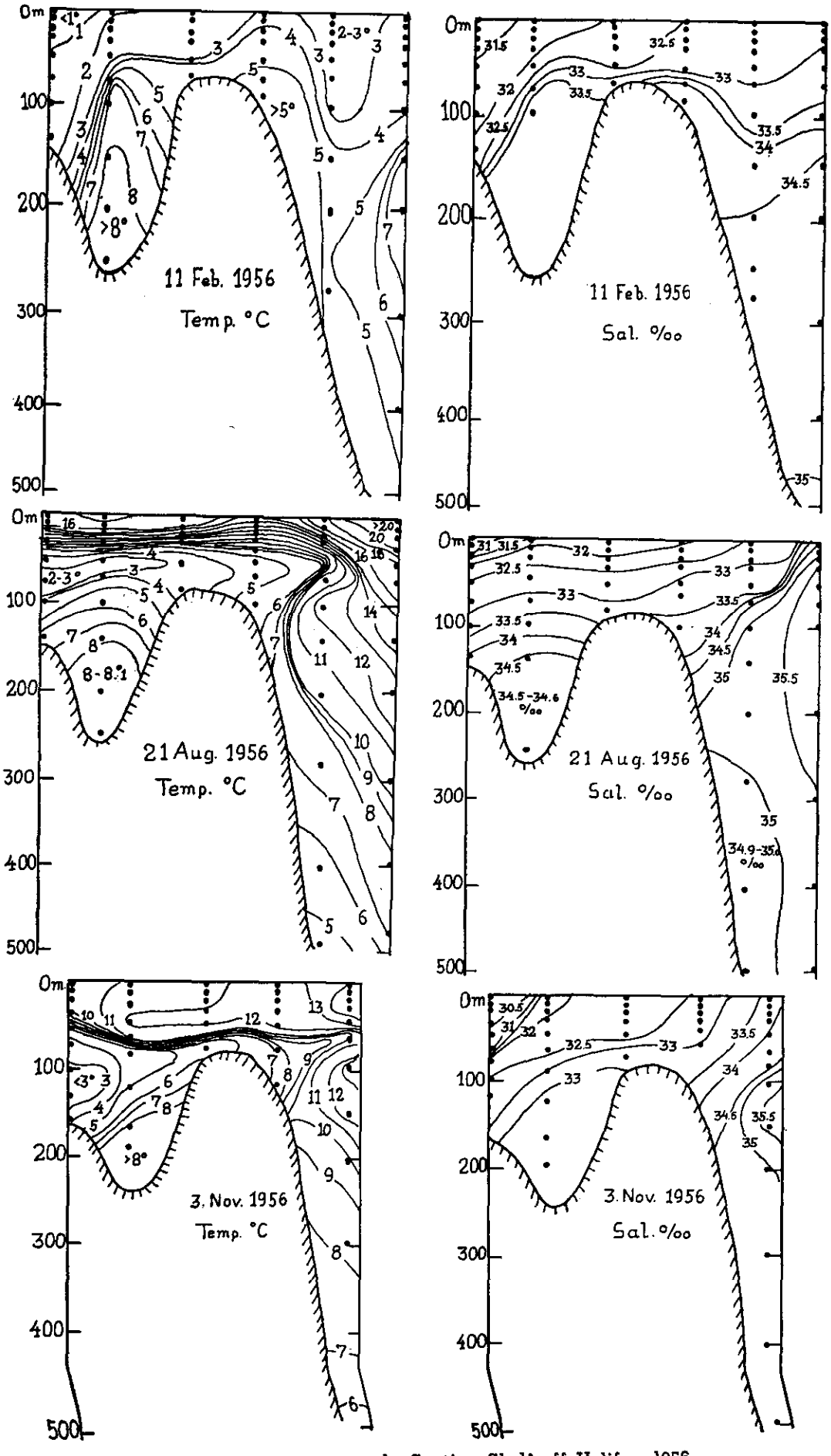


Fig. 5. Hydrographic section across the Scotian Shelf off Halifax, 1956.

II. Danish Research Report, 1956

I. COD IN COASTAL WATERS AND ON THE OFFSHORE BANKS OF WEST GREENLAND 1956

BY PAUL M. HANSEN

1. Occurrence of Cod Eggs.

The number of cod eggs caught by "Adolf Jensen" in the Godthåb Fjord area with the lm. stramin net are given in Table 1 and Figure 1.

From previous investigations it is known that there is a spawning place for cod at Station 4. This explains why the lgarest numbers of cod eggs have been taken on this station. It appears from the numbers caught in the different months that only a poor spawning takes place in February. In April and in the first half of May the strongest spawning takes place. On the Stations 5 and 6 some spawning occurs in May but much less than on Station 4 and still less spawning seems to take place on the Stations 1, 2 and 3. On the station in the entrance of the Godthåb Fjord, Station 7, no eggs were found before the end of April and then only small numbers. Also on May 16 and June 7 small numbers of eggs were caught on this station. Probably these eggs had been transported out of the fjord by the surface current. On Station 8 no eggs were caught in April and only 10 in the end of May.

The numbers of cod eggs caught in Godthåb Fjord were very poor compared with the numbers caught in this fjord in previous years.

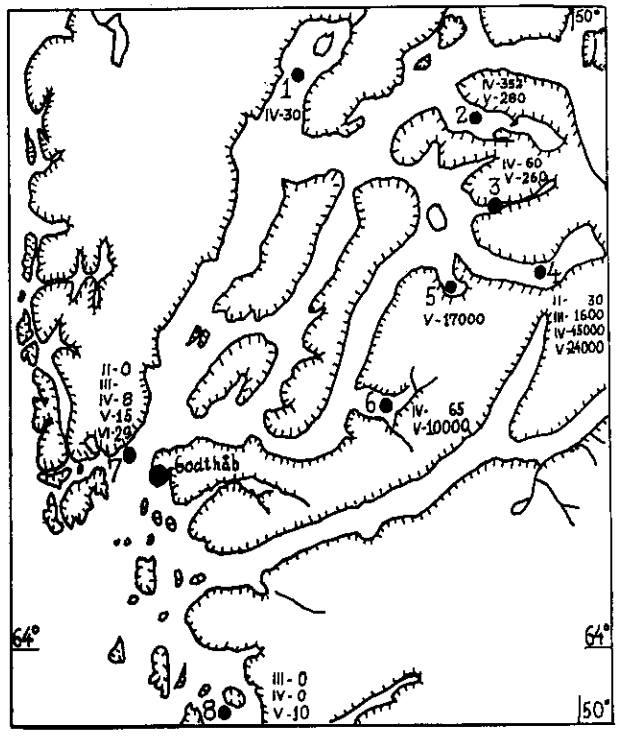


Fig. 1. **Stations in Godthåb Fjord where cod eggs were caught with a one meter stramin net, 100 to 50 m. wire out, from "Adolf Jensen" in 1956. Off the stations are shown numbers of eggs caught per month (II-VI).**

TABLE 1

Station		1	2	3	4	5	6	7	8
February	1-15								
	15-28				30			0	
March	1-15				1600				0
	15-31								
April	1-15	30	352	60	45000		65	0	
	15-30							15	0
May	1-15		280	260	40000	17000	10000		
	15-31	180			8000			15	10
June	1-15							29	
	15-30								

On the middle of Fylla Bank 4 cod eggs were caught April 23. On May 7, 5 cod eggs were caught in a haul between the bank and the coast. Three hauls with the lm. stramin net, on June 5, one between the bank and the coast, one on the middle, another on the western edge of the bank gave respectively 0, 1 and 35 cod eggs. The comparatively large number of eggs caught over the western edge of the bank is not surprising as there is a spawning place for cod on the western slope of the bank.

2. Occurrence of Cod Fry.

The numbers of larval cod caught by "Dana" in July with the 2m. stramin net are given in Figure 2. The numbers are the smallest found during the six years' investigations (1950 and 1952-56).

The largest number of larvae taken in half an hour's haul was twenty on a station west of Fylla Bank on 63°25'N 57°20'W. In all the other catches the numbers were below five and on many stations no larvae were caught. The catch of 20 larvae on the station farthest towards west indicates a drift by a westgoing current of cod fry towards the Labrador Area from the spawning grounds on the western slope of the Greenland Banks. Also in 1955 cod larvae were caught in the same westerly position as in 1956.

The poor occurrence of eggs and larvae suggests that the 1956 year-class will be very poor.

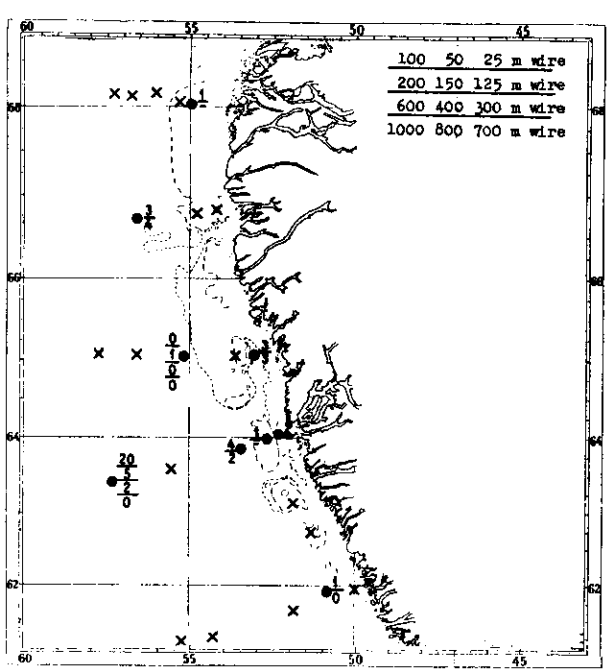


Fig. 2. **Catches of cod larvae with a two meter stramin net per 30 minutes haul by "Dana", 1956.**

3. Occurrence of Small Cod of Age-Groups I, II and III.

Small cod were taken in rather small numbers in hauls with the fine-mesh seine and the shrimp trawl. The details of the catches are given in Table 2 and the length frequencies in Figure 3.

TABLE 2

Sample	Position	Date 1956	Gear	Number of Fish
a	66°55'N, 53°40'W	16/7	Seine	787
b	64°21'N, 50°22'W	10/6	,,	276
c	63°17'N, 51°05'W	28/8	,,	456 (ages
d	63°53'N, 51°28'W	10/2	Shrimp Trawl	59 deter-
e	63°53'N, 51°28'W	10/3	Shrimp Trawl	65 mined)

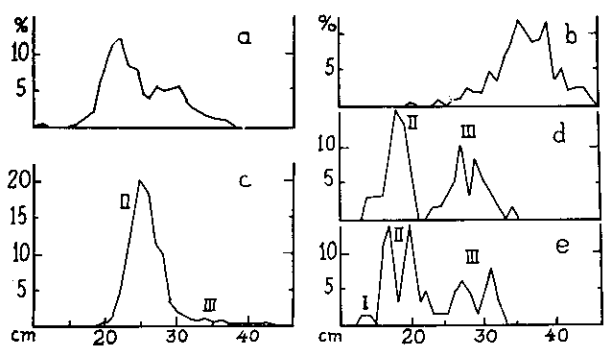


Fig. 3. **Length frequencies of small cod, age groups I, II, and III, 1956.**

The II - and III-group appear as peaks of the length distribution curves from the catches c, d and e.

According to experience during many years small cod belonging to the III-group are much more difficult to catch with seine than cod belonging to the I- and II-group. This in connection with direct observations on occurrence of large shoals of small cod of sizes corresponding to the III-group in several inshore localities suggests that the 1953 year-class is the most important of the young year-classes of cod.

The average lengths of small cod belonging to the age-groups II and III were the following:

Station	Date	II	III
d	10 February	18.0 cm	27.5 cm.
e	10 March	18.6 cm.	28.6 cm.

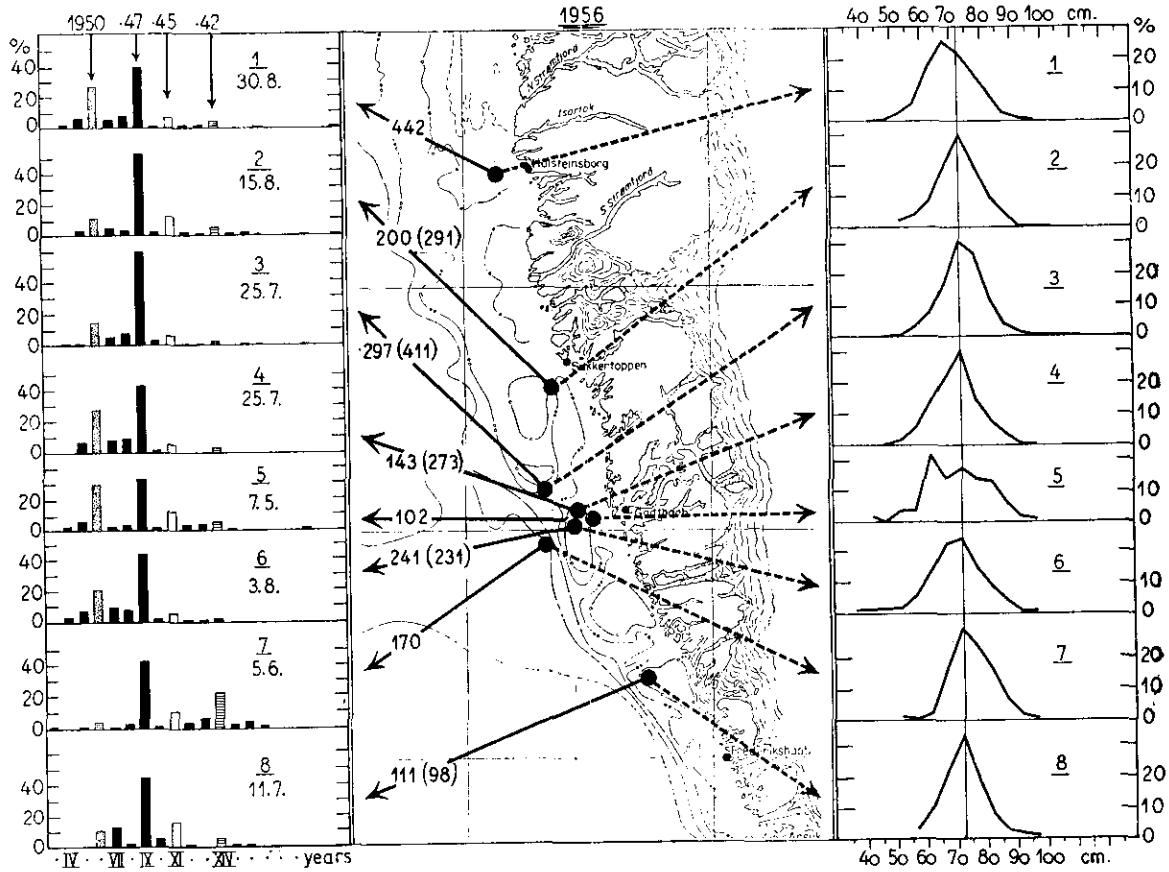


Fig. 4. **Percentage age-distribution (left) and length-distribution by 5 cm groups (right) of cod caught on the Greenland Banks in 1956. The numbers of cod examined and of cod tagged (in brackets) are given for each station on the map (center).**

4. Commercial Fish. The Age Composition.

a. Offshore Banks.

Age determinations were made on 1700 otoliths of cod from the banks, of which 551 (Nos. 3, 4 and 8 in Figure 4 were collected by the "Dana" from catches made by jig and 1149 (Nos. 1, 2, 5, 6, 7) by the "Adolf Jensen" mainly from long-line catches.

Figure 4 (left) shows the age compositions of the eight catches from the banks.[1] The 1947 year-class predominates in all the samples as in 1955. It amounted to between 40 and 60% of the catches. In sample No. 5, however, it only made up 32.3% of the catch.

Year-classes older than that of 1947, for instance the formerly rich 1942 and 1945 year-classes, were only now sparsely represented in the catches on the banks. In most of the samples the 1942 year-class was less than 5%. Only in No. 7 does it amount to a little more than 20%. Among the year-classes younger than 1947 only the 1950 was of some importance. It did not, however, reach more than 30% in any of the samples.

The length distribution of cod in the samples (Figure 4, right) is very similar in the different samples. Most graphs having a maximum between 70 and 75 cm., corresponding to a mean weight of 3.5 to 4 kg.

b. Inshore Waters and Fjords.

Figure 5 shows the results of 4021 age determinations made with otoliths from samples from inshore waters and fjords. Unfortunately no samples were collected in the important Subdivision 1C. Most of the samples were from cod hooks on long-lines. Nos. 12 and 16 came from pound-net catches, Nos. 14, 29 and 30 from trawl catches and Nos. 13 and 31 came from catches with jig.

(1) The material in tabular form is given in "Sampling Yearbook, 1956."

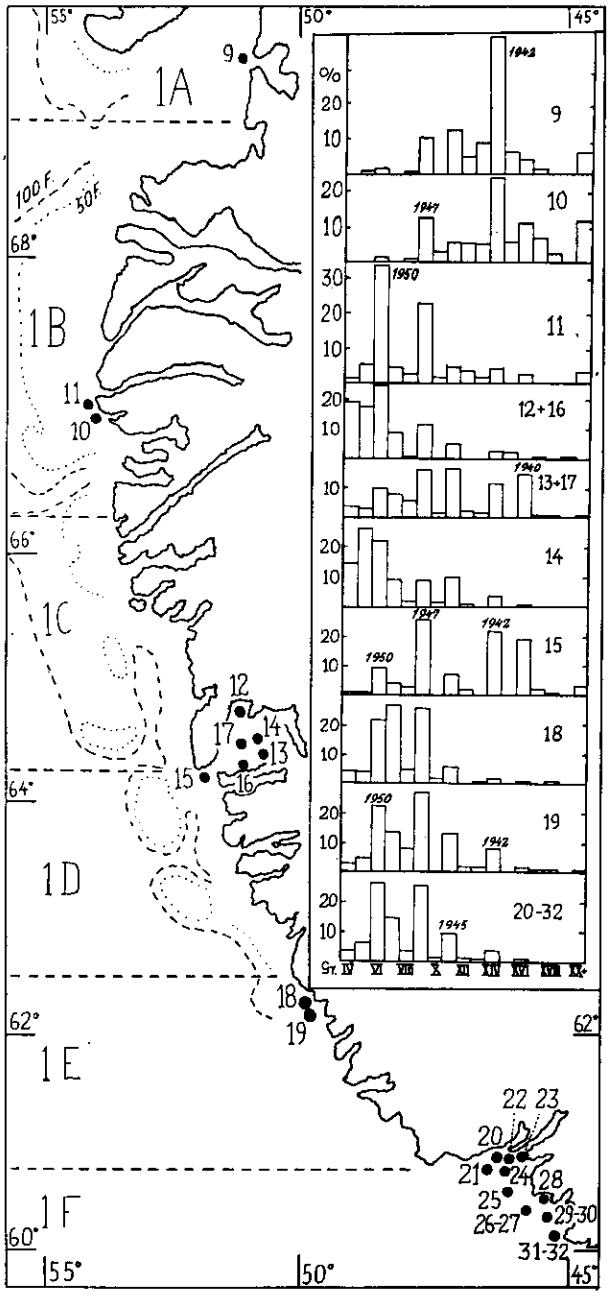


Fig. 5. **Percentage age-distribution of cod samples (nos. 9-32) from inshore waters and fjords in West Greenland, 1956.**

In the sample from Subdivision 1A (No. 9) 1942 (Gr.-XIV) was the predominant year-class, with 42%. From the southern part of Subdivision 1B the two samples (Nos. 10 and 11) differ very much in regard to age composition. No. 10 was taken from a Greenlandic catch with long-lines from rather shallow water, No. 11 with long-lines by "Adolf Jensen" in 100 to 200m depth south of Holsteinsborg. In sample No. 10 only the two year-classes 1950 and 1947 were of importance with respectively 35 and 24%. The sample No. 11 included mostly older year-classes with the 1942 year-class predominant with 25.9% and 1936, 1940 and 1947 amounting to 12% each.

The six samples Nos. 12-17 from Subdivision 1D were collected in the Godthåb Fjord withd if-ferent gears. Very distinct differences in the composition of year-classes occured. The small young cod were taken by pound-nets (Nos. 12 and 16); the 1950 year-class and younger year-classes amounting to 50 to 70%. Sample No. 13, taken by jig from the ice at the spawning place for cod at Kapisigdlit, contained mostly spawning cod of the old year-classes 1940, 1942, 1945 and 1947. These four year-classes amounted to about 72% of the sample. These cod belonged to the fjord type with very slow growth rate. The same fjord type was also found in sample No. 17, in which the year-classes older than 1945 were fairly well represented (43.5%).

Sample No. 15, in which the three year-classes 1940, 1942 and 1947 amounted to about 66%, was taken by long-line in 60 to 260m. depth near the entrance to the fjord. The growth rate was quite different from that of samples 13 and 17, being more similar to that found on the offshore banks. It is therefore possible that the cod found in the outer part of the Godthåb Fjord originate from the Fylla Bank.

The samples Nos. 18 and 19 from Subdivision 1E were from Greenlanders' catches, probably caught with long-lines. Sample No. 18 contained merely young cod with the 1949 year-class predominating (27%). This year-class has only been of importance in samples in Subdivisions 1E and 1F. In samples No. 19 the 1947 year-class predominated and the older year-classes 1945 and 1942 were better represented than in sample No. 18.

Not less than 13 samples, containing a total of 2324 specimens were collected in Subdivision 1F. The 1950 year-class predominated in 7 samples while the 1947 year-class predominated in 6 samples. The 1945 year-class was not as well represented as in previous years. As in Subdivision 1E, the 1949 year-class seems to have been of some importance in some of the catches.

The growing importance of the 1947 year-class in the catches in Subarea 1 in 1956 suggests an immigration from the northern part of the

subarea of the 1947 year-class. There is reason to fear that this very important year-class is going to emigrate gradually in the coming years to other areas as for example East Greenland and Iceland, as was the case with the 1945 year-class.

5. Tagging Experiments.

In 1956, 3273 cod were tagged in West Greenland waters. 623 recaptures were reported. The recoveries of the marked fish of different ages are given in Table 2. There were 597 recaptures in West Greenland waters, 21 in Icelandic waters, three on the Anton Dohrn Bank between East Greenland and Iceland, one at Bjørneø and one from Newfoundland. The recapture from Bjørneø is rather doubtful owing to the fact that the tag was found on a cod after it was landed in the fishing port (Cuxhaven). The recapture from Newfoundland was from Woolfall Bank, 47°07'N, 51° 35'W by a French trawler 2 May, 1956. It was tagged 1 September, 1955 south of Holsteinsborg, 66°26'N, 53°53'W.

Three recoveries have been reported by German vessels from Anton Dohrn Bank. The recovery from 7 February, 1956 has been mentioned in Ann. Biol., Vol. XII, 1955 page 135. The two others were recaptured in May 1956. One was tagged in September 1953, 60°23'N, 45°38'W, the other in September 1955, 64°04'N, 51°55'W. The former belonged to the year-class 1949, the latter to the 1945 year-class.

Otoliths were collected from 368 recaptured cod. As in 1954 and 1955, the great majority of the cod recaptured in Icelandic and other distant waters belonged to the 1945 year-class. The 1947 year-class is represented by 4 recaptures off Iceland.

The age composition of cod recaptured in Greenland waters shows the predominance of the 1947 year-class. The two next most numerous year-classes were the 1950 and 1945 year-classes.

The table below gives the numbers of recaptures reported by different countries. As in the last three years most of the recaptures were reported by Portuguese and Greenland fishermen.

The comparatively low number reported by Greenlanders in 1956 compared with 1955 may be due to the fact that a larger number of cod were tagged in 1956 on the offshore banks where no fishery is carried out by the Greenlanders.

Cod recaptured in 1956

	Greenland	Iceland	Other areas
Denmark	1		
Greenland	140		
Faroe Islands	7		
Norway	21		
Iceland	7	18	
United Kingdom		1	
France	1		1
Germany	22	2	4
Portugal	373		
Spain	22		
Italy	3		
Total	597	21	5

6. Redfish (*Sebastes marinus*) caught with Shrimp Trawl in West Greenland Fjords, 1952-56.

Samples of otoliths with length measurements were collected especially from catches with shrimp trawl, mainly in 250m. depth in a branch of the Godthåb Fjord. A total of 19,274 redfish caught in 29 hauls were measured between 1952 and 1956.

In August, 1930, large numbers of small redfish were found in the Julianehåb District drifting dead and dying on the surface. Thirty-eight of these small redfish were measured and the mean length was 35.6 mm. These redfish evidently belonged to the 0-group. On September 18, 1951, small redfish were collected from cod stomachs in the Julianehåb District. The mean total length was 43.6 mm. It is thus reasonable to believe that the O-group reaches a length of about 4 cm. The smallest specimens taken with shrimp trawl (mesh-size 20 mm.) were 5 cm. long (May, 1952). These small fish must belong to the I-group.

The first distinct maximum in the measurements from 1952-56 is at 8 cm., and this probably represents the individuals of the II-group. The peaks of the measurement curves for the different catches give a rough idea about the growth of the early age groups of redfish. For instance, the peak at 8 cm. in June, 1954, may probably be traced in the samples until December, 1956: in July, 1954, the peak is still at 8 cm.; in December of the same year it is at 9 cm. By 1955 the peak has reached 10 cm. in May, 11 cm. in July and August, and 12 cm. in September. In February, 1956, the peak is still at 12 cm., which indicates no growth during the winter. In May, July and

in December 1956, the peak is at 13, 14 and 15 cm. respectively. From these observations it appears that the mean lengths for redfish of the age-groups I, II, III and IV are approximately, 4-5 8-9, 10-12 and 12-15 cm. respectively, giving a yearly growth of 2 to 3 cm.

By following the maximum at 10 cm. in March, 1954, to December, 1956, a similar growth rate is found. Thus growth rate for the stock of redfish in the Godthåb Fjord seems to be very slow.

The measurements referred to are to be given in I.C.N.A.F. "Sampling Yearbook" Vol. 1, 1956.

7. Spotted Wolffish (*Anarhicas minor*) and Striped Wolffish (*Anarhicas lupus*).

The spotted wolffish has been of increasing importance to the fishery of the Greenlanders in the last three years. The output of the fishery has been: 1952 626 tons, 1953 1,987 tons, 1954 2,434 tons, 1955 3,400 tons, 1956 3,510 tons.

Fishing experiments with long lines were carried out by the "Adolf Jensen" in 1956 in order to find new fishing grounds for wolffish in inshore waters between 64° and 67°N. lat. Length frequency curves from measurements on wolffish taken from these experiments are given in Figure 6, which shows the length frequencies of 786 *A. minor* and 174 *A. lupus* in 5 cm. -groups. There is a large difference in the sizes of the two species. It is interesting that very few specimens of *A. minor* below 80 cm. in length have been caught. A large material of otoliths together with measurements of both species have been collected, but have not yet been worked up.

Tagging by means of ebonite discs in the dorsal fin was carried out with 644 specimens of both species.

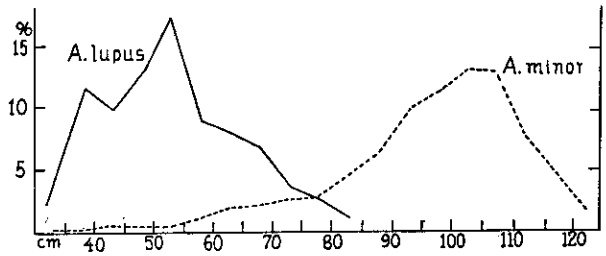


Fig. 6. **Percentage length distribution of striped wolffish and spotted wolffish caught with long lines in inshore waters of West Greenland in 1956.**

TABLE 2. **Cod recaptured at Greenland (Gr.) and at Iceland (Ic.) in 1956, tabulated according to Age and Year of Tagging.**

Year-class	Age-group	1948 Gr.	1948 Ic.	1949 Gr.	1949 Ic.	1950 Gr.	1950 Ic.	1951 Gr.	1951 Ic.	1952 Gr.	1952 Ic.	1953 Gr.	1953 Ic.	1954 Gr.	1954 Ic.	1955 Gr.	1955 Ic.	1956 Gr.	1956 Ic.	Total Gr.	Total %	Total Ic.
1936	XX	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	—	—	3	0.9	—
1937	XIX	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	2	0.6	—
1938	XVIII	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	0.6	—
1939	XVII	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.3	—
1940	XVI	2	—	—	—	—	—	1	—	—	—	—	—	13	—	7	—	—	—	23	6.7	—
1941	XV	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.3	—
1942	XIV	1	—	—	—	—	—	—	—	—	—	1	—	9	1	6	—	2	—	19	5.5	1
1943	XIII	—	—	—	—	—	—	—	—	—	—	1	—	3	—	3	—	1	—	8	2.3	—
1944	XII	—	—	—	—	—	—	—	—	1	—	1	—	—	1	3	—	—	—	5	1.5	1
1945	XI	—	—	—	1	—	—	2	2	3	2	4	2[1]	16	3	16	—	3	—	44	12.8	10[1]
1946	X	—	—	—	—	—	—	—	—	—	—	—	—	5	1	3	—	—	—	8	2.3	1
1947	IX	—	—	—	—	—	—	—	—	14	1	15	—	45	3	43	—	16	—	133	38.6	4
1948	VIII	—	—	—	—	—	—	1	—	—	—	2	—	6	—	9	—	3	—	21	6.1	—
1949	VII	—	—	—	—	—	—	1	—	—	—	2	—	7	—	12	1[3]	3	—	25	7.3	1[3]
1950	VI	—	—	—	—	—	—	—	—	—	—	2	—	6	—	32	—	6	—	46	13.4	—
1951	V	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	3	0.9	—
?	?	—	—	—	—	1	—	7	1	11	1	18	—	62	5[2]	106	1[4]	48	—	253		8[2,4]
Total number		4	—	—	1	1	—	12	3	31	4	46	2[1]	174	14[2]	247	2[3,4]	82	—	597		26[1,2,3,4]

(1) two cod recaptured on the Dohrn Bank.
(2) one ,, ,, at Bear Island.
(3) ,, ,, ,, on the Dohrn Bank.
(4) ,, ,, ,, at Newfoundland.

II. HYDROGRAPHIC CONDITIONS IN WEST GREENLAND WATERS 1956

BY FREDE HERMANN

As in the preceding years, hydrographic observations were carried out in the fjords and coastal area by M/K "Adolf Jensen" and M/K "Tornaq" and in the Labrador Sea and Davis Strait by R/V "Dana". Fig. 7 shows the location of the sections and the distribution of temperature in 50 metres. The hydrographic conditions are further illustrated by Figs. 8-12.

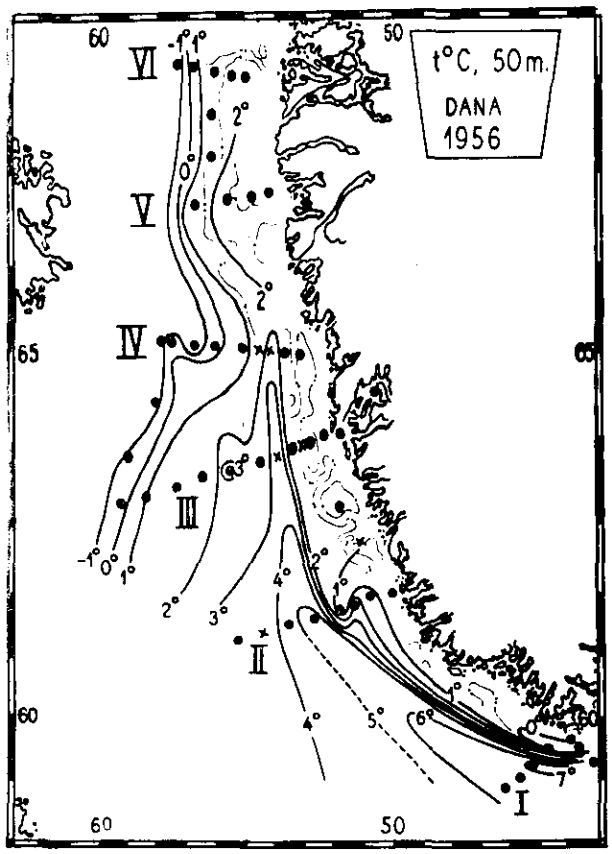


Fig. 7. Temperature distribution at 50 metres depth, and location of sections, July-August, 1956.

The "Storis" was nearly absent in West Greenland waters in July 1956 and the temperatures in the polar component of the West Greenland current were not very low. Only at the southernmost section a trace of water with negative temperature was found.

The Atlantic component of the current was well developed and transported great amounts of warm water up along the western slope of the banks. North to Lille Hellefiskebank water with temperature above 4°C. was found in a thicker layer than has been found in many years.

The boundary of the Arctic Baffin Land current was found further eastwards than usual, specially at the section off Lille Hellefiskebank (section IV). The same was the case with the limit of the "Vestis".

A section over Fyllas Bank worked by M/K "Adolf Jensen" on 23rd April showed that water with negative temperature was not present either over the shallow part or over the edges of the bank. This indicates that the winter cooling was less severe than usual which is in accordance with the fact that the winter was very mild.

When the section was repeated on 5th June the temperature over the shallow part of the bank had only increased to 0.°8, which is considerably

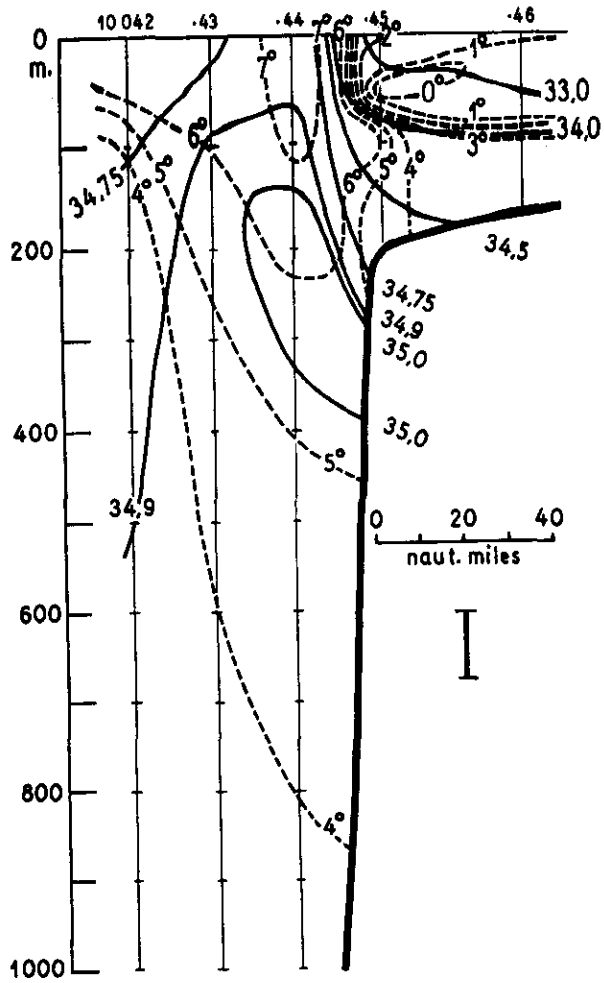


Fig. 8. Section I, off Cape Farvel, 1-10 August, 1956.

below normal. This low temperature is supposed to be due to low air temperatures in May and June and is possibly the main reason for the very low number of cod larvae caught in the summer 1956.

In July the temperatures over the shallow parts of the banks were about normal north to Great Hellefiske Bank where they were a trifle below normal.

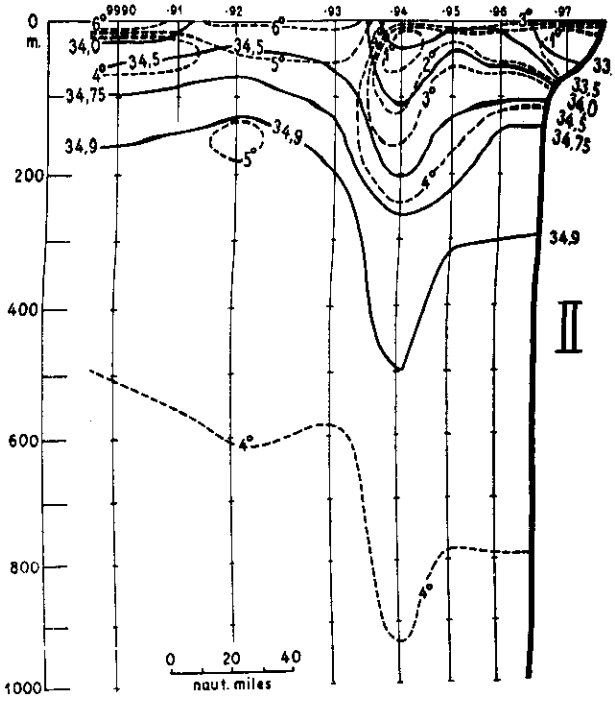


Fig. 9. Section II, off Frederikshåb, 10-11 July, 1956.

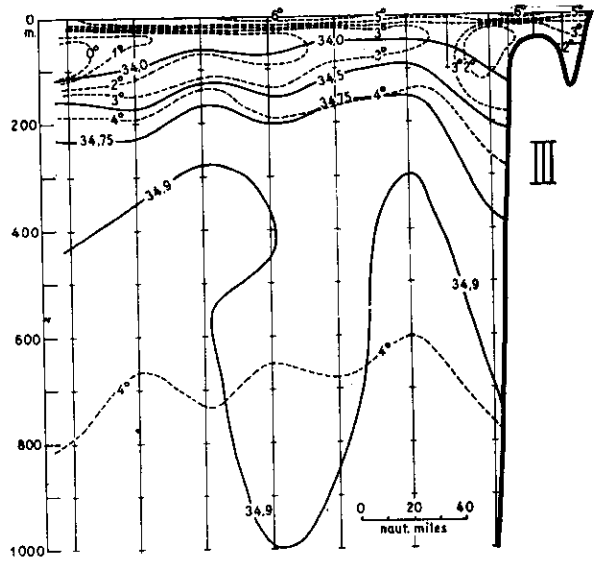


Fig. 10. Section III, off Fyllas Bank, 16-18 July, 1956.

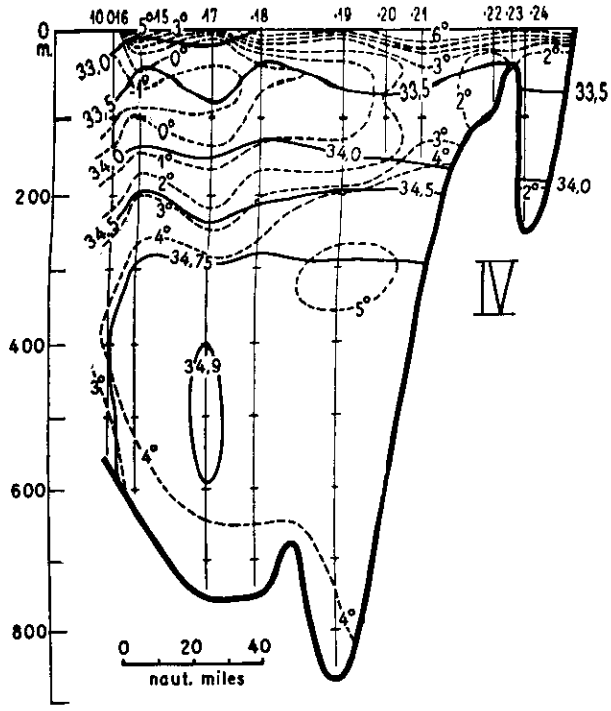


Fig. 11. Section IV, across Lille Hellefiskebank, 19-20 July, 1956.

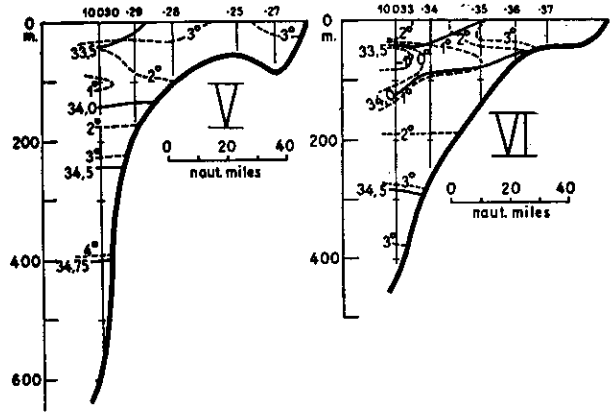


Fig. 12. Left: Section V, off Holsteinsborg, 21-23 July, 1956.
Right: Section VI, off Egedesminde, 23-24 July, 1956.

Fig. 13 shows the distribution of phosphate at 20 metres as found on the "Dana" cruise. The essential features were the same as found in previous years with one maximum off the banks of southwest Greenland and another at the boundary of the Baffin Land current. Over the Great Hellesfiske Bank the phosphate concentration was somewhat higher than usual.

A fixed station at the entrance of Godthåbsfjord was worked 12 times during 1956. The variation of temperature at this station from October 1955 to January 1957 is given in Fig. 14. In most years an inflow of warm and saline bottom water takes place in November-December. This was also the case in 1956 when the maximum bottom temperature exceeded 4°, which is higher than measured in 1954 and 1955. An extra inflow of warm water occurred in February, which is quite extraordinary.

The effect of winter cooling was less pronounced than in the two previous years. No temperatures below zero were measured below 50 metres. In 1954 and 1955 temperatures below -0.°5C were found from surface to bottom in March.

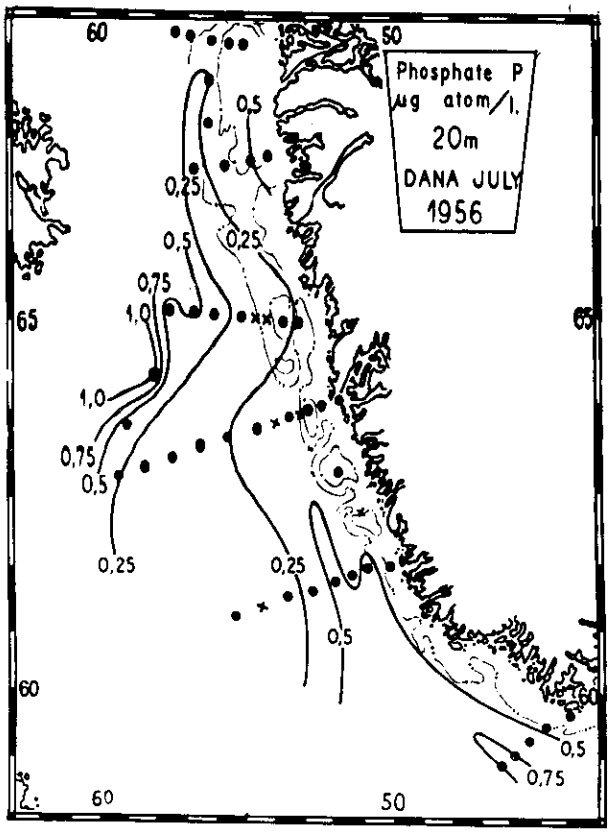


Fig. 13. **Distribution of phosphate, July 1956.**

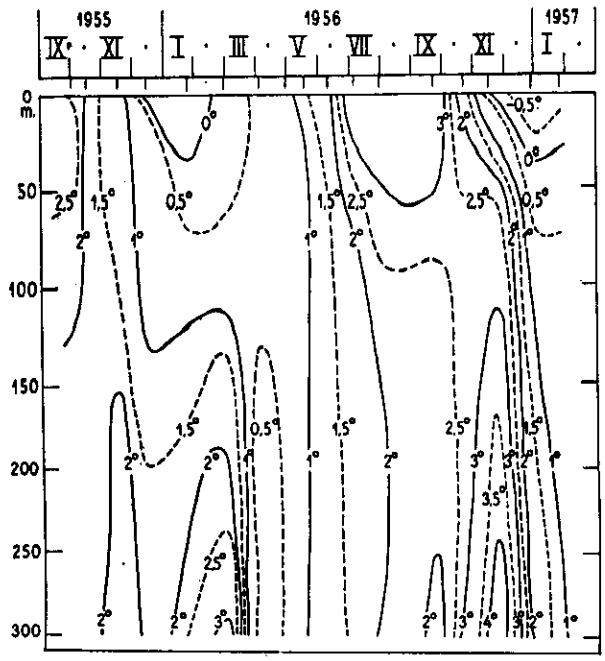


Fig. 14. **Variation of temperature at the entrance to Godthåb Fjord (64°07'N - 51°53'W), September 1955 to January 1957.**

III. French Research Report, 1956

BY J. FURNESTIN

In 1956 the escort vessel "Aventure" of the French Navy carried out the following research work on the Grand Banks of Newfoundland:

(a) Hydrographic section off the Avalon Peninsula, Bearing 135, (7 stations)—May 1956;

(b) Hydrographic section of the channel separating the St. Pierre Bank and the Grand Bank (4 stations)—May 1956.

(c) Hydrographic section across the Cabot Strait (5 stations)—June 1956.

Experimental hauls with trawls of manila and of nylon with from one to three extra nets covering the codend (multiple codends) were carried out on the Grand Banks of Newfoundland with a view of the application of the clauses for saving gear contained in the proposals for regulation of the trawl fishery for cod and haddock in the area of the Convention, Subareas 3, 4 and 5.

IV. German Research Report, 1956

(A) INTRODUCTION, BY A. BÜCKMANN

1. In the Area adjacent to that of the ICNAF the research vessel "Gauss" of the German Hydrographical Institute carried out systematical soundings of the shelf and continental slope between Angmagsalik and Northwestern Iceland. Some 80 sections were run, and in addition, hydrographical observations were made at the surface and, to a small extent, in vertical series.

"Anton Dohrn" did not operate in the Area before April, 1957.

2. A survey was kept of the German fishery in the Greenland area by the Institut für Seefischerei, Bundesanstalt für Fischerei, Hamburg. A report on the observations on cod by Dr. Arno Meyer is included.

(B) OBSERVATIONS ON THE COD AND THE COD FISHERY IN 1956 BY ARNO MEYER

German fishing activity in the waters of West, South and East Greenland continued to increase. The total catch rose from 66,744t in 1955 to 76,681t in 1956 (West Greenland 30,780t, South Greenland 1,216t, East Greenland 44,683t). The proportion of cod increased from 13.5% (9,041t) to 41.3% (31,672t) and that of redfish dropped from 83.0% to 51.8%.

West Greenland

In contrast to 1955 the West Greenland fishery of 1956 was a real cod season, as the trawlers did not succeed in finding the redfish concentrations as in the preceding year. Thus the yield of cod increased from 6,040t to 23,669t. The season started early by the end of April and lasted until the end of July. The daily catch was again highest in June with 32.5t (gutted, landed weight). Most trawlers fished for fresh fish, but 4 trawlers landed 1,890t of green salted cod from 8 trips.

As in the preceding year, the success of the West Greenland cod fishery was due to the strong 1947 year-class, which accounted for 40.6% of the catch. The average length of these fish was 71.6cm. The 1945 and 1942 year-classes, still important in 1955, have now become weak. The second best year-class was, as expected, that of 1950 with 22.6% and a mean length of 61.7cm. The average length of all West Greenland cod was 69.1 cm., nearly the same as in 1955 (68.7 cm).

South Greenland

German trawlers developed little fishing activity in South Greenland waters. Large shoals of cod were found, but the fish were very small and a lot of them had to be rejected. The average length of the trawler landings was 64.2cm. Most of the landed cod (53.1%) belonged to the 1950 year-class. The 1945 year-class, which was rather abundant in 1955 in the trawler catches (28.5%) as well as in the catches taken by "Anton Dohrn" (15.6%), has now become weak. Age analysis revealed again the fact, that the share of the 1949 year-class is larger in the south than in the west of Greenland. On the other hand, the strong 1947 year-class of West Greenland gained only small commercial value in the south of Greenland and from 1955 to 1956 its share decreased to 9.1% (1955: 17.3% in the trawler catches, and 13.1% in catches of "Anton Dohrn").

East Greenland

Since the discovery of large fish shoals on the Dohrn Bank in September 1955, by the German research vessel, the German trawlers fished off East Greenland throughout the year, generally with good success. In 1956, the fishery was supported by exceptionally fair ice conditions, for in winter and spring 1956 the East Greenland ice belt was very narrow. Fishing was mostly carried out on Dohrn Bank (65°40′N; 30°W) and off Angmagsalik (64°40′N; 35°W), but also on the Heimland Ridge and its south-western edge, and (after the Icelandic "Fylkir" search trip in July) in the south-east of Greenland near Cape Bille.

In 1955, the fishery off East Greenland dealt mainly with redfish. The share of cod amounted only to 6.5%. But when the redfish catches decreased and the trawlers moved again more towards the banks, the output of cod increased. In 1956, 7,437t of cod were caught, i.e. 16.6% of the total catch. In December 1956 and January 1957, the cod catches on Dohrn Bank reached a maximum of 39% and 46% respectively with an average daily output of 6.7t and 7.7t respectively. In March and April 1957, the cod catches on

Dohrn Bank exceeded by far those of redfish and the daily catch of cod increased to 30-60t. In the Angmagsalik area and on the Heimland Ridge in spring 1957 the yield of cod amounted to 25-30% of the total catch.

As in 1955, the 3 year-classes 1945, 1947, and 1949 constituted the major part of the East Greenland stock of cod. There is apparently no doubt, that the 1945 and 1949 year-classes are of Icelandic origin and a lot of them probably grew up in South Greenland waters. With regard to the cod of the 1947 year-class we may suppose that they belong to the West Greenland stock. This assumption is supported by tagging experiments and may also be related to the retarded growth of this year-class. In March and April 1956 the average length of this 1947 year-class in the Angmagsalik area was 74.8cm., whereas the 2 years younger cod, born in 1949, measured 75.0cm. The mean length of the 1945 year-class was 80.3cm

There is a difference in the age composition between cod from Dohrn Bank and Angmagsalik. The share of the 1947 year-class is far greater on the western fishing ground and the age composition of Dohrn Bank cod lies approximately between those of Angmagsalik and N.W. -Iceland. This difference in age composition between Angmagsalik and Dohrn Bank cod was again observed in spring 1957 and seems to be typical for that area.

The real spawning place of the East Greenland cod is still unknown, but we are able to draw some conclusions from our examinations of ungutted cod. In March and the first week of April 1956 most of the cod from Angmagsalik were found to be completely ripe. At the end of April we noticed a sudden increase in the proportion of immature cod and consequently a remarkable decrease in length from 78.5 to 73.5cm (see figure). This means that the mass of mature cod, ready for spawning, left Angmagsalik by mid April. However, in the last week of April still one-third of the Angmagsalik cod had ripe sexual organs, some just before spawning. At this time fishing off Angmagsalik ceased and moved to Dohrn Bank, where in May the output of cod reached its first maximum with 25.9% of the total catch. Unfortunately, we obtained no ungutted cod from Dohrn Bank in 1956, but in April 1957 we examined ungutted cod from Dohrn Bank and found most cod to be fully ripe and some cod spawning or at the beginning of spawning. By the end of April 1957, we had obtained the proof, that cod were also spawning in the Angmagsalik area. We observed all stages of spawning from the beginning until the end of the spawning period.

From these first examinations of East Greenland cod we may conclude, that the spawning migration of mature cod occurs very late in April and May and that the spawning area of the East Greenland cod extends from Angmagsalik (possibly west of Angmagsalik) to West Iceland. This means, that the fry spawned in East Greenland waters, or on the way from East Greenland to Iceland is carried regularly by the Irminger current to East, South-East, and South Greenland, and thus has developed (or is still developing) a self-containing stock of East Greenland cod. Besides this fry from genuine East Greenland cod, fry from Icelandic spawning grounds is also carried to Greenland, if the current conditions are favourable.

It is a very interesting fact, that many of the largest cod from East Greenland are still immature. These large juvenile cod belong mostly

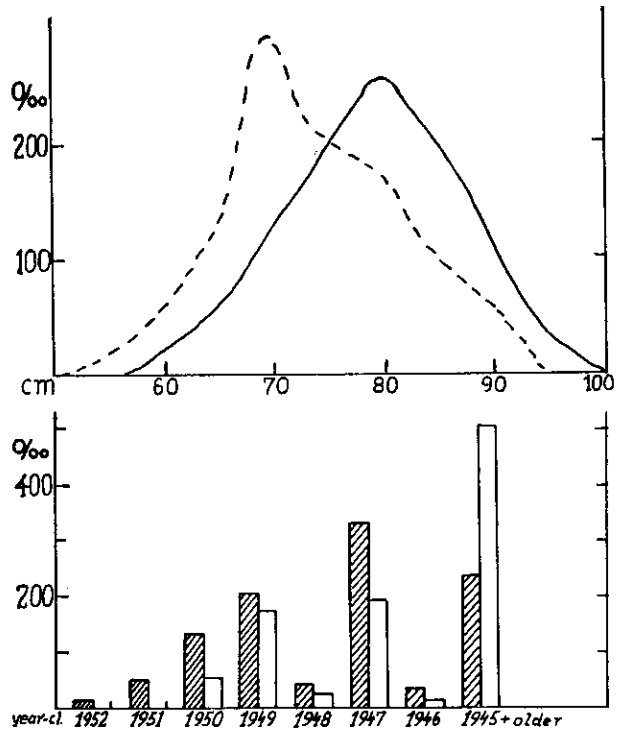


Fig. 1. **Length (above) and age (below) distribution of Angmagsalik cod caught in March and in the first week of April 1956 (drawn line - white columns) and at the end of April 1956 (broken line-shaded columns).**

to the 1945 year-class. By the end of April, 1956, about 75% of all cod born in 1945 and caught off Angmagsalik were immature. Also in March 1957 about 25% of these 12-year-old cod were still juvenile. These findings conform well with the investigations made on the Icelandic spawning cod and prove that the unusually large bulk of first time spawners of this 1945 year-class caught on the Icelandic spawning grounds in 1954, 1955 and 1956, immigrated mostly from East Greenland. These findings show further, that the East Greenland waters are not only the connecting link between Greenland and Iceland, but also a reservoir of large cod for the fishery off East Greenland and Iceland, and for the Icelandic spawning stock.

The phenomenon of the late inception of maturity of the cod in East Greenland waters may be due to the fact, that these cod grew up in the colder waters off East and South Greenland and that the ripening of the sexual organs is delayed by the colder waters of East Greenland which they pass on their journey to the spawning grounds.

Stomach investigations of cod revealed again, that East Greenland, especially Dohrn Bank, is an area with abundant food supply, where immense shoals of bathypelagic fish and crustacea are attracting the cod. Further investigations will prove whether these areas are feeding grounds, also attracting the mature cod having spawned in Icelandic waters.

V. Icelandic Research Report 1956

(A) COD. BY JÓN JÓNSSON

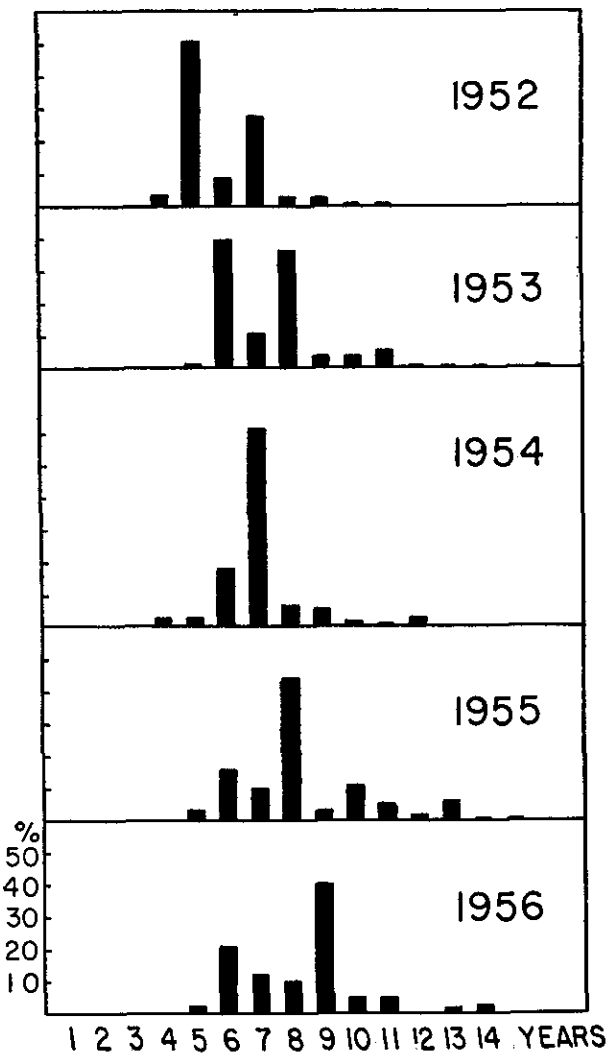


Fig. 1. **Age distribution of cod caught by Icelandic trawlers in West Greenland waters in the years 1952-1956.**

The Icelandic research in the Convention area was limited to sampling catches from commercial trawlers fishing on the West-Greenland banks.

Fig. 1 shows the age-distribution of the trawler caught cod in the years 1952-56. The figure shows that in this period the trawl fishery had for a great part been based upon one single year-class, that of 1947. In 1952 and 1953 the year-class of 1945 also constituted a considerable part of the catches and in 1956 the year-class of 1950 had entered into the commercial fishery. After 1953 however, the year-class of 1945 was almost lacking in our material from Greenland.

Danish marking experiments have shown that a number of fish belonging to this year-class have been recaptured on the Icelandic spawning grounds since 1951. The year-class of 1945 in Icelandic waters has shown some sign of mixture with a slower growing fish, which is indicated in Table 1.

The growth of the 1945 year-class in Icelandic waters was fairly normal until its seventh year, but from that year its growth has been far below the present average. The growth of the 1945 year-class in Greenland is calculated from our trawl samples. The difference in length between these two areas as regards age-groups 7 and 8 is in fact greater than indicated by the table, as the Greenlandic values are taken from autumn observations, but the Icelandic ones from spring observations.

It is not easy to distinguish between these two stocks on the Icelandic spawning grounds, for instance by their otoliths, but the decrease in the average length surely indicates a certain admixture.

In 1957 we are expecting our catches on the West-Greenland banks to be mainly composed of seven and ten year old fish.

TABLE 1

Age-Groups	7	8	9	10	11
Average 1928-51 Iceland	79.2	81.8	85.6	87.3	90.6
Average in 1955 Iceland	84.8	87.2	90.0	86.4	93.8
1945 year-class Iceland	76.9	80.2	81.7	86.4	85.4
1945 year-class Greenland	71.5	74.5		77.0	77.0

(B) REDFISH. BY JAKOB MAGNÚSSON

The Icelandic redfish fishery in Greenland waters is quite new. Before 1954 the fishing was exclusively carried out in West-Greenland waters, but in that year, fishing for redfish in the East-Greenland area was started. This area soon became the most important one as regards the Icelandic redfish fishery. However, notable catches are still taken at the West-Greenland coast. Thus about 14.5 thousand tons were taken in the Convention Area in 1954. During the following year about 18 thousand tons were taken while in 1956 only 7 thousand tons were landed. This

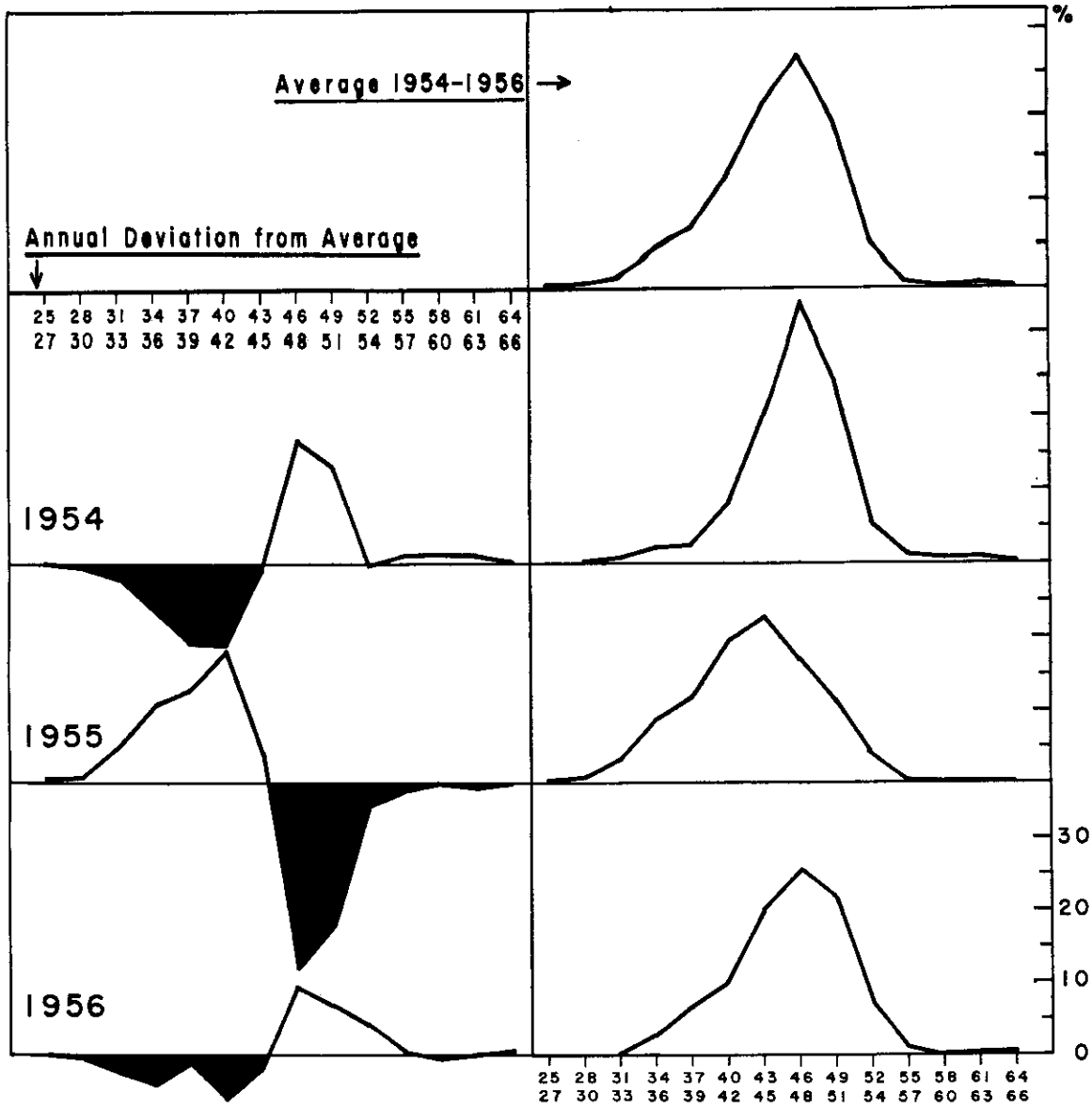


Fig. 2. Length distribution by 3 cm groups of redfish caught by Icelandic trawlers in West Greenland waters, 1954-1956. With deviations from mean lengths 1954-56.

smaller quantity in 1956 is due to more intensive fishery in the East-Greenland area during the main redfish season at West-Greenland.

Measurements were made from the commercial catches in W.-Greenland waters, 1954 to 1956. Only two to three samples were taken each year, a total number of 3,271. All samples from the same year revealed a very similar length distribution and in all three years the catches mainly consisted of the medium sized individuals, i.e. 40 - 50 cm. In 1955 the catches were composed of smaller redfish than in the years 1954 and 1956 as illustrated in Figure 2. The mean lengths in 1954 to 1956 were 46.97 cm., 43.16 cm. and 46.30 cm. respectively.

VI. Norwegian Research Report, 1956

By BIRGER RASMUSSEN

During the 1956 fishing season 71 Norwegian vessels participated in the West Greenland fishery. This is a little reduction compared to the preceding year. Of these vessels 8 were fishing exclusively for halibut, while 63 were engaged in the cod fishery. Only 2 Norwegian trawlers visited the area in 1956. The total catch amounted to 14,046 tons of salted cod compared with 14,325 tons in 1955. In addition 691 tons of halibut were landed as compared with 881 tons the preceding year.

One of the vessels tried purse-seining for cod in the area in 1956. Two long-liners went to the Newfoundland Banks from West Greenland during the first week of August. This was the first time that Norwegian long-liners fished the Grand Banks. They set their long-lines in deep water along the slope of the bank off St. John's. In the course of three weeks they caught 100 tons of salted cod each. The fish were very large and of excellent quality. The result obtained by these vessels will probably induce more vessels to visit the Grand Banks in 1957.

Off West Greenland the long-liners started their fishery in early May on the Julianehåbs-, Danas- and Fiskenaes Banks. During the first part of the season there were many fish present on the banks, but the fishery was partly slowed down by bad weather. The quality of the cod must be characterized as very good, and better than in the last two years. In July most of the vessels finished their first trip. They went to Norway for unloading, and returned again early in August. The long-line fishery was then very poor on all the banks. The cod had seemingly left the bottom and was swarming pelagically in most ships resorted to the modern form for hand-lining which met with better success.

The halibut vessels fished only in the Davis Strait outside the West Greenland Banks. None of the vessels sailed to the Labrador coast on account of difficult ice conditions in that area.

As in earlier years the Norwegian Institute of Marine Research collected material for the study of the age- and size composition of the commercial cod catches, and for the study of the temperature conditions along the banks. The research ship "G. O. Sars" undertook a cruise to this area during July. The research ship fished the different banks with the usual fishing gears employed by commercial fishermen. About 2000 measurements of cod and otolith samples were taken. Tagging of cod was likewise carried out as usual.

Later in the season an observer from the Institute also sampled the purse-seine catches during the experimental fishing. A third vessel was engaged in tagging of halibut.

In 1956 Denmark and Norway had agreed to a plan of cooperation in the hydrographic work. Both the Danish research ship "Dana" and the "G. O. Sars" had a relatively short time at their disposal for the work at West Greenland, and by dividing the hydrographic sections between the ships more work could be done in other fields. As her share the "G. O. Sars" took four sections, viz., westwards from Danas Bank, Fiskenaes Bank, Banan Bank and northern part of Lille Hellefiske Bank (see Fig. 1-2).

The four sections taken show no exceptional features compared to earlier years. As usual a

ticular depths where the long-lines usually are set, 150- 200 m, the temperature both on Danas and Fiskenaes Bank were above 2°C, while on the banks further north, the Banan Bank and Lille Hellefiske Bank somewhat below 2°C. In more shallow water on the banks the temperatures were between 1 and 1.5°C. In the Davis Strait proper, some distance from the banks, a considerably colder core of water was present. The temperature conditions in 1956 were not more unfavourable for the fishery than in 1955, but rather somewhat better.

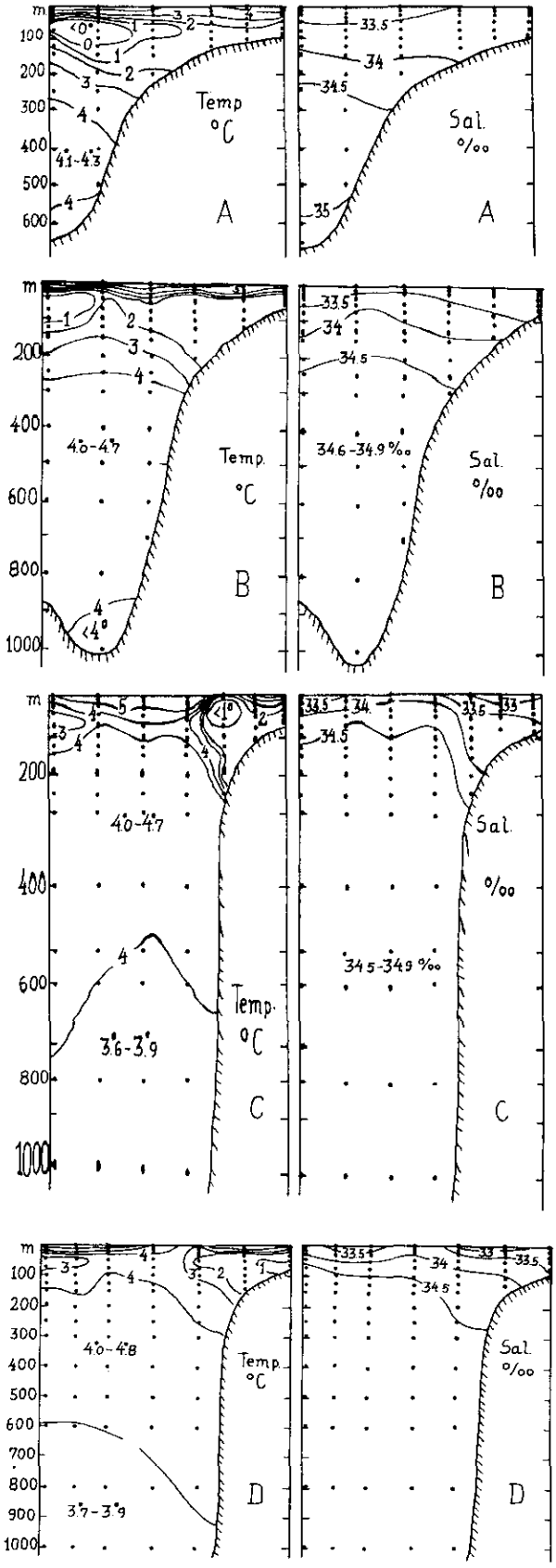


Fig. 1. **Hydrographic sections across Lille Hellefiske Bank, 22 July 1956—A, Banan Bank, 21 July 1956—B, Fiskenaes Bank,**

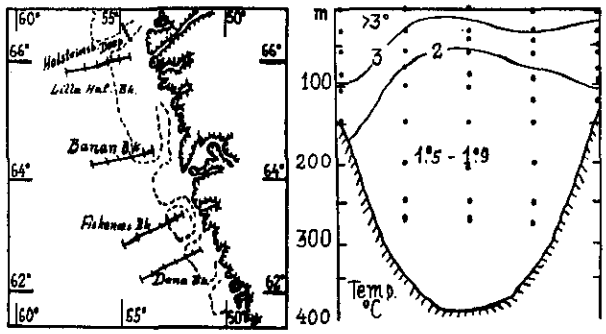


Fig. 2. **Left: position of hydrographic sections. Right: section across Holsteinsborg Deep, 24 July 1956, Temperature.**

An area of relatively great importance for the Norwegian fishery is the Holsteinsborg Deep where the cod assemble in pelagic swarms in early August. In previous years investigations have shown that in this area a rather sharp thermocline is formed, with relatively warm surface water of varying thickness, and a cold layer below. The fish usually concentrate against the ceiling of warm water. In 1956 a section of 5 stations was taken on July 24th with a bathythermograph from the northern edge of Lille Hellefiske Bank across the deep to the southern edge of Store Hellefiske Bank (Fig. 2). In the southern part of the Deep cold water of 1.2- 1.5°C was clinging to the bank slope, probably being carried in from the outside. This cold layer was present in depths between 80 and 300 m. Above the cold water the temperature rose rapidly to 3°C at the surface. In the northern part of the Deep the warm surface water penetrated somewhat deeper. The general picture was that the temperatures were higher in the northern part of the Deep, with little stratification. Echo soundings and Asdic sweeps carried out all over the Deep showed only single scattered fish in the northern part of the deep, while in the southern part a more dense, although scattered, occurrence of fish was found between 75 and 200 m.

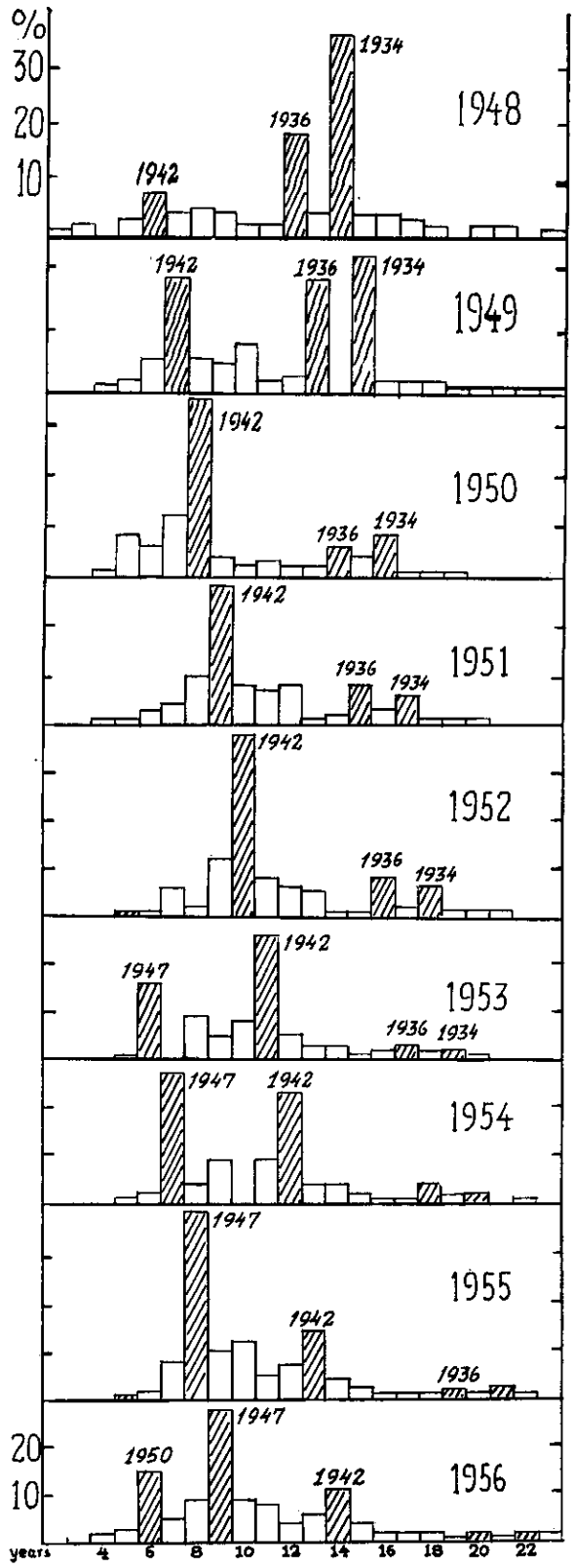


Fig. 3. **Age distribution of cod in Norwegian long-line catches in the years 1948 to 1956.**

schools of cod were, however, found in dense masses close to the bottom, and pelagic concentrations had started to form in the cold water below 2°C stretching out from the bank slope. A week later the temperature conditions had changed completely. The surface water had then become warmer with a thermocline at 25-50 m depth. Dense pelagic schools of cod were then feeding on sandeels, fish young, and plankton organisms.

The cod population.

Onboard the research ship samples of cod were collected. The fish were caught by the ordinary types of commercial gear used by the Norwegian fishermen, such as bottom long-line, floating long-line and hand-line. Samples were also obtained from purse seine catches of cod.

The bottom long-line fishery.

Bottom long-lines were fished from the research ship on the western slopes of Frederikshåbs Bank, Danas Bank, Fiskenaes Bank, Fyllas Bank and the Banan Bank Samples were obtained in all thees localities from catches taken in depths varying between 120 and 240 meters. On all these banks it is the nine year old fish belonging to the year-class 1947 which is dominating. (Fig. 3) The strength of this year-class varies, however, from 22.8 per cent on the southern banks to 37.4 per cent on Banan Bank. Another strong year-class is the 1942-class which has been prominent in the Norwegian long-line catches for a number of years already. Also this year-class shows a tendency of increasing strength from the southern banks (9%) to the northern banks (17%).

A new year-class coming into the fishery is the one born in 1950. This group of 6 year old fish was in 1956 most prominent on the southern banks where it constituted between 13.5 and 15.3 per cent of the catch. Further north, on the Fyllas and Banan Bank the 1950 year-class decreased to respectively 8.6 and 4.0 per cent (Fig. 4). This year-class seems to be exceptionally rich, and it will in the coming years probably be the most important component of the Norwegian long-line fishery.

The size distribution of the cod in the different localities shows some variation. The largest cod is caught on Fyllas Bank and Danas Bank, where the mean size was respectively 77.07 and 76.85 cm.

On the other banks the mean size varies between 73.06 and 74.07 cm. The mean size of all long-line caught cod is 74.81 cm. with a mean age of 10.1 years.

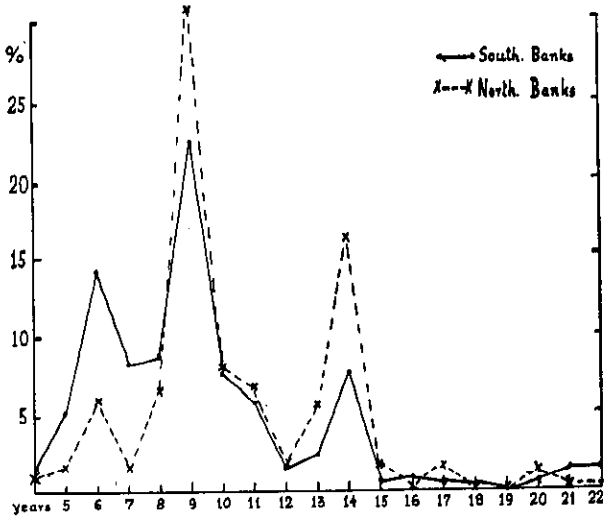


Fig. 4. **Age distribution of cod caught on bottom long-lines, 1956, on the southern banks (Frederikshåb, Dana, and Fiskenaes) and on the northern banks (Fylla and Banan).**

The pelagic long-line fishery.

On July 24th a floating long-line of 2000 hooks was set by the research vessel from the northern edge of Lille Hellefiske Bank northwards partly across the Holsteinsborg Deep. At every 400 hooks the line was kept floating by 7 fathom vertical ropes fastened to buoys. The age composition of the catch is shown in Fig. 5. The cod caught on the pelagic long-line was on an average somewhat younger than those caught on bottom lines. The dominating year-class was that born in 1947. Next in importance come the 6 year old cod born in 1950 and 8 year old cod born in 1948. The mean age of the cod on pelagic long-line was 9.4 years compared to 10.1 years for the bottom long-lines. The mean size is respectively 71.98 and 74.81 cm, with the same size of hooks used.

As mentioned before, the pelagic long-line fishery was no success for the commercial fleet in 1956. Instead they resorted largely to hand-lines which proved more efficient.

The hand-line fishery.

In recent years hand-lining for cod on the West Greenland Banks has become quite an important feature in the Norwegian fishery. In 1956 hand-lining to a great extent substituted the pelagic long-lines. This is again due to the recent modernization of the hand-line gear. The hand-line is used only when the cod is found pelagically during August. In 1956 the hand-line proved both equally efficient as well as less expensive in use compared to the pelagic long-line. The average daily catch on a ship was 3-4000 cod on hand-line, with top catches around 6-7000 cod.

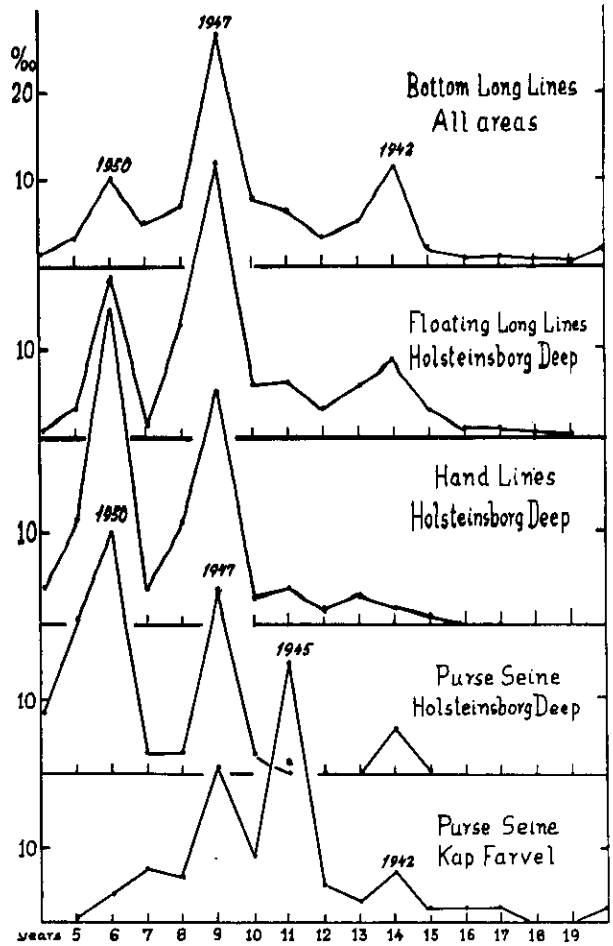


Fig. 5. **Age distribution of cod from different gears, 1956.**

The hand-line used is made of monofilament nylon of 1 mm diameter. At the lower end of the line is fastened a "Swedish Jigger" weighing about one pound. From the jigger upwards along the line is strung 6-10 artificial rubber worms threaded on a hook. The colour of the artificial bait is usually red, white, green or yellow. The hand-line is wound on a hand-reel fastened to the gunwhale, one reel being operated by each man.

During the first days of August the temperature conditions in the Holsteinsborg Deep had improved considerably. On July 24th the tem-

perature in the southern part of the Deep had been 3.3°C at the surface decreasing to 1.8°C at the bottom (125 m). On August 7th-10th the temperatures in the same locality were between 4.5 and 5.7°C at the surface, and between 2.9 and 4.6°C at the bottom. A decided thermocline was present at 20-25 meters depth. The echo sounder registered pelagic concentrations of cod between 5 and 50 meters, while the hand-line catches indicated the greatest fish density at 20-30 m. Similar concentrations of cod were also found in the Cape Farewell region in the latter half of August in 10-50 m depth. However, here the temperature was lower, being 2.5-3.0°C at the surface decreasing to as low as 1.1°C at 90 m depth with a sharp thermocline between 20 and 50 m. In both localities the temperatures could vary somewhat from day to day. At Holsteinsborg the pelagic cod was feeding on sand-eels, while off Cape Farewell they were feeding heavily on capelin.

The cod at the Holsteinsborg Deep caught with hand-lines were small-sized, having a mean length of only 66.53 cm, and a mean age of 7.5 years. The hand-line catches were dominated by the 6 year old fish belonging to the year-class 1950. Next in importance comes the 9 year old fish of the 1947-class. (Fig. 4). We have no sample from the hand-line catches at Cape Farewell, but according to the observer the hand-line cod here had the same size composition as found in the purse-seine catches in the same area.

Purse-seining for cod.

During the summer 1956 an experiment was carried out with purse-seine for cod in Greenland waters by the commercial long-liner "Longva". The Institute of Marine Research had an observer on board the vessel during this experimental fishery.

The purse-seine used was an ordinary cod purse-seine of the type used in the Lofoten fishery in Norway. It was 225 fathoms long and 32 fathoms deep, with a mesh size of 10 cm stretched mesh.

The M/s "Longva" arrived at the Holsteinsborg Deep on August 6th, and started immediately to search the area with echo sounder for concentrations of cod. On August 7th, two sets were made in the southern part of the Deep where fish were detected at 10-20 fathoms, while the depth to the bottom were 30-35 fathoms. The surface temperature was 4.5°C. A thermocline was present at about 25 meters depth where the temperature suddenly dropped to 3.7°C. The bottom temperature was 3.2°C. The first set gave no catch, but the net was torn. The second set made in the afternoon gave only 50-60 cod and the net was again torn. On August 9th a third set was made. Dense schools of cod were registered from surface down to 15-20 fathoms. This day the surface temperature was 5.2°C with a thermocline at about 25 m where the temperature dropped suddenly to 4.2°C. Bottom temperature at 70 m was 4.1°C. In spite of ideal conditions for setting, the catch was only 35 cod. The reason for this failure was surmised to be that the fish were scared by the seine in the clear daylight. At 6 p.m. the net was set again in the same locality. This time the catch was 1000 cod. At 9 p.m. the net was set again on good schools of cod, but the catch was only 15 rather small fish, but the net was again torn.

During the succeeding days the weather changed for the worse, with fog, wind and a fairly heavy sea which prevented the use of purse-seine. On August 12th it was decided to leave the Holsteinsborg Deep and rather try in the Julianehåb– Cape Farewell region, where surface concentrations of cod had been reported by other vessels. The new area was reached on August 18th. Echo soundings were started immediately in order to locate cod concentrations. Promising schools of cod were located some distance off Cape Farewell on August 20th. The fish had a ceiling height at about 7 fathoms. Due to a strong current it was not found feasible to set the purse-seine, but by hand-line 2700 cod were caught during the day. The conditions improved the next day, and the seine was set. The catch was 700 cod. The surface temperature was 2.6°C with a thermocline at about 60 meters where the temperature dropped to 2.0°C. The bottom temperature at 140 m was 3.0°C. In the afternoon another set was made in the same locality with a catch of 500 cod, all large fish. In the following days bad weather prevented the use of the purse seine. Good weather conditions existed again on August 25th. The net was set, but the current was so strong that it turned the seine inside out and no catch was made. Large schools of cod were present and hand-lining during the day gave 2-3000 cod.

A total of 8 sets were made with the purse-seine, viz., 5 sets at the Holsteinsborg Deep and

3 sets off Cape Farewell. The first 5 sets caught 0 - 60 - 35 - 1000 - 15, a total of 1110 cod. The other 3 sets gave 700 - 500 - 0, a total of 1200 cod. It cannot be said that the purse-seine experiments were successful. The use of the purse-seine is largely dependent on good weather conditions and not too strong a current, conditions which are not easily fulfilled off West Greenland. It is not expected that the cod purse-seine will come into ordinary use in the Norwegian Greenland fishery on the basis of the 1956 experiments.

The pelagic cod in the Holsteinsborg Deep were feeding heavily on sandeels (*Ammodytes*), while the cod in the Cape Farewell region were feeding on capelin, 9-13 cm in length. In both localities were also found small squid, fish larvae, schizopods, and other organisms.

From the cod caught with purse-seine at Holsteinsborg we have at disposal only a small sample of 33 specimens. The cod is relatively young and small-sized, with a size- and age-composition (Fig. 5) similar to that found in the hand-line catches. At the Holsteinsborg Deep it is the 6 year old fish of year-class 1950 which dominate the purse-seine cod, constituting more than 30 per cent of the catch. Next in importance comes the 9 year old fish (1947 year-class) with 24 per cent and 5 year old fish (1951 year-class) with 21 per cent. Altogether these three year-classes make up 76 per cent of the catch. The mean size of the cod is 64.09 cm, a rather unsatisfactory size for saltfish production. Although the sample taken is rather small it is believed that the figures give a quite correct picture of the catch.

From the purse-seine cod taken off Cape Farewell we have a sample of 124 specimens. The size- and age-composition of this fish is completely different from that found at the Holsteinsborg Deep. First and foremost, the fish is very large with a mean length of 75.81 cm, i.e. 11.72 cm above the length of the Holsteinsborg cod. The Cape Farewell cod compete favourably with cod caught on long-lines in deep water in this respect. In regard to age (Fig. 5) the Cape Farewell purse-seine cod is completely dominated by 11 year old fish belonging to the 1945 year-class which makes up 34.7 per cent of the catch. Next in importance is the 1947 year-class with 20.2 per cent. The mean age of the purse-seine caught cod at the Holsteinsborg Deep is 7.0 years, while at the Cape Farewell it is 10.3 years.

The total age distribution of cod in the Norwegian commercial catches from 1948 to 1956 is shown in Fig. 3. The experimental catches made with purse-seine in 1956 have been omitted.

During the period 1950-53 the Norwegian catches were dominated by the year-class 1942. In the years 1954-56 it is the year-class 1947 which has been carrying the fishery. This year-class is still quite strong in 1956 when it constitutes 26.9 per cent of the catch. In the same year a new and strong year-class enters the fishery for the first time. This is the 1950 year-class which in 1956 made up 14.4 per cent of the catch. The Danish investigations have shown that the 1950 year-class apparently is very rich, and that it constituted 47.5 per cent of the Danish catch in 1955 on the northern part of Store Hellefiske Bank. The 1950 year-class will probably be the dominating one in the Norwegian fishery in 1957. The mean size of the 6 year old fish belonging to this year-class was in 1956 61.52 cm, i.e. it shows approximately the same growth rate as the year-class 1947 which at the same age measured 59.9 cm.

The 9 year old fish belonging to year-class 1947 had in 1956 a mean size of 72.76 cm, a size which should give a good saltfish product also during the next fishing season.

Summarily the age and size of the cod taken on the different commercial gears in 1956 may be tabulated as follows:

	Age, years	Size, cm
Bottom long-line	10.1	74.81
Floating long-line	9.4	71.98
Hand-line	7.5	66.53
Total Mean	9.9	73.62

Tagging of cod.

The tagging of cod was continued in 1956. On July 23rd-24th, 1956, 491 cod were tagged in the Holsteinsborg Deep. Of these fish 14 individuals were recaptured within the same season. 9 recaptures were made in the same area where tagged, and 4 cod had migrated northward to Store Hellefiske Bank where they were recaptured in August. One individual was recaptured on December 12th south of the locality of tagging. The general pattern of the autumn migration of the cod from the Holsteinsborg Deep is the same as indicated by the 1953 taggings (see Norwegian ICNAF report, 1954).

From the 1955 taggings we have received altogether 30 recaptures which confirm the migration pattern indicated in the 1954 report. During the 1955 season a total of 275 cod were tagged. The recaptures from this experiment are shown in Fig. 6. The recaptures made during the first months after tagging show a decided northward migration to Store Hellefiske Bank in July-August. In winter the cod apparently undertake a southward spawning migration to Danas- Fiskenaes- and Fyllas Bank. On these southern banks we have many recaptures during May and June. Later in the season, in June and July, recaptures are made further north on Lille Hellefiske Bank, and in July-September still further north on Store Hellefiske Bank.

The recaptures from the 1955 taggings confirm the picture of seasonal movement of the cod which was indicated by the 1953 tagging experiments, viz. a southward spawning migration to about 62 N. lat. in winter, and a northward feeding migration in summer to 68 or 70 N. lat. If this circulatory seasonal movement of the west Greenland cod may be proved to be correct it is natural to think that the area north of 62 N. lat. is dominated by a separate population of cod with a more or less "closed" migration pattern, and that the cod population further south, i.e. between 62 N. lat. and Cape Farewell, may have a different pattern of migration and possibly also form a separate population. That this might be the case is indicated by several factors. In his "Studies on the biology of the cod in Greenland waters" (1949) Paul M. Hansen mentions that the great spawning migrations of cod to Iceland take place mainly from the southern zones south of 62°30'N. lat. Over 70 per cent of the recaptures from this area are taken at Iceland, while the Icelandic recaptures from the northern zones are very low. Another indication of a possible division of the West Greenland cod stock is found in the respective age compositions. In 1956 a purse-seine sample from the Cape Farewell region was dominated by the 1945 year-class, a year-class which in recent years has dominated in the Danish samples from Subdivision 1 F. This year-class has not been particularly noticeable on the northern banks. Furthermore, Danish taggings in Subdivision 1 F in later years seem to indicate a strong emigration from this area to Iceland. An enlarged tagging program on the southern banks will probably give interesting results which may throw more light on the cod population problem.

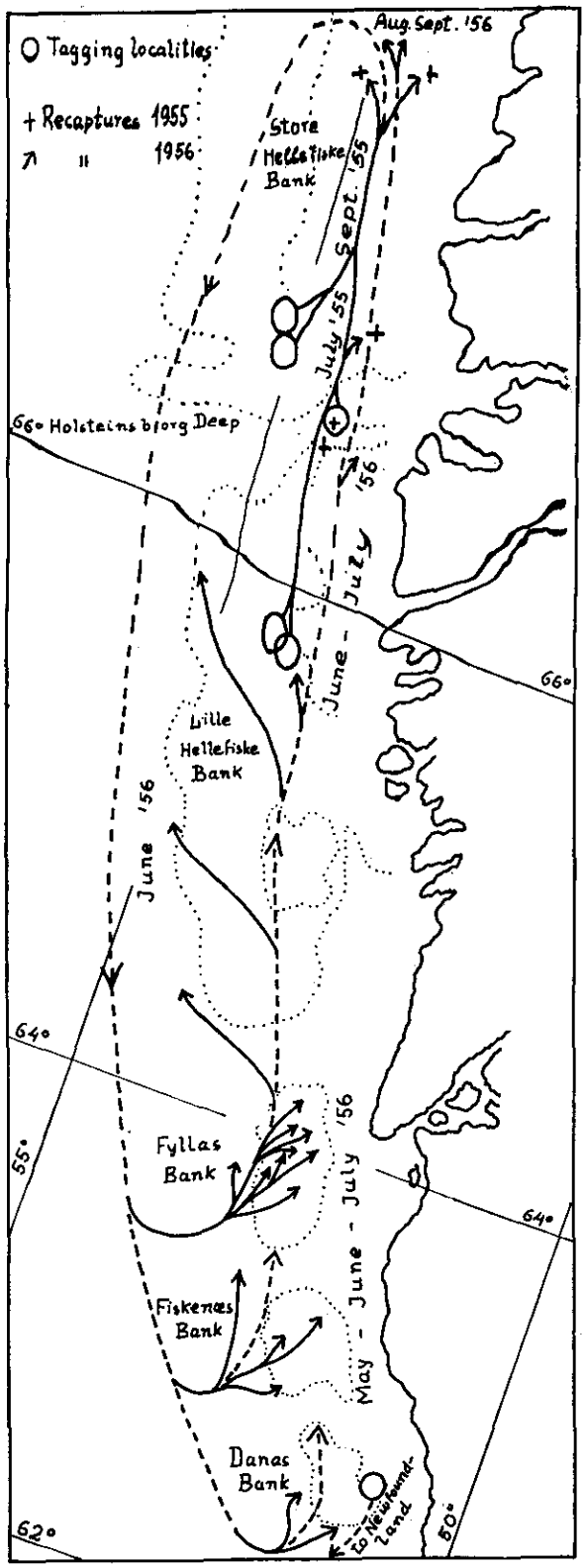


Fig. 6. **Migration pattern of the West Greenland cod from the banks north of 62° N. Lat. as indicated by the 1955 markings.**

It may be of interest to note that we have received one recapture from the Grand Bank southeast of Newfoundland. This cod was tagged on Danas Bank in June 1955 and recaught April 1956.

Tagging of halibut.

A program of halibut tagging in the Davis Strait was instituted in 1955, when 100 individuals were tagged off West Greenland and Labrador These tagging operations were continued in 1956. The halibut taggings were carried out by a captain on a commercial long-liner according to instructions received from the Institute of Marine Research. In 1956 a total of 138 halibut were tagged in Subdivisions 1 C - 1 E - 1 F. (see Table 1). Hitherto no recaptures of the 1956 taggings have been reported.

From the 1955 taggings we have received 9 recaptures, one recapture in 1955 and 8 in 1956. Most of these recaptures were made in the same area where the halibut were marked Only in 2 cases has the halibut undertaken longer migrations. One individual tagged off the Labrador Coast (Subdivision 2 G) in August 1955 was recaptured in September 1956 on Store Hellefiske Bank (Subdivision 1 B). During the 370 days of liberty this halibut had migrated 540 nautical miles eastwards across the Davis Strait. Another individual tagged a little north of Store Hellefiske Bank (Subdivision 1 B) in August 1955 was recaptured on Fyllas Bank (Subdivision 1 D) in June 1956. This fish had migrated 330 nautical miles southwards in 331 days.

VII. Portuguese Research Report, 1956

BY MARIO RUIVO

The Portuguese Researches in 1956 included mainly the study of samples from the commercial cod fishery in Subareas 1, 2 and 3. The results from Subarea 1 - W. Greenland and 2 - Labrador are summarized below. The data from Subarea 3 Grand Bank of Newfoundland have not yet been elaborated. A short summary of the results from the 1955 samplings from this subarea is appended.

The data of the samples from Subareas 1 and 2 for 1956 and for Subarea 3 for 1955 are to be published in ICNAF "Sampling Yearbook." Sampling was also carried out in Subareas 3 and 4 in 1956.

A. Subarea 1, W. Greenland, Cod, 1956.

50 samples, or around 7,500 individuals were collected on board trawlers and on dory vessels. The mesh size of the codend used is around 117mm. The hooks of the dory vessels are No. 14½.

The trawler samples are taken after discarding of individuals without commercial interest (below 35-40 cm.). The dory samples are from fish brought on board by the dories.

Figure 1 shows the positions of the samples and the age and length distribution in groups of samples.

The fish were measured from the point of the snout to the end of the middle rays of the caudal fin, and to the nearest cm. The age was determined by means of the otoliths of around 2,700 individuals. The age at first maturity was determined from the first spawning ring. The stage of maturity was found through macroscopic observation of the gonads, using a scale of seven stages. For tabulation, the data were grouped in four stages: (I) Resting (immature individuals and individuals in resting stage after spawning), (II) Developing maturity, (III) Full maturity (spawning), (IV) After-spawning.

1. Age Distribution (Fig. 1 left)

(a) Trawl, 1st Campaign (May-June). The samples from trawlers in Subdivisions 1C, 1D and 1E, from 10 May to 13 June 1956, show in general a pronounced predominance of age-group IX (1947; 38-56%), followed by the group VI (1950; 10-24%), and group VIII (1948; 10-12%). Age-group VII (1949) accounted for 8-10%. All the other age-groups were below 5%.

Sample 8, from the area between Dana and Fiskenaes Bank, contains somewhat younger fish. Age-group VI predominates (1950; 24%), followed by age-groups IX (15%) and VII (10%).

Sample 25, from the west slope of Banan Bank in depths around 500m., shows a slight predominance of group IX (35%), followed by VI

(32%) and by VIII (18%). The other groups are very poorly represented or not present.

(b) Trawl, 2nd Campaign (27 August-13 September). The samples of the second campaign were from Subdivision 1D - Fylla Bank (E) and from Subdivision 1B - Store Hellefiske Bank (F, 46 and G).

On Fylla Bank predominate age-groups VI (28%) and V (21%). Group VII is 15% and group IV 11%. Groups IX and X are represented by around 10%.

On Store Hellefiske Bank on the contrary, there was a marked predominance of age group VI (41-59%); it is followed by age-group V

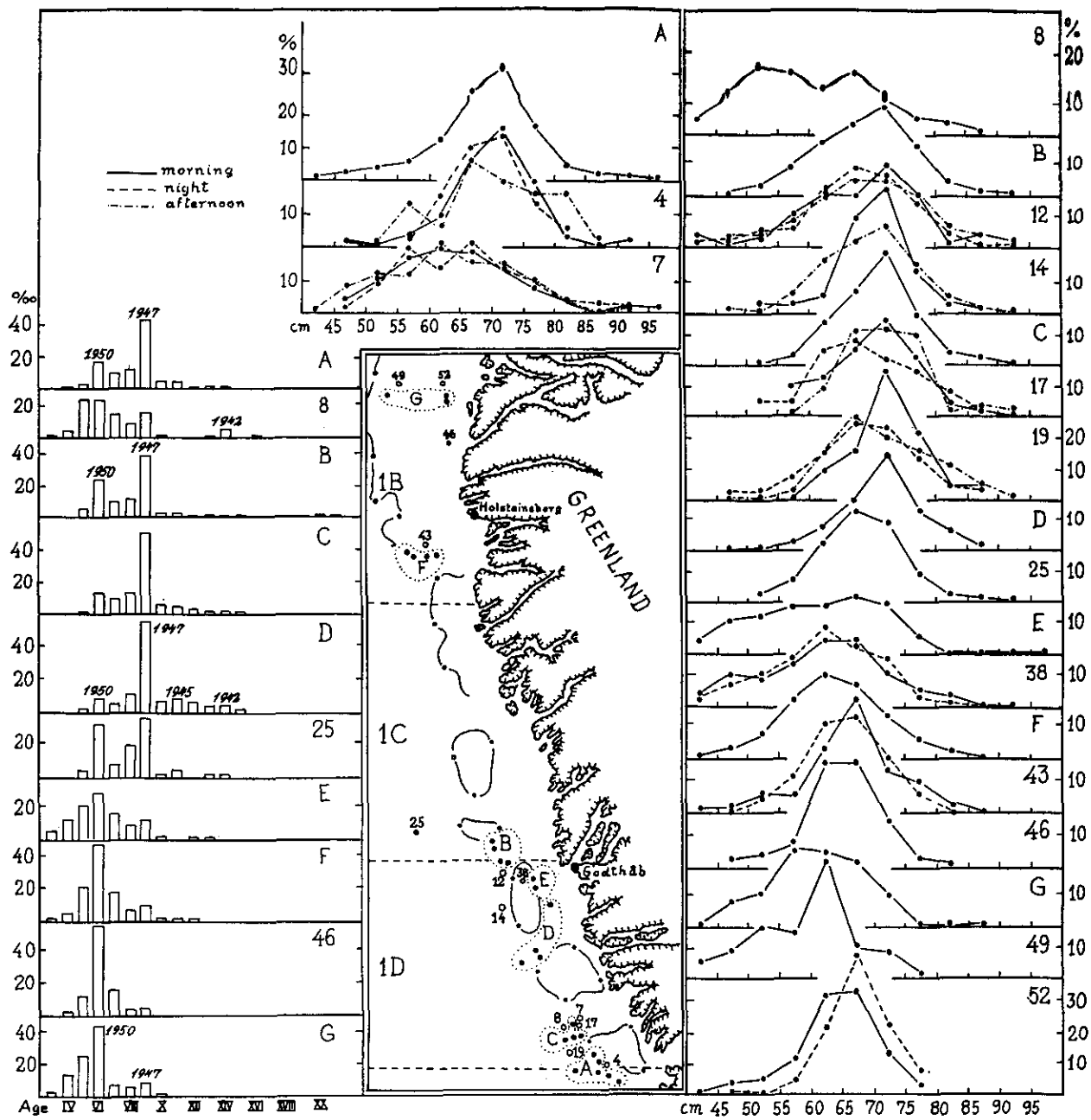


Fig. 1. Age and length distribution of samples of cod caught by Portuguese trawlers in West Greenland waters, 1956. Left: age distribution, right and above map: length distribution. Numbers on map indicate separate samples, capital letters sample-groups.

(13-24%). Age-group VII accounts for around 17% in samples from the southern and central part of the bank, being much less abundant (6%) on the northern part of the bank. Age-group IX varies between 5 and 10%. In sample G the 1952 year-class (age-group IV) is represented by 13%.

Summary: In the first campaign in Subdivisions 1C-1D-1E the 1947, 1950, and, in some cases, the 1948 year-classes predominate. In the second campaign, in Subdivision 1B, the 1950 and 1951 year-classes predominate, followed by the 1949 year-class and in a single sample by the 1952 year-class.

2. Size Distribution (Fig. 1 above and left)

(a) **Trawlers, 1st Campaign.** The samples are from Subdivisions 1C-1D-1E. In the majority of the samples, the peaks of the size curves are around 72cm. (25-40%) and 67 cm. (20-30%). In sample 7, the peak is as low as 62 cm. for morning and afternoon catches, even as low as 57 cm. in night catches. In sample 8, close to sample 7, between Dana and Fiskenaes Bank, the length frequency curve is bimodal with peaks in the classes 52 and 67 cm.

In cases with observations from fisheries in the mornings, in the afternoons and at night, the corresponding size compositions do not differ significantly. There is, however, an indication of the catching of smaller fish at night than during the day.

(b) **Line Fishing** (24 June - 19 August, Fig. 2). In sample 28 from Fylla Bank (Subdivision 1D), the peak is at the 72cm. class (38%); the same is found for sample 29, which was taken a little more to the north (Helders Bank, Subdivision 1C), where the peak also falls in the 72cm. class (24%), which corresponds to the predominance of age-group IX already observed in samples from the trawlers.

In the samples from Subdivision 1B, the peaks are in the smaller size group, 62 cm. (25-30%), which coincides with the predominance of age-groups VI and V.

(c) **Trawlers, 2nd Campaign** (Fig. 1 right, 27 August - 14 September). The peaks are in the 62 and 67cm. classes, in a single case in the 57cm. class (sample G), which corresponds with the predominance of age-groups VI and V.

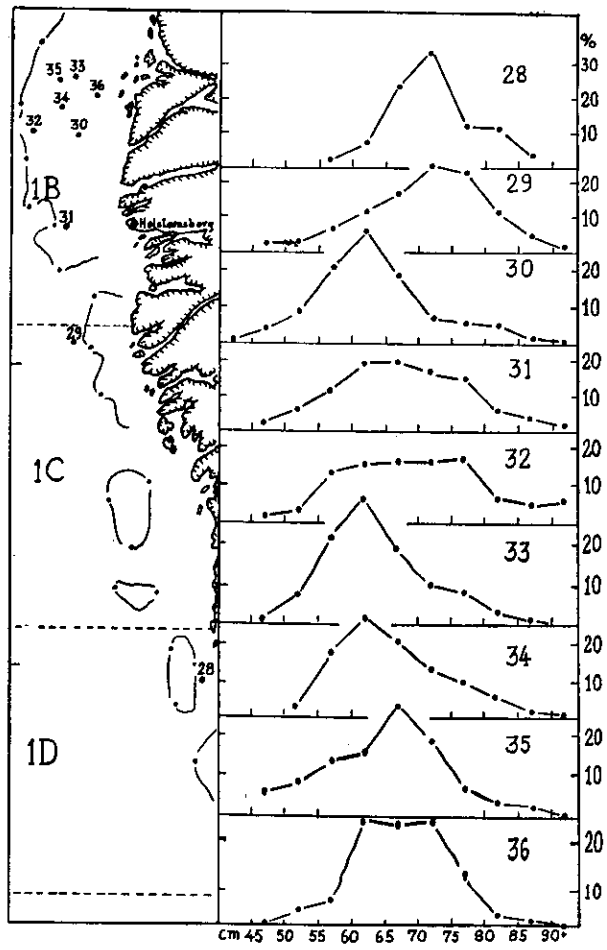


Fig. 2. **Length distribution of samples of cod caught by Portuguese dory vessels in West Greenland waters, 1956.**

Summary: The peaks fall on larger size groups in samples from the central and southern region of Greenland, corresponding to the predominance of age-group IX. The cod of the most northern region, Store Hellefiske Bank, are somewhat smaller, corresponding to the predominance of age-groups VI and V.

3. Growth.

Based on the sample data the mean growth was determined for males and females from the southern Subdivisions 1C-1D-1E and the northern Subdivision 1B (Fig. 3).

In both regions the growth of the males is a little lower than that of the females. The crossing of the growth curves is at the age of 6-7 years. which corresponds to the age at first maturity.

The insert of Figure 3 shows the annual growth of the more abundant year-classes. The

results are rather doubtful for the year-classes older than 1946 owing to the small number of otoliths investigated. The annual increase in growth is a little bigger in the northern region.

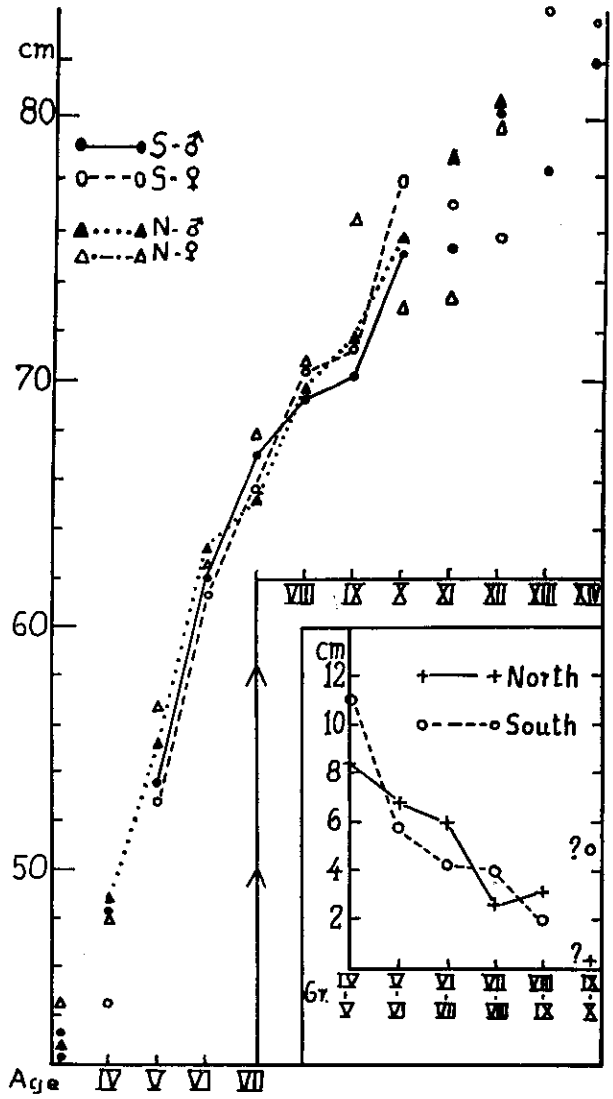


Fig. 3. **Mean lengths of males and females of cod of age-groups III-XIV from southern (S) Subdivisions 1C, 1D, and 1E and the northern (N) Subdivision 1B, 1956. Inserted annual growth of the more abundant year-classes.**

4. Sex Ratio.

(a) The samples from Subdivision 1D and the southern part of 1C show a great irregularity as far as sex ratio is concerned and seem to suggest that the males have a tendency to predominate in the south of Subdivision 1D, and the females in Subdivisions 1D-1C. The variation of the sex ratio during the various periods of the 24 hours apparently is quite irregular.

(b) The samples from Subdivision 1B show nearly equal sex ratios. Only in a sample, from the slope of Store Hellefiske Bank, there is a predominance of females (56%).

5. Stage of Maturity.

For the study of the development of the gonads, the samples were arranged according to time of the year (Fig. 4).

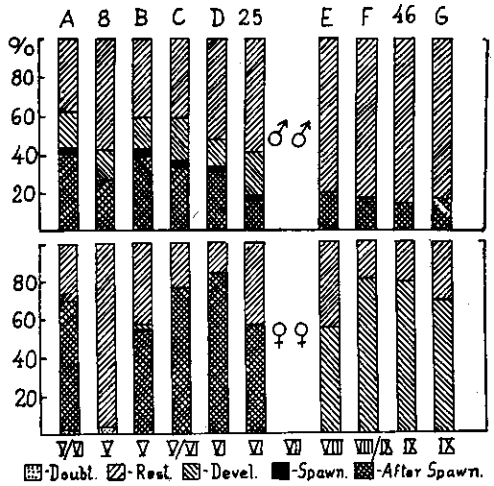


Fig 4. **Cod, West Greenland, 1956 Percentage number of males and females of different stages of maturity in the various months (V-IX). Sample-group or sample-no. indicated above.**

Males. In May and June the majority were in the resting stage (40-60%) and in the after-spawning stage (16-41%). A small percentage were in the developing stage (ca. 15%) or still showing signs of full maturity (2-3%).

There are no observations from the month of July. In August and September the great majority of the individuals are in the resting stage (more than 85%); the rest are in the after-spawning stage.

Females. In May and June, with the exception of sample 8, collected between Dana and Fiskenaes Bank in May, where practically all females were in the resting stage (97%), a predominance of the after-spawning stage (55-84%)

occurs. The remainder are in the resting stage. Only one sample shows a small percentage (0.4%) in the spawning stage.

In August-September the majority were in the developing stage (54-80%), the remainder in the resting stage.

These results are obviously influenced by the age composition of the samples as there is a pronounced precocity of the males and a different age at first maturity.

6. Age at First Maturity.

The age at first maturity (Fig. 5) is found by determining the first spawning ring in the otoliths. Only those age groups best represented in the samples are considered. The data are arranged in two groups: Subdivision 1B (northern region) and 1C-1D (southern region).

All cases with difficulties in interpretation of the existence or position of the first spawning ring were included in the doubtful category.

Generally, the first spawning ring occurs between the 6th and 9th year of age, only very rarely in the 5th or in the 10th year.

The majority of males spawn for the first time in the 8th and especially in the 7th year, the females in the 7th and the 8th year, mostly in the 8th year. They thus mature later than the males.

The data do not show any clear difference as to age of first maturity between cod from the north and the south regions.

The high number of individuals of age-groups VII and VIII which, from the reading and interpretation of the rings in the otoliths, were considered as having not yet reached the first maturity, may result from the difficulty of interpretation of the peripheral ring, yet only badly developed. In fact, in cases where this was still under formation and where more peripheral rings to compare were lacking, the definition of the spawning ring is not very clear.

Thus the results obtained for Groups VII and VIII contradict to a certain extent the results of the macroscopic observation of the gonads and the results obtained through the reading of the otoliths of the older year-classes.

7. Weight Data.

Data on individual weights by sex and sizes and on weights of sexual organs were collected.

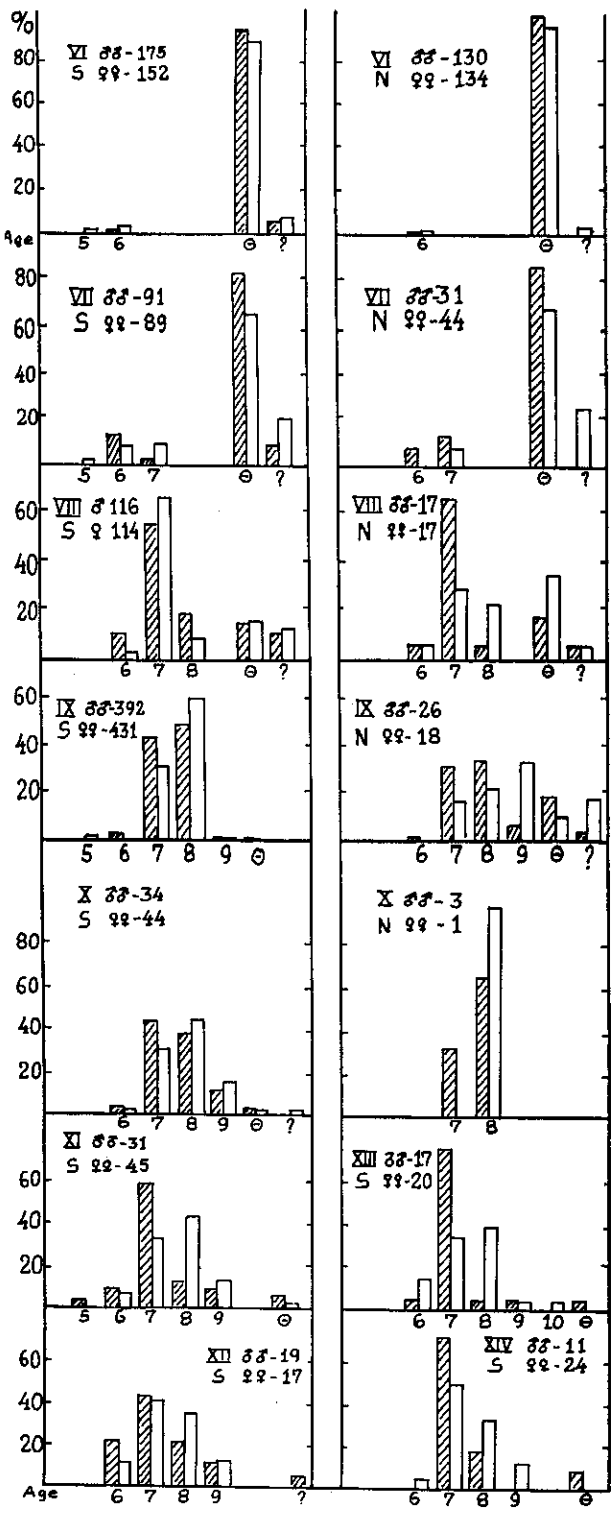


Fig 5 Cod, West Greenland, 1956. Percentage number of males (shaded columns) and females (white columns) spawning for the first time at the various ages (5-10 years). Only the abundant age-groups (VI-XIV) are considered. S—southern, N—Northern region. ⊖ indicates no spawning mark.

B. Subarea 2 - Labrador, Cod, 1956.

21 samples with 2,300 individuals, were collected on board a trawler operating in Subdivision 2J in various periods between August and November 1956.

The mean size of the meshes in the codend used was around 117mm. The samples contained almost exclusively fish destined for landing, after the discarding into the sea of those individuals which were of no commercial interest (below around 35-40cm.). The methods followed for the study of this material are the same as for Subarea 1. For the study the samples were arranged in eight groups (A-H).

1. Age Distribution (Fig. 6)

The age groups IX (1947), X (1946) and XI (1945) are predominating in the proportions of 6-19%, 13-18% and 12-20% respectively. Age group VIII is a little higher than 10%, reaching around 17% in the sample group E. The age group XII represents 7-10%. The groups below VI and over XII are far more scarce or almost non-existent. Sample 3, the most northern sample and taken rather close to the coast, shows a predominance of the younger age groups (V-24% and VI-20%).

2. Size Composition (Fig. 6)

The size peak (30-36%) is in the majority of the samples in the size group 57 cm., thereupon follows either the 62 cm. group or the 52 cm. group. These values correspond to the predominance of age groups IX, X and XI and in some cases age group VIII.

In sample 3 the peak is found in the size group 42 cm. (39%) corresponding to the predominance of the young age groups V and VI.

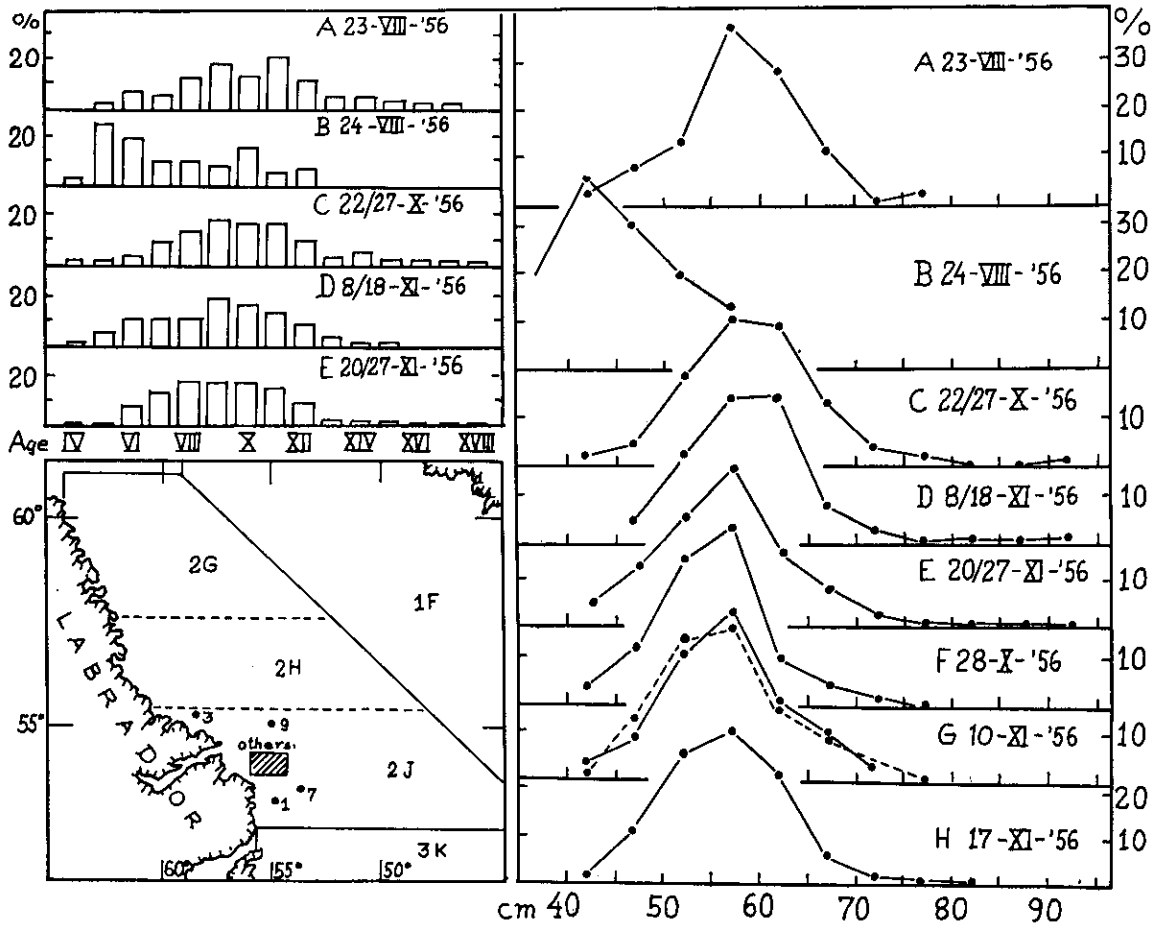


Fig 6 Age and length distribution of samples of cod caught by Portuguese trawlers in the Labrador area (Subdivision 2J), 1956. Map showing position of samples inserted.

3. Growth.

Figure 7 shows the growth for the age groups IV-XII. The growth of the males is a little less than that of the females, particularly from the sixth year. This difference in growth is surely in relation with the fact that first maturity is reached more early in the males than in the females. It can be noted that the individuals of sample 3 show a somewhat smaller growth which could be in relation with the fact that this sample comes from one of the most northern regions.

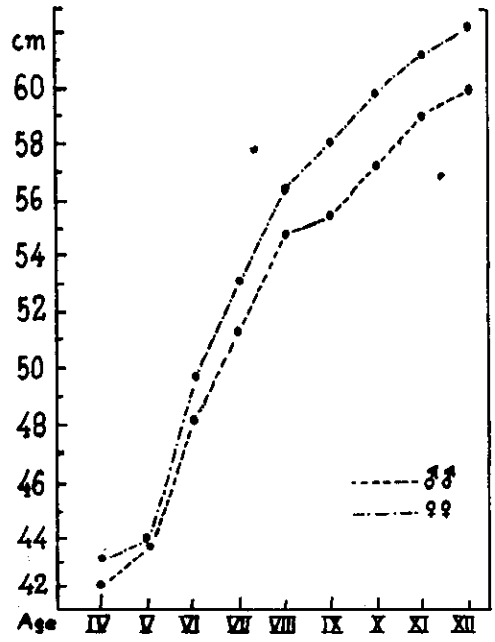


Fig 7. Cod, Subdivision 2J, 1956. Mean lengths of males and females of age-groups IV-XII.

4. Sex Ratio.

In sample 3 (younger and smaller individuals) the males predominate with 68%, in the other samples the females with 53-66%.

5. Stage of Maturity (Fig. 8)

In August the majority of the males are in the developing stage (89%) or in the resting stage. Of the females, 62% are in the after-spawning stage, the remaining in the resting stage.

In October-November, the percentage of males in the after-spawning stage is insignificant. Nearly all specimens are in the developing stage and only a small number in the resting stage. Within these months the number of females in the after-spawning stage falls from 37% to 3%. The numbers in the resting stage also decrease, from 42 to 23%. The developing stages dominate towards the end of November.

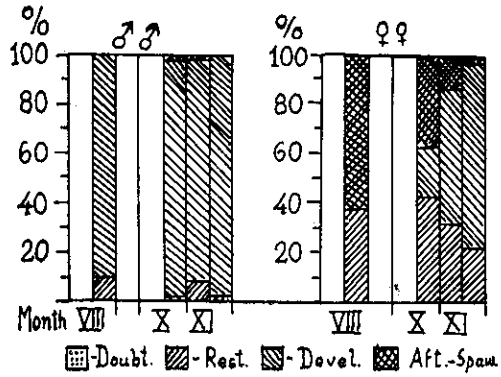


Fig. 8. Cod, Subdivision 2J, 1956. Percentage number of males and females of different stages of maturity in the period August-November (VIII-XI).

6. Age at First Maturity (Fig. 9)

The age at first maturity was determined from the first spawning ring in the otoliths. All the cases in which it was not possible to determine with accuracy the first spawning ring or to verify its existence are shown as "?".

Generally, first maturity is achieved between the 6th and the 10th year of age, rarely in the age group XI. The majority of the males reach first maturity in the 7th year, the majority of the females in the 8th year.

It is to be noted that, as in Subarea 1, difficulties arise as to the interpretation of the first spawning ring when it is at the margin of the otolith, and more external rings to be used for comparison do not exist. The percentage of immature individuals (age groups VII and VIII) is therefore higher than it ought to be, judging from observations on the gonads and of otoliths of cod of higher ages.

7. Weight Data.

Data on individual weights by sex and sizes, and on weights of livers, intestines and sexual organs were collected.

C. Subarea 3, Newfoundland, Cod, 1955.

12 samples, around 3,000 specimens, caught by a trawler in Subdivision 3K (Belle Isle) in October-November 1955, were studied. The mesh size of the codend used was around 117mm. The samples consisted for the main part of fish to be landed, i.e. catch after discarding. In order to facilitate the study, the samples were arranged in regional and seasonal groups.

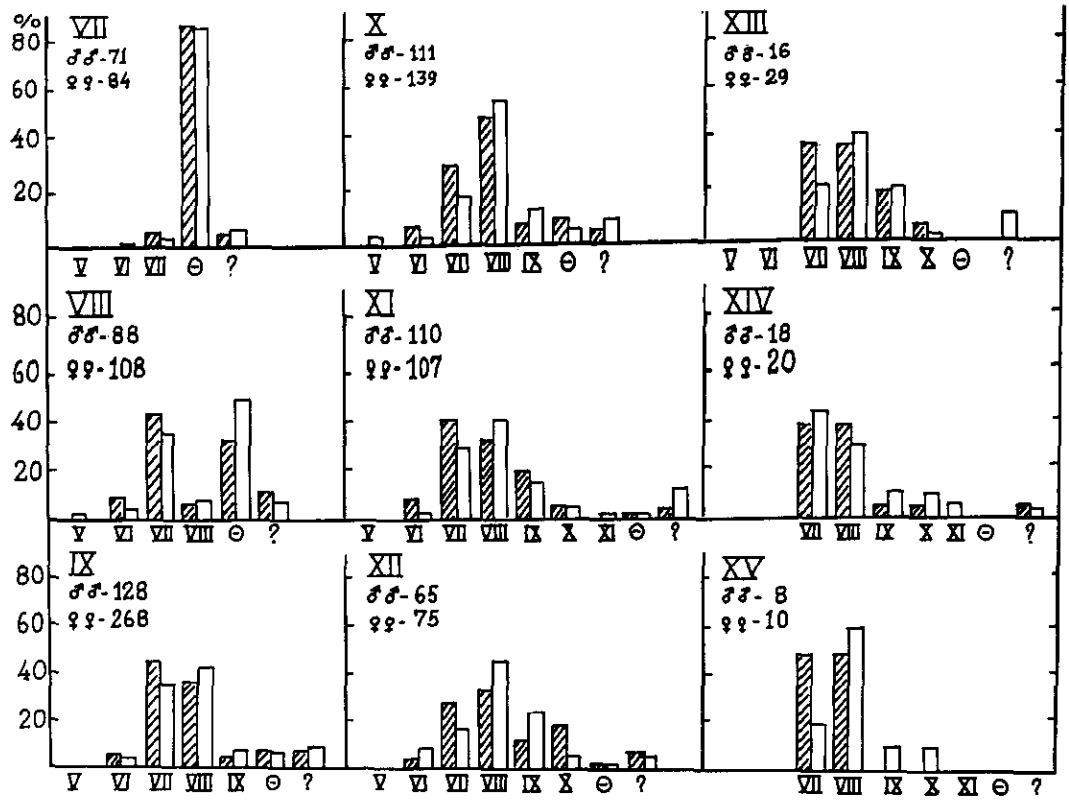


Fig. 9. Cod, Subdivision 2J, 1956. Percentage number of males (shaded columns) and females (white columns) spawning for the first time at various ages (V-XI). ⊖ indicates no spawning mark.

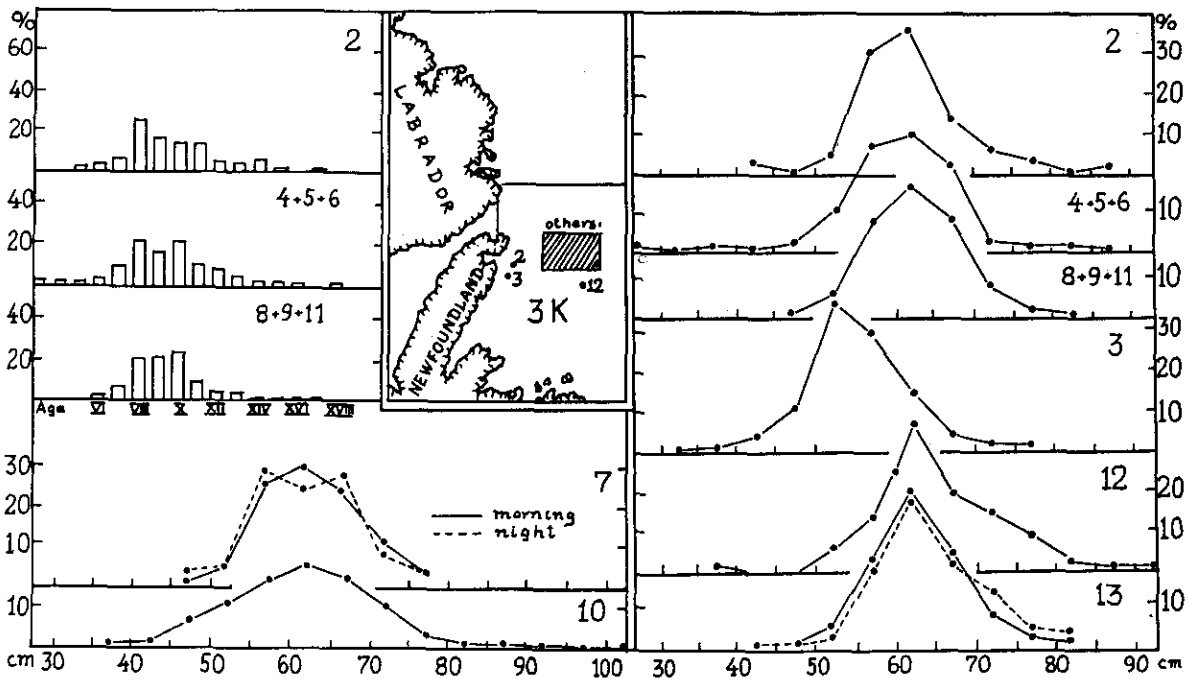


Fig. 10. Age and length distribution of samples of cod caught by Portuguese trawlers in Subdivision 3K, 1955. Map showing positions of samples inserted.

1. Age Distribution (Fig. 10)

Around 700 otoliths from 7 samples were studied, which were arranged in three groups.

The otoliths of cod caught in Subdivision 3K seem to be a little more difficult to interpret than those from Subareas 1 and 2. In general the otoliths studied belong to two types: "a" and "b".

The otoliths of type "a" show more or less well defined rings. They are relatively homogeneous, sometimes with a diffused structure, and additional rings often occur. At times the first and the second rings are broad, composed of a number of less defined narrow rings. These otoliths are of a type very close to the otoliths of the Labrador cod.

The otoliths of type "b" are more difficult to interpret. The rings are less well defined in relation to the growth zones. The structure of the rings is diffused and a number of false rings appear. The otoliths are of much the same type as those of cod from Subdivision 3L (the Grand Bank). Otoliths of type "a" are the most abundant, approximately 70%; they are found especially in the 1947 and 1946 year-classes.

The results of otolith readings from the 1955 samples are to be considered as a tentative interpretation, subjected to later corrections. The fact that no data are made available for comparison from other years makes the work more difficult.

In most samples the 1945, 1946 and 1947 year-classes predominate (21-24%). 1944 and 1948 year-classes yield around 6-10%.

In sample 2 from a fishery more close to the coast, the 1947 year-class predominated with 26%, followed by the 1946 year-class (17%) and the 1944 and 1945 year-classes with around 14%, the 1948 class had only 6%.

It should be noted that the sample from Labrador, 1955, also showed a predominance of the 1947, 1946 and 1945 year-classes. However, in this subarea the year-class 1948 was rather abundant.

2. Size Distribution (Fig. 10)

Besides the samples from which otoliths were taken, five additional samples were studied, but only as to size.

In nearly all the samples the main peak is in the 62cm. group. Next come, with about equal percentages, the 57 and 67 cm. groups. Only in two samples do peaks occur at a smaller size: in the 57 cm. group (sample 7, night fishery) and in the 52 cm. group (sample 3).

3. Growth.

The growth of the males (Fig. 11) is from about the 7th year a little smaller than that of the females. From the 8th year both sexes show a remarkable decrease in growth. The small number of specimens of group XI-plus do not permit a consideration of the differences in growth of these older cod.

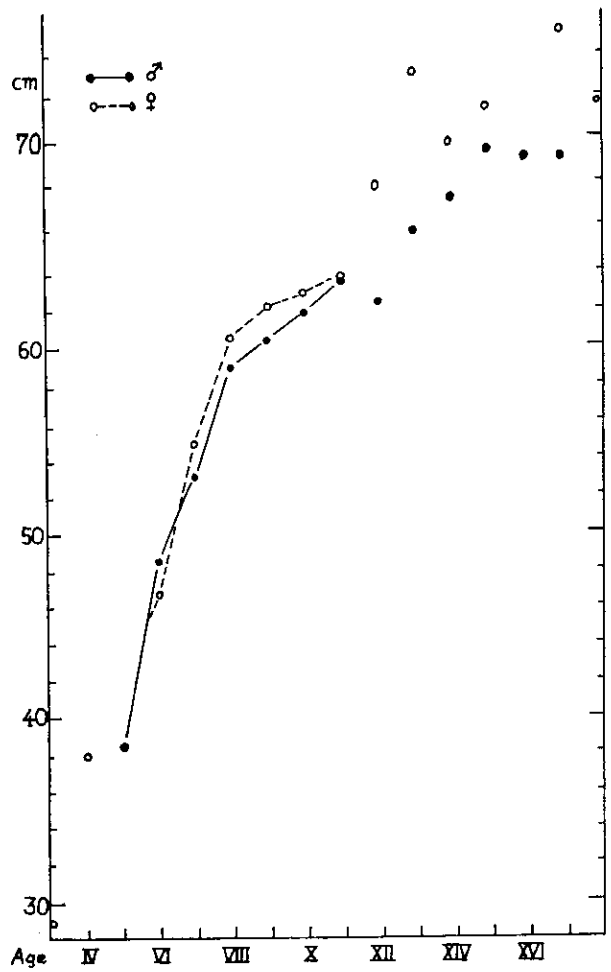


Fig 11. Cod, Subdivision 3K, 1955. Mean lengths of males and females of age-groups IV-XVIII.

It should be noted that the mean sizes found for the age groups VIII, IX, and X are about the same; this might be the result of a wrong interpretation of a few of the otoliths. More probably, however, it results from the existence of individuals of two growth types in the same age-group; a slower-growing group, which resembles the Labrador cod, and a more rapid-growing group resembling the Grand Bank cod. The growth data observed being the means for the two growth types.

4. Sex Ratio.

Data concerning sex ratio were only collected for sample 2 (50% males) and for the groups of samples 4, 5, 6, and 8, 9 and 11 where there was a slight predominance of the females (52-55%). The sex ratio is the opposite of what was observed for the Labrador cod in 1955 (males 58%). The number of observations is, however, too small to allow definite conclusions.

5. Stage of Maturity (Fig. 12)

In October and November the majority of the males are in the after-spawning stage (62-65%), the remainder in the developing stage (21-26%) or in the resting stage (12-14%). 95% of the females are in the developing stage, the remainder in the after-spawning or resting stages.

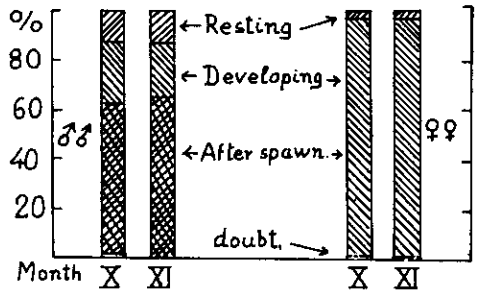


Fig. 12. **Cod, Subdivision 3K, 1955. Percentage number of males and females of different stages of maturity in October to November X to XI.**

6. First Maturity.

The age at first maturity was determined from the study of the otoliths (Figure 13). Only the more abundant age-groups are considered.

Generally the identification of the first spawning ring was more difficult than in the material from Subareas 1 and 2. The considerations referring to the interpretation of the peripheral rings are identical to those for the W. Greenland cod.

First maturity appears between the 6th and the 10th year, most commonly in the 7th and 8th years. The females become mature a little later than the males, having a tendency to attain first maturity only in the 8th year.

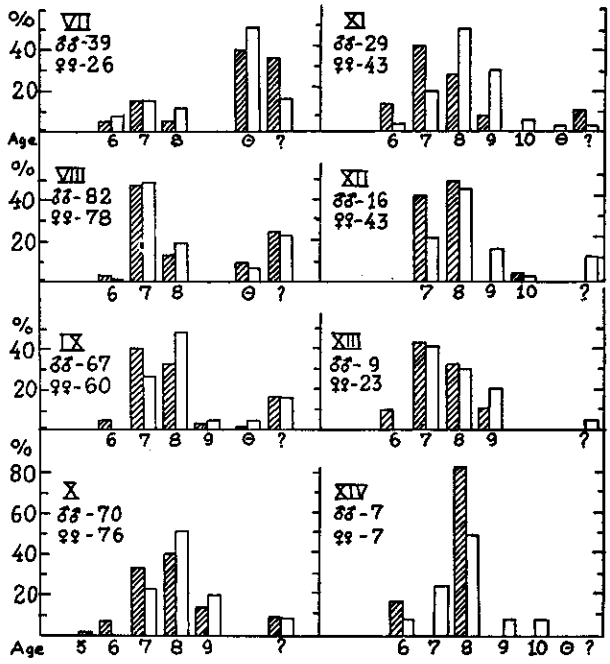


Fig. 13. **Cod, Subdivision 3K, 1955. Percentage number of males (shaded columns) and females (white columns) spawning for the first time at various ages (5-10 years). ⊖ indicates no spawning mark.**

7. Weight Data.

Observations of total weight were carried out on 269 individuals. No notable difference between the weight of males and females within the same size groups occurred.

VIII. Spanish Research Report, 1956

RESEARCHES CARRIED OUT ON BOARD THE TRAWLERS "SANTA INES" AND "SANTA CELIA" IN SUBDIVISION 3N, GRAND BANK OF NEWFOUNDLAND, SEPTEMBER, 1956.

BY DR. ALFONSO ROJO

Introduction

The studies carried out on board the Spanish commercial fishing vessels in 1956 were mainly concerned with cod, *Gadus callarias* L., and haddock, *Melanogrammus aeglefinus* (*L*), the two species principally caught by the Spanish vessels.

The trawls used by both vessels (of the fishing company PEBSA) are identical in material and design, and manufactured from No. 4 manila. When measured by means of a calibrator (Scottish Spring Gauge) the meshes measure 120.6 mm. internal diagonal measurement when the net is new and dry, and around 110 mm. after use.

Place and Season of Fishery. The area investigated was Subdivision 3N, on the Grand Bank of Newfoundland, between 44°17′ and 45° 54′N. Lat. and 50°03′ and 51°15′ W. Long., northwest of the Plateau of the Grand Bank. The same region was studied in 1954 during June and July. The 1955 cruise also took place in much the same area. The results of these three years are therefore comparable. The duration of the cruise was three weeks during the month of September, 1956.

Particulars about the Commercial Fishery. During August, September and part of October, twelve Spanish vessels were fishing in the area, however, under changing conditions. At the end of August, when the campaign started, cod and haddock were caught. The cod were small and much mixed with haddock, but during September and the first half of October the cod increased in quantity and in quality. About the middle of October the cod disappeared from the region. The haddock, on the contrary, was decreasing in quantity during September and it was very scarce towards the end of the month. The size of the haddock increased during the month.

A. Cod.

Size. The samples were taken on board the two trawlers by the author when the fish came on deck. The length was measured from the snout to the fork of the tail fin; the measurements were later grouped in 3 cm. groups. Curves of percentage length distribution for the samples of the separate days, and for all samples together are given in Fig. 1. A total of 3,400 specimens were measured.

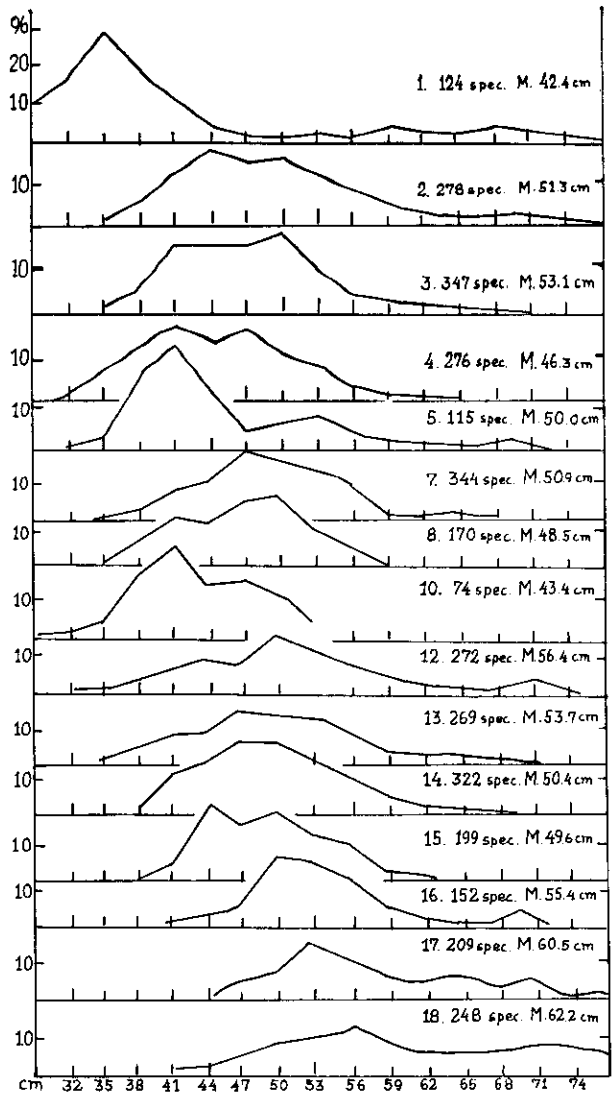


Fig. 1. Cod, Grand Bank of Newfoundland, Subdivision 3N, 1-18 September, 1956, daily variations in size distribution by 3cm groups. For each curve are given date, number of specimens and mean length.

The mean size of the samples varied from day to day with a tendency to increase during the campaign. The equation of this tendency has been found to be as follows: $y = 46.743 + 0.81X$.

The total mean of the samples is 52.31 cm. The mean size varies from day to day between 42.38 and 62.24 cm., these sizes being found on the first and the last day of the sampling. This seems to indicate migration through the region during the cruise.

A summary of the study of the size of the cod in Subdivision 3N in 1954, 1955 and 1956 is given in Fig. 2. The mean size increased, between 1954 and 1955, from 53 to 58.5 cm., and between 1955 (June-July) and 1956 (September) the two peaks of 41 and 62 cm. were displaced to 50 and 71 cm. respectively. These changes in mean size correspond to changes in age composition over the same years.

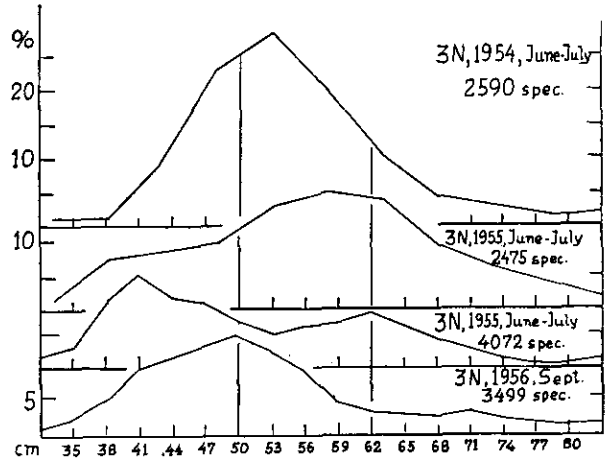


Fig. 2. **Cod, Grand Bank of Newfoundland, Subdivision 3N, length frequency curves for the years 1954, 55, and 56, by 3cm groups. The sample 3N, 1955, June-July, 2475 spec. was measured by O. Rodriguez.**

In 1955 three cruises were made in April-May. The results were not then reported to the Commission because the main attention of the Spanish researches that year was centred on the haddock. Therefore the curves from that year are given now (Fig. 3).

1. Subdivision 3O. The samples were taken in February and April. The mean size in February was 59 cm. and in April as much as 71 cm. An increase in size during the campaign was also found in September of 1956.

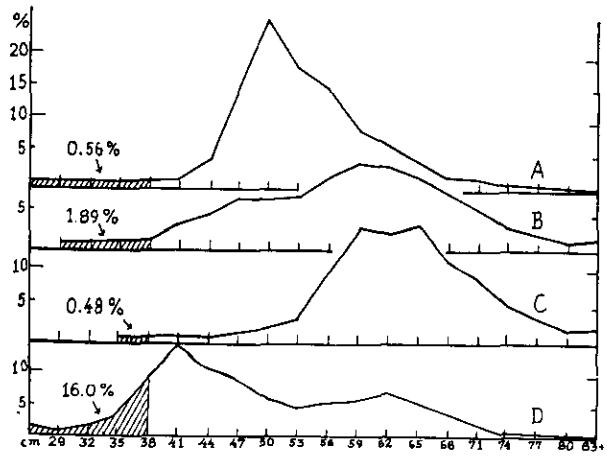


Fig. 3. **Cod, length frequency curves (3 cm groups) 1955. A—Subdivision 4V April; B—3L April-May; C—3O April-May; D—3N June. Discarded part (below ca 40 cm) of sample shaded.**

2. Subdivision 3L. The samples were taken in May. The size peak is in the 59 cm. length group. An increase in size during the period of investigation also occurs in this case, but the stocks are more uniform. The scarcity of small sized fish is apparent.

3. Subdivision 4V. The fishery was carried out in April. Only one sample of 708 specimens was taken; the size was 50 cm., which corresponds to the small commercial culling.

4. Subdivision 3N. This subdivision accounts for by far the greatest proportion of small cod. The size peak was only 41 cm. Many specimens of one year's age were found in the stomachs of the adult cod.

Growth Rate. Curves of growth for cod in the Subdivision 3N were calculated from data collected in the campaigns July-August, 1955 and September 1956. (Fig. 4) All the data come from an area within half a degree of 44°N. and 50°W.

Although the samples were collected with a month's difference in time, both curves coincide up to the eleventh year. Thereafter, they diverge and there are discrepancies due to the scarce number of specimens. On the whole the growth rates from the 1955 samples are higher than those of the 1956 samples.

Quantity of Cod Discarded. It is difficult to estimate the quantity of cod discarded by the Spanish fishing fleet of 30 trawlers and an addi-

tional number of pair trawlers, as the captains only note the quantities of fish of each size category placed in the holds.

Figure 3 gives the percentages of cod below commercial size (ca. 40 cm.) in samples from 1955. These percentages vary considerably according to the area and season. From the following table it appears that the quantities discarded in summer are much larger than those discarded in spring. The reason is that in the spring the stock on the banks is composed of adult spawning specimens, while in summer the population is more heterogeneous.

COD. Percentage Number of Specimens Discarded (smaller than 40 cms.)

		1954	1955	1956
	3L		1.89%	
Spring	3O		0.48%	
	4V		0.56%	
Summer	3N	2%	16%	8.7%
		Mean Sizes for the same Cruises		
	3L		59 cms.	
Spring	3O		59-65 cms.	
	4V		50 cms.	
Summer	3N	51-55 cms.	39-41 cms.	49-52 cms.

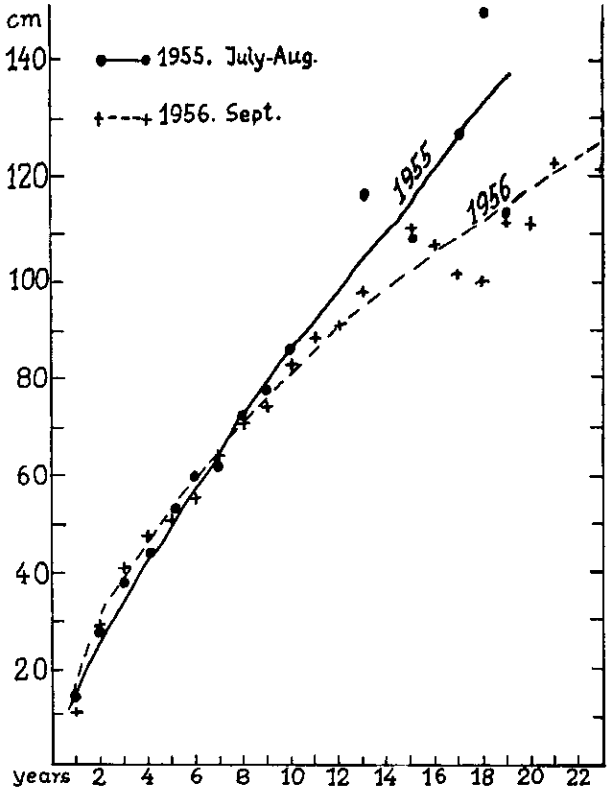


Fig. 4. Cod, Subdivision 3N. Growth curves for 1955 and 1956.

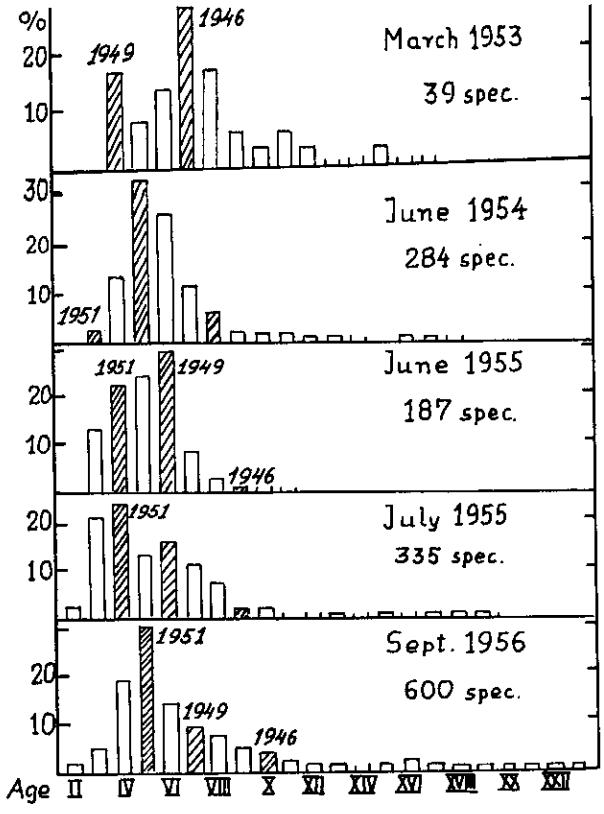


Fig. 5. Cod, Subdivision 3N. Age distribution in samples from 1953, 54, 55, and 56.

Age Distribution of Cod. Otoliths of 600 specimens from Subdivision 3N, September 1956, were used for the study of age. In the majority of cases it was easy to count the age. The largest percentage was found for age-group V, followed by age-groups IV and VI. Figure 5 shows the age distribution of the material from the years 1953, 1954, 1955 and 1956. The 1949 year-class

predominated only in 1954 and June 1955, although it is still rather well represented in the later catches. In 1953 it occupied the second place, after the 1946 year-class. The 1951 year-class was well represented in 1955 and 1956. This year-class also appeared good for haddock.

Sex and Maturity. In September only immature specimens, apart from two males of maturity IV and V, or specimens which already had spawned in the preceding spring were found. The material was sorted in two categories, immature and mature:

Immature	236	individuals or	37.94%
Mature	384	,,	,, 61.73%
Stage IV	1	,,	,, 0.16%
Stage V	1	,,	,, 0.16%
Total	622		

The males and the females are found practically in the same proportion in the stock, 48.9% and 51.1%.

Figure 6 shows the distribution of sexual maturity. The curve indicates that at 50 cm. 50% were mature. All individuals over 70 cm. were mature.

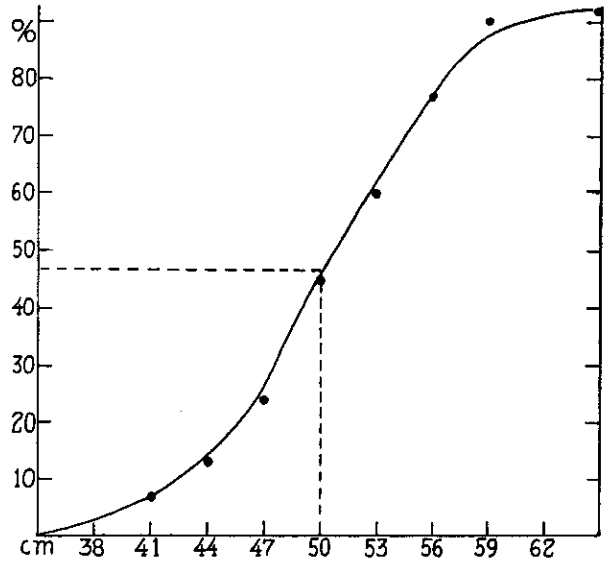


Fig. 6. **Cod, Subdivision 3N, September 1956. Percentage of mature cod by 3cm groups.**

Stomach Contents. The preferred food of the cod at this time in this area is the capelin (*Mallotus villosus* O.F.M.). However, other species were also found in the stomachs. On the 11th of September it was impossible to fish owing to a hurricane, and a change in the feeding of the cod occurred from this date. In the cod caught before the 11th of September 61 percent (346 specimens) had empty stomachs.

The amount of food found in the cod was very scarce even if the stomachs are noted as "full", and the species eaten were the common mussel, haddock, spider crabs, sea urchins, hermit crabs, prawn, *Ammodytes americanus* in small numbers, annelids, actinians, plaice, whelks and clams; all slow-moving animals living on the bottom.

After the 11th of September the picture of feeding changed completely, hand in hand with an increase of the stock until the first days of October. The number of cod with a full stomach had increased from 39 to 61% (276 specimens).

The only species found in the stomach from 12th September and onwards was the capelin, and in very large quantities. The effect of the hurricane on the capelin was to make it seek deeper waters, and the cod followed. During the time after the hurricane a vertical displacement of the cod towards deeper waters was observed through the fishery.

Parasitism. The number of specimens with parasites was small in this subdivision. Only external parasites (*Clavella* and *Lernaeocera*) were found. Of 625 specimens examined three were infected with *Lernaeocera* and 46 with *Clavella*.

B. Haddock.

Size. The size of the haddock, as well as that of the cod, increased during the month of investigation; its abundance, however, decreased during the same period.

In September a total of 2,422 specimens were measured. Of these 56.7% were discarded as being too small for the fishing industry.

The length curves for the samples taken since 1954 in Subdvision 3N (Grand Banks) are shown in Figure 7.

In 1954 two rich year-classes, 1949 and 1946, showed as peaks in the curve. In July-August and December, 1955 the 1949 year-class was still rich; the three year old 1952 year-class was entering the fishery. In September 1956 there was only one peak on the length distribution curve, corresponding to the 1952 year-class. This year-

class will probably play a considerable role in the fishery of 1957.

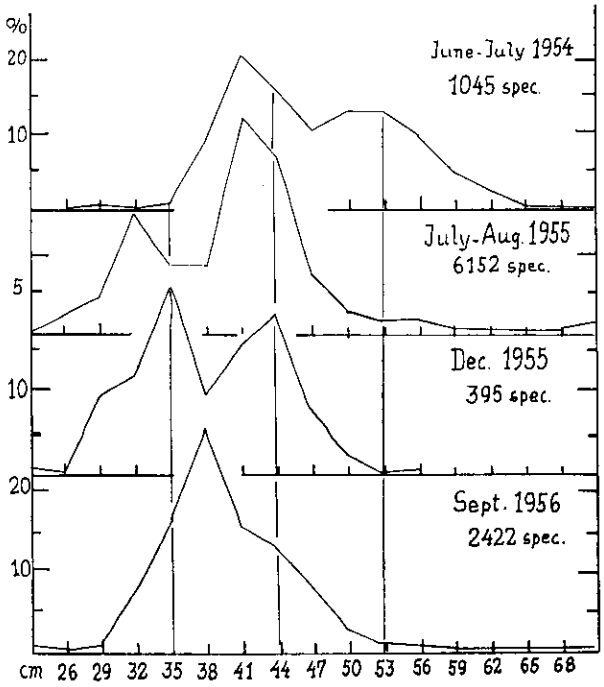


Fig. 7. **Haddock, Subdivision 3N. Length distribution curves of samples taken in 1954, 55, and 56.**

Age. Scales of 91 of the 2,422 haddock measured were taken for age determination.

Using these 91 specimens the age distribution of the total specimens measured (2,422) were calculated. The same procedure was used for the samples from the previous years. Figure 8 is based on these calculations. It shows the comparative strength of the year-classes in the three years 1954, 1955 and 1956. The 1949 and 1952 year-classes predominate; in 1956 the young 1953 year-class was fairly well represented.

Maturity. Of the individuals investigated 35 specimens were immature and 56 specimens mature. The percentage of males was 43.

Stomach Contents. Ninety one specimens were examined for stomach content; of these 30 individuals or 33% had full stomachs.

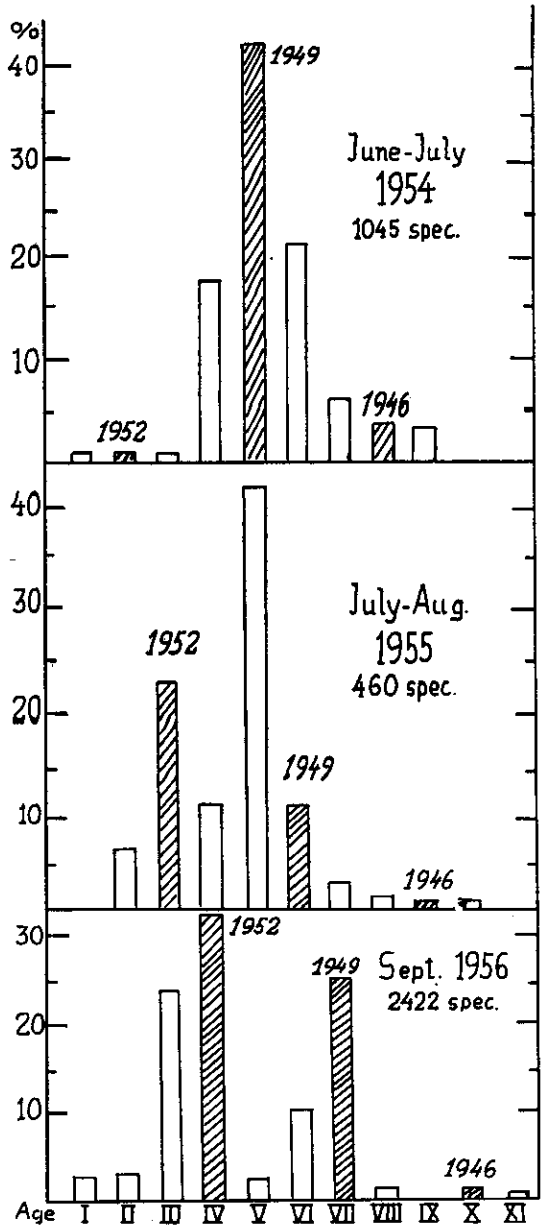


Fig. 8. **Calculated age distribution for all haddock measured in 1954, 55, and 56.**

IX. United Kingdom Research Report, 1956

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

Landings and effort for the various subdivisions worked by English trawlers in respect of cod and all species are shown below:

	Voyages	Hours Fishing	Cod metric tons	All Fish metric tons
Subarea 1				
Subdivision F	11	889	1335.79	1390.40
Subarea 3				
Subdivision P	1	951	126.85[1]	534.92[1]
Subdivision N	1	1080	294.33[1]	456.43[1]

[1]As landed. The cod would be fillets and therefore from 1/5 to 1/2 of the fresh round weight.

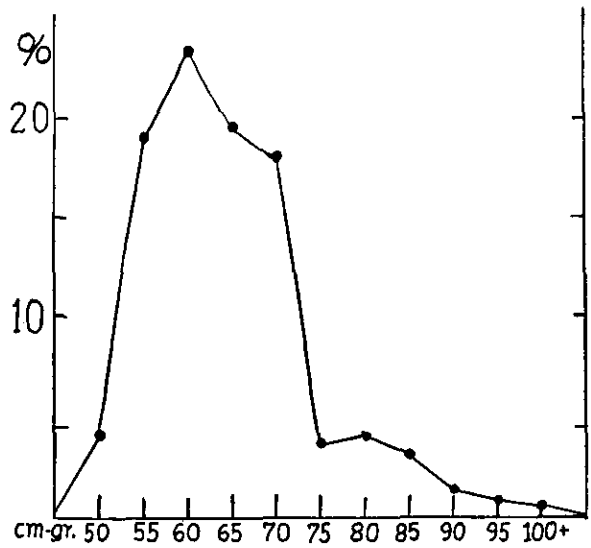


Fig. 1. **Cod, Subdivision 1F. Length distribution by 5 cm groups of 986 specimens caught by English trawlers in 1956.**

986 cod length measurements are available from Subarea 1, Subdivision F. They are reported in 5 cm. length-groups, raised numbers to landings and as percentages.

Figure 1 gives the length distribution in 5 cm. groups as percentages of raised numbers. The material in tabular form is being published in I.C.N.A.F.'s "Sampling Yearbook," Vol. I, 1956.

No otolith readings were carried out on material from the Commission's area in 1956, but observation is being maintained on fish stocks, particularly halibut stocks, in the waters to the north-east of the Commission's area and it is likely that work in these waters will be intensified during 1957.

X. United States Research, 1956

BY HERBERT W. GRAHAM

CHIEF, NORTH ATLANTIC FISHERY INVESTIGATIONS

SUBAREA 5

Haddock (*Melanogrammus aeglefinus* (L.))

Georges Bank Population in 1956. Landings of large haddock surpassed those of scrod for the first time since 1950. The 1954 year-class entered the fishery two months later than usual. Scrod were thus available for a shorter period. This and the selectivity of the large mesh were chiefly instrumental in changing the scrod-haddock ratio.

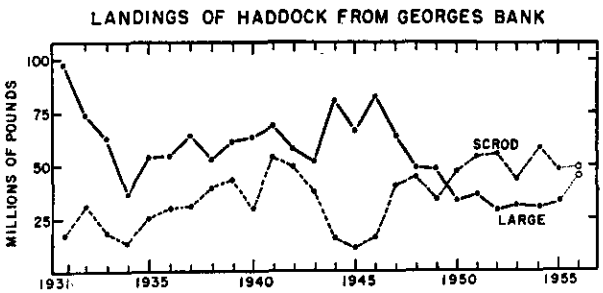


Fig. 1. **Landings of haddock (scrod and large) from George's Bank, 1931-55.**

Stock Definition. About 700 trawl caught haddock were tagged on Georges Bank with yellow Petersen disks on the left opercle. This tagging will supplement results obtained from earlier taggings of 1,870 haddock in the waters off Cape Cod.

Underwater Television. The behaviour and escapement of haddock, and other fish, were observed by means of a television camera rigged in the cod end of a standard otter trawl in experiments carried out from the research vessel *Albatross III* in November, 1956.

Effects of Mesh Regulation. A study of the effect of the large mesh on the yield of the 1952 year-class is continuing. Fish landed from this year-class have averaged 15 percent heavier than fish landed from the 1948 and 1950 year-classes. Growth studies show no change in growth rate, so the increase is attributed to the selective action of the large mesh. Compared to the 1950 year-class, which was of equal magnitude, the yield of the 1952 year-class shows an uncorrected advantage for the large mesh of 32 percent. Corrected for differences in the amounts of fishing, the advantage for the large mesh is estimated to be 42 percent.

Average weight in pounds, by age and season, for the 1952 year-class compared to average for the 1948 and 1950 year-classes.

Age	1	2				3			
Season	D	A	B	C	D	A	B	C	D
1952	1.15	1.56	1.25	1.70	1.69	1.91	1.78	2.20	2.56
1948 } 1950	1.15	1.24	1.15	1.38	1.46	1.64	1.62	2.07	2.26

The sea sampling program is continuing. The data collected during the four years of this program, together with a new method being tested for obtaining haddock discard information, indicate it may be possible to discontinue this program in the near future.

Amendment to the Mesh Regulation. An amendment to Title 50, C.F.R., part 155, was proposed by the fishing industry. The amendment would allow mixed fishery trawlers to use small mesh gear in taking haddock provided the annual catch of haddock does not exceed ten percent of their total annual catch of trawl-caught fish. The amendment is regarded as an experiment to go into effect in 1957 for two years, with a review at the end of the first year.

Food Habits. During the past year studies were continued on the feeding habits of haddock. Emphasis has been placed on the two main objectives of this work: detection of annual differences of the diet of haddock and completion of a survey of Georges Bank to determine benthonic and areal variations in food organisms.

The survey of the Georges Bank area covered sixty-eight stations spaced 15 miles apart. Bottom samples were obtained with the Petersen sampler, Van Veen grab, Digby scallop dredge, rocker-type and mud-type quahog dredges.

Sampling by means of a sled-mounted ring net showed that many food organisms important to the diet of haddock are found in the water stratum that lies between one and four feet above the bottom.

Gross differences in the bottom fauna were found from one area to another. In general, the areas rich in food are the same areas where the commercial fishing fleets concentrate their efforts.

Drift of Eggs and Larvae. Six cruises were completed during 1956 for the survey of eggs, larvae and pre-ring haddock. Data from the areas of Georges Bank, Browns Bank and the Gulf of Maine were analyzed.

Observations on the drift of eggs and larvae, supplemented by information from drift bottle returns, indicate that water movements were similar to 1953 when many eggs and larvae were carried off the bank, a poor year-class resulting. The survey by otter trawl in September for pre-ring haddock showed the young fish were nowhere abundant and a poor 1956 year-class is indicated.

Redfish (*Sebastes marinus* (L.))

Redfish landings during the calendar year of 1956 were 152.6 million pounds (69,218 metric tons), a decrease of almost six million pounds (2,700 metric tons) from the 1955 total. The fishery in the Gulf of St. Lawrence declined considerably with a decreasing catch per day. The landings and catch per day from the Gulf of Maine and Grand Banks increased slightly while those from the Nova Scotian banks increased 30 percent from the 1955 value. In some regions along the Nova Scotian banks the catch per day was almost twice the value it had been in 1955.

The first step in studying the migrations of redfish was undertaken in the fall at Eastport, Maine, when it was discovered that these fish come to the surface there to feed on shrimp around the docks. The tagging of 3,385 fish was accomplished by hook and line fishing, using shrimp or small herring for bait. The tagged fish ranged in length from 13 to 34 cm. with the mode at 20 cm. This is close to the size composition of the fish found in the deep waters of the Gulf of Maine. During the subsequent fourteen weeks 185 were recovered at the tagging site by hook and line fishing, all in excellent condition. The average growth shown by the tagged fish during this period was about 2 mm.

The age and growth of redfish has been studied extensively in the Commission Subareas 3, 4 and 5. The Barents Sea growth rate appears to be typical of the growth of *Sebastes* on most of the eastern North Atlantic fishing grounds, and is much greater than that of the Gulf of Maine

redfish. Preliminary results from the Grand Banks redfish study show the growth rate to be considerably less than that for the Gulf of Maine redfish.

At present, the racial studies suggest that all of the commercial landings of redfish from the Newfoundland to New England area are from a similar stock. It is not yet clear how this group of *Sebastes* compares with the typical "*marinus*" and "*mentella*" forms of the Barents Sea region. Further study of the morphometric and meristic characteristics is being developed with the cooperation of Canadian biologists.

Cod (*Gadus callarias* L.)

During the past year study of the cod in Subarea 5 progressed. Returns from the cod tagged off the New Jersey coast are approaching ten percent and indicate little or no mixing of these fish with the more northern stocks. The effective northeastern limit of these fish is enclosed within 42°N., 69°W. About one hundred cod were tagged from otter trawls on Georges Bank in December to further this phase of the investigation.

A study of monthly statistics kept since 1932 indicates a change in the distribution of cod on Georges Bank, both with regard to area and to depth. Indications are that this change may be associated with the warming trend in recent years.

Work is continuing on a bibliography of cod of the Northwest Atlantic. Approximately four hundred pertinent papers have been abstracted on punch cards.

Silver Hake (*Merluccius bilinearis* (Mitchell))

Analyses of the New England landings and catches per hour for the five year period from 1951 through 1955 show a decline in the inshore landings and the amount of fishing by small otter trawlers and an increase in offshore fishing by medium otter trawlers.

In 1955 a fishing ground on the northwest edge of Georges Bank was heavily exploited and contributed over one-fifth of the total landings of silver hake for New England. The southern New England stock has been increasingly exploited for industrial purposes. The bulk of these catches are one- and two-year-old fish.

The ageing of silver hake by determining the number of rings in otoliths appears to be the most satisfactory method. The otoliths are clear and the rings well defined in whole mounts, indicating seasonal growth. Current studies indicate that the first and second rings are apparently laid down during the first year and single rings in subsequent years.

Age-length composition by sex shows that females grow faster, are larger, and live longer than males.

Meristic counts and body proportions would seem to show two stocks of silver hake populations; one in southern New England waters and the other in the Gulf of Maine.

A three-week survey cruise was conducted with the *Albatross III* in New England waters in November. Age and growth as well as racial data collected on the cruise have shed considerable light on the life history and distribution of the silver hake in the New England waters.

Flounder.

The status of the flounder fishery remained stable during the past year. The decline of the yellowtail flounder (*Limanda ferruginea* (Storer)) was offset by the increased landings of blackback flounder (*Pseudopleuronectes americanus* (Walb.)) and more particularly the fluke (*Paralichthys dentatus* (L.)).

Progress has been made on the study of age determination and growth rates.

Industrial Fishery.

Abundance of industrial species, principally red hake (*Urophycis chuss* (Walb.)), remained high and has contributed to a new peak in landings for this mixed fishery. There is no indication that an over-fishing problem will be created by a proposed expansion in the processing industry.

Efforts are continuing to determine reliably the age composition of the red hake catch from monthly length frequency distributions.

A hydrographic survey of parts of the New England industrial fishing ground is continuing. Regular sampling of industrial catches and life history information is being accumulated for the principal species in this fishery.

Hydrography.

Hydrographic research by the U.S.A. in the convention area was carried out by three agencies: U.S. Coast Guard, Fish and Wildlife Service and the Woods Hole Oceanographic Institution.

A. The U. S. Coast Guard, as the agency operating the International Ice Patrol, examined the temperature and salinity distribution from the surface to about 1500 meters in network surveys off the eastern and southern slopes of the Grand Banks from Flemish Cap to the Tail of the Banks in April and again in May; in the northeastern slope from Flemish Cap to and including the Bonavista triangle in June. A post season cruise during July again occupied the Bonavista triangle and a section across the Labrador Sea from South Wolf Island, Labrador, to Cape Farewell Greenland. The latter section[1] was occupied from surface to bottom. These data will be published in U.S. Coast Guard Bulletin No. 42 which is expected to appear in print toward the end of 1957.

B. The Fish and Wildlife Service (North Atlantic Fishery Investigations) 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 late June. Over 4,500 drift bottles were strewn over the whole of the Gulf of Maine and Georges Bank area in the course of these five cruises. Four hundred returns have been received to date.

C. The Fish and Wildlife Service (Herring Investigations Laboratory) has undertaken a joint study with the Fisheries Research Board of Canada and in the course of that study, has taken bathythermograph observations throughout the whole of the Bay of Fundy and the Gulf of Maine during the latter parts of September, October and November. Nearly 4,000 drift bottles were set adrift during the period from which there have been 120 returns to date.

D. The Woods Hole Oceanographic Institution, under contract with the Fish and Wildlife Service, has tabulated historical temperature records, established oceanographic observation posts, examined all of the drift bottle returns from the Gulf of Maine area since 1930 and developed and employed a new telemetering device.

The daily records of surface water temperature at shore stations, lighthouses and lightships along the Atlantic Seaboard of the U. S. have been tabulated as monthly and annual means for the period of record. This comprises 29 locations in Subarea 5. (Bumpus, D.F., Surface water temperature along the Atlantic and Gulf Coasts of the United States, (in prep.).

Twelve lightship stations from Maine to Florida were equipped at the end of 1955 as Oceanographic Observation Posts to collect surface temperature and salinity observations daily, bathythermograph drops daily and bottom water samples weekly. Including lightships, U. S. Coast and Geodetic Survey Tide Stations and cooperating observers, there are 15 locations in Subarea 5 from which daily surface water temperature readings are available for 1956.

Analysis of drift bottle experiments conducted in 1931, '32, '33, '34, '53, '55 and '56 (12,751 releases—1,290 returns) has been completed. (Day, C. G., Drift bottle studies over the Gulf of Maine and Georges Bank. Woods Hole Oceanographic Institution, Ref. No. 57-1. Unpublished MS.)

A new device, a transponding drift buoy, has been developed. This instrument may be used to telemeter temperature or current data, or as a drifting radio beacon for the study of tidal or non-tidal currents. Experiments to study the non-tidal drift in the Bay of Fundy were conducted during the first two weeks of October, November and December. (D. F. Bumpus, J. Chase, C. G. Day, D. H. Frantz, Jr., D. D. Ketchum and R. G. Walden. A new technique for studying non-tidal drift with results of experiments off Gay Head, Massachusetts and in the Bay of Fundy. Woods Hole Oceanographic Institution. Ref. No. 57-2. Unpublished MS.).

[1] By courtesy of the U.S. Coast Guard the data from this section were circulated in graphic form within ICNAF on 15 Oct. 1956 (Serial No. 425). — The Secretariat.

Appendix to United States Research, 1956

CONVERSION OF TOTAL LENGTH TO FORK LENGTH FOR SUBDIVISION 5Z HADDOCK

ROBERT LIVINGSTONE, JR.

At the 6th annual meeting of ICNAF, the Standing Committee on Research and Statistics recommended that a standard method be employed by all member countries for measuring fish. The committee recommended: fork length (maximum length from tip of jaw to median ray of caudal fin) recorded to the nearest centimeter or millimeter.

The committee further recommended that all lengths should be submitted to ICNAF on the basis of the standard method and that fish measurements recorded in any other way should be converted to the standard.

The purpose of this study is to present data for the Commission's use in converting total lengths of haddock to fork length. Total length is considered as the length from the tip of the snout to the end of the upper caudal rays with the tail in a natural position. All measurements were recorded in millimeters.

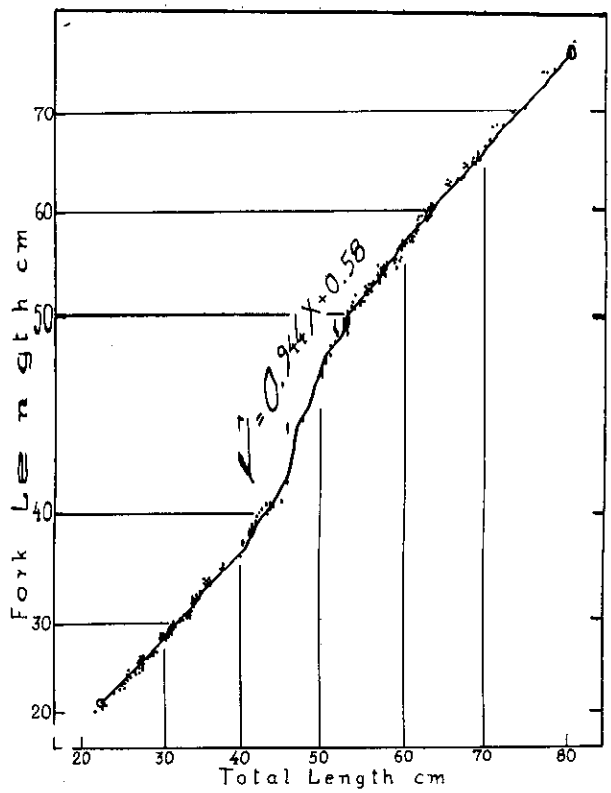


Fig. 1. Relation of total length (X) to fork length (Y) for Subdivision 5Z haddock.

Our data were collected in 1930 aboard a commercial trawler fishing in Subdivision 5Z. Measurements of fork length and total length of 330 fish from 13 samples were compared by regression analyses to obtain a conversion equation. The data and derived regression line are shown in Figure 1. Fork lengths have been calculated from total lengths where Y = fork length and X = total length, for each centimeter interval by the regression formula (Y + 0.944 = 0.58) and listed in the Table 1. (The original data are filed).

TABLE 1. FOR CHANGING TOTAL LENGTH TO FORK LENGTH FOR SUBAREA 5Z HADDOCK

Total Length (in cm.)	Estimated Fork Length (in cm.)	Total Length	Fork Length	Total Length	Fork Length	Total Length	Fork Length
20	19.5	37	35.5	54	51.6	71	67.6
21	20.4	38	36.5	55	52.5	72	68.6
22	21.4	39	37.4	56	53.5	73	69.5
23	22.3	40	38.4	57	54.4	74	70.5
24	23.2	41	39.3	58	55.4	75	71.4
25	24.2	42	40.3	59	56.3	76	72.4
26	25.1	43	41.2	60	57.3	77	73.3
27	26.1	44	42.1	61	58.2	78	74.2
28	27.0	45	43.1	62	59.1	79	75.2
29	28.0	46	44.0	63	60.1	80	76.1
30	28.9	47	45.0	64	61.0	81	77.1
31	29.9	48	45.9	65	62.0	82	78.0
32	30.8	49	46.9	66	62.9	83	79.0
33	31.8	50	47.8	67	63.9	84	79.9

A similar study has been made for Grand Banks haddock in 1955, (Rojo, Doc. No. 13, ICNAF 6th Ann. Meet.,). Rojo derived a factor of 0.965 for conversion of total length to fork length. Our calculations for Georges Bank yielded a factor of 0.944. A fish of 50 cm. for example, would be converted to 47.8 cm. with our equation and 48.2 with Rojo's factor. Whether this difference is significant can only be determined by further research.

PART 3

B. Compilation of Research Reports by Subareas 1956

BY ERIK M. POULSEN

Summaries of researches carried out in 1956 were reported by Canada, Denmark, France, Germany, Iceland, Norway, Portugal, Spain, United Kingdom and United States. The reports appear in a somewhat changed form this year, owing to the fact, that tables including data on length, age, etc., of fish caught by commercial gears have been removed from the reports to the newly established "Sampling Yearbook."

The table below shows the distribution of researches by subareas and countries (++ indicates researches from special research vessels, + researches from other state vessels or commercial vessels):

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

SUBAREA 1.

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

A. Hydrography.

Sections: Hamilton Bank-Cape Farvel, 15-20 July, U.S.A.
Off Cape Farvel, 1-10 Aug., Denmark.
Off Frederikshåb, 10-11 July, Denmark.
Dana Bank, 16 July, Norway.
Fiskenaes Bank, 17 July, Norway.
Fylla Bank, 16-18 July, Denmark.
Banan Bank, 21 July, Norway.
Lille Hellefiske Bank, 19-20 July, Denmark.
N. Lille Hellefiske Bank, 22 July, Norway.
Off Holsteinsborg, 21-23 July, Denmark.
Holsteinsborg Deep, 24 July, Norway.
Off Egedesminde, 23-24 July, Denmark.
Fixed station at entrance to Godthåb Fjord, through the year, Denmark.

The water temperature was generally a little higher than in 1955 in the eastern part of the subarea. "Storis" was nearly absent in the summer of 1956, in 1955 it was present in great quantities. Warmer Atlantic water was found north to Lille Hellefiske Bank in thicker layers than for many years. The surface temperature in summer was about normal up to Store Hellefiske Bank where it was slightly below normal. In May-June the surface temperature was below

In the Davis Strait proper, west of the banks, considerable masses of cold water were present. The Arctic Baffin Land current reached farther east than usually, and the same was the case with the "West Ice."

A comparison of the water temperature on and off Fylla Bank in the years 1954, 55 and 56 is shown in Figure 1 which gives temperature curves from the Danish sections in these years. The sections were worked on very nearly the same dates in the three years, viz. 21-22 July 1954, 22 July 1955 and 16-18 July 1956. In 1954 there was a small tongue of below +1° water close to the western slope of the bank. In 1955 such cold water reached to close to the surface and stretched far westwards from the bank. In 1956, however, water below +1° was only found in the most western part of the section (the Labrador current). Fylla Bank and its western slope was covered by water of between +2 and +3°, and west of the bank water of more than +3° was found right from bottom to surface. The surface water was considerably warmer in 1956 than in 1955, in the eastern part of the section over 5-6° in 1956, against in 1955 only below +3°.

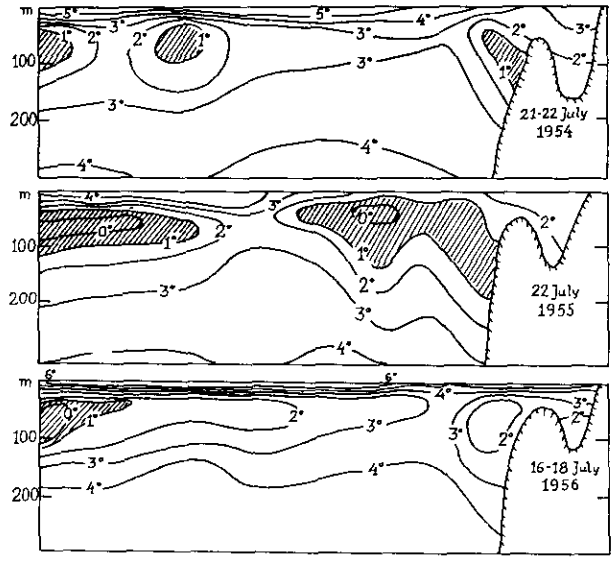


Fig. 1. **Comparison of water temperatures on and off Fylla Bank in 1954, 55, and 56. Water masses below + 1°C shaded.**

B. Cod.

The numbers of cod larvae were as in 1954 and 1955 very small; the numbers per 30 minutes' haul with a 2m. stramin net were in the later years as follows:

	1950	1951	1952	1953	1954	1955	1956
No.	8	?	1.6	4.1	1.3	1.3	1.2

The low number of larvae coincides with low temperature of the more shallow water in May-June (the spawning season), caused by low air temperatures.

Investigations in fjords and coastal waters confirmed the observation from last year that the 1953 year-class is the richest of the year-classes younger than 1951. This is in agreement with the abundance of larvae over the same years.

Age and length distributions of catches of cod from the W. Greenland banks are reported by Denmark, Germany, Iceland, Norway, Portugal and United Kingdom. Those by Denmark, Norway and Portugal are fully separated by subdivisions and are compiled in Figure 2. The 1947 year-class - 9 year old cod predominate in the catches as in 1955. Of the older year-classes the 1942 still is of importance, contributing around 8% by number. The 1945 year-class is rather poor in the northern and central subdivisions, but in the southernmost Subdivision F it is by far the richest, 35%, against only 21% for the 1947 year-class. In 1955 it contributed only some 20%, against the 34% of the 1947 year-class. This reversal of these two year-classes might be caused by migrations, of the 1945 year-class from the central regions to 1F and/or by the 1947 year-class from 1F to the central regions, i.e. for both year-classes migrations back to their home. The young, rich 1950 year-class has greatly increased in importance; in the northern area, 1B, it is with 34% the richest, in C, D and E it is fairly rich; in 1F it is, however, scarce. This fact supports the view that the South Greenland waters have more or less their own cod stock.

No samples are reported from Subdivision 1A, the most northern. It is to be hoped that countries fishing in 1A will make a special effort to sample this the most northern area for cod fishing.

SUBAREA 2.

Research vessel "Investigator II", Canada, August.
Commercial fishing vessels, Portugal, Aug. and Nov.
Hydrographic observations, U. S. Coast Guard, July

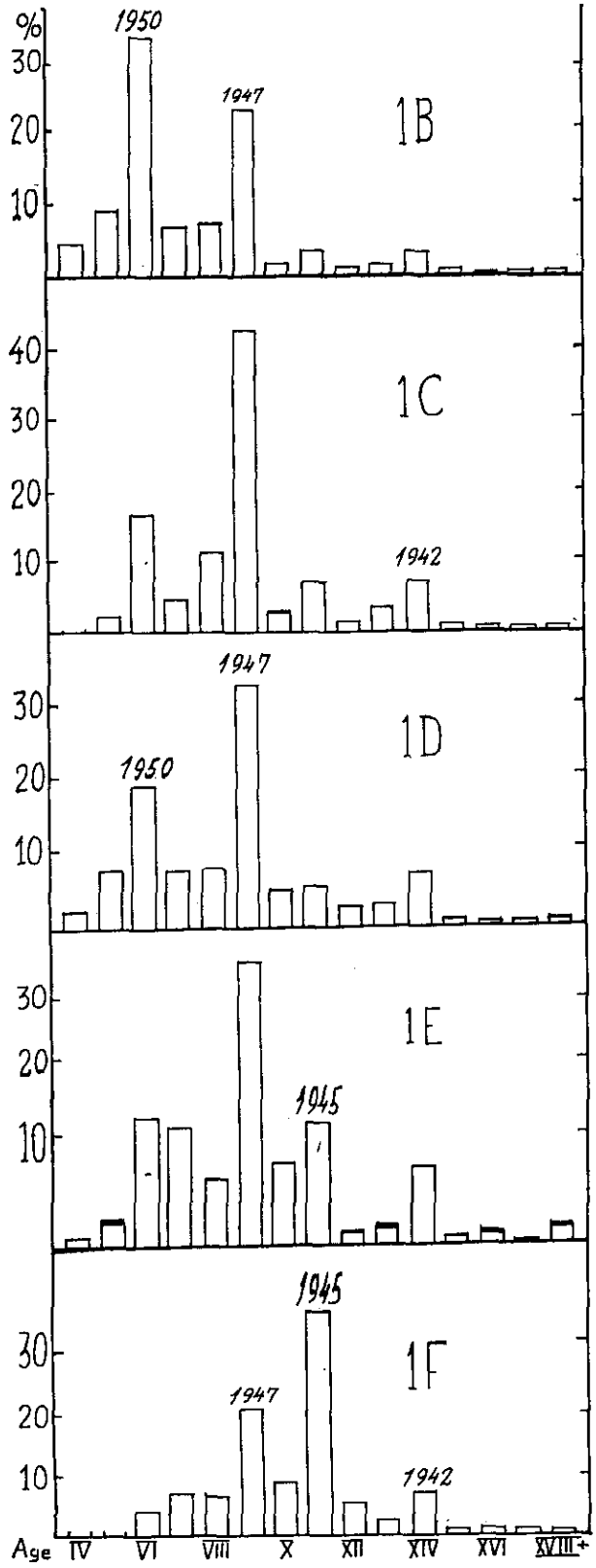


Fig. 2. Percentage age frequency of cod caught in Subdivisions 1B to 1F in the summer 1956 by Denmark (coastal area and fjords excluded), Norway, and Portugal. Various gears.

A. Hydrography.

1 section across Hamilton Inlet Bank, August, Canada.

1 section Hamilton Inlet Bank-Cape Farvel, July, U. S. Coast Guard.

The temperature of the surface layers were similar to those in 1955. At intermediate depths (50-100 m) the water mass below -1° was of somewhat greater extent than in 1955. The deeper water masses east of the bank, 150-500 m, were a little warmer than in 1955.

B. Cod.

Cod from the Portuguese trawl catches in 2J in August and November were investigated. Figure 3 shows the age-distribution of the Portuguese samples in 1956 compared to 1955. In 1956 age-groups IX and X predominate, closely followed by VIII and XI. Cod of more than 13 years, are scarce, and scarcer than in W. Greenland waters. The fall in abundance from middle aged cod to older ages (XI to XII in 1955, and XII to XIII in 1956) is rather steep. As the fishery is not very strong and as there is no reason to believe that it especially should affect just these year-classes, the steep fall may be taken as an indication of an emigration from the subarea of these older cod. The Portuguese researches show that part of the cod in the northern area of Subarea 3 resembles the slowgrowing Labrador cod.

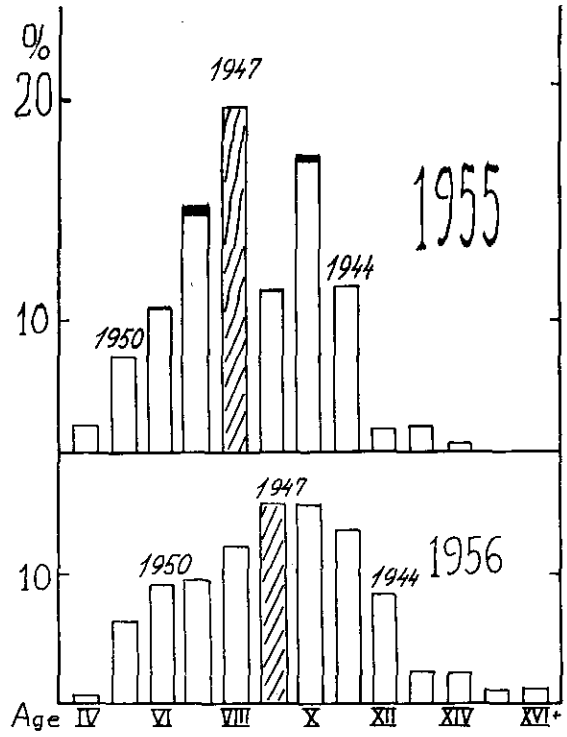


Fig. 3. Age distribution of Portuguese samples of cod caught by trawl in Subdivision 2J in 1956 and 56

C. Redfish.

Canadian researches in the area east of Hamilton Bank (150-300 fathoms) showed that more than 99% of the stock was made up by the small type *Sebastes marinus mentella*; *S. marinus marinus* thus was exceedingly scarce.

SUBAREA 3.

Various research vessels, Canada, over the year.
Frigate "l'Aventure", France, May-June.
Hospital ship "Gil Eannes", Portugal, spring-autumn.
Commercial fishing vessels, Portugal, spring-autumn.
Commercial fishing vessels, Spain, spring-autumn.
Hydrographic observations, U.S.A., over the year.

A. Hydrography.

5 sections off the Newfoundland coast, July-Aug., Canada (results of the St. John's-Flemish Cap section reported).
1 section off the Avalon Peninsula, May, France.
1 section of the channel between St. Pierre Bank and the Grand Bank, May, France. (Results of the French sections not reported).
Observations in connection with commercial fishery, Portugal.
Observations in connection with commercial fishery, Spain.
Observations, over the year, U.S.A.

The Canadian section St. John's-Flemish Cap was as in 1955 taken in the latter ten days of July. The temperatures were nearly the same in both years. However, the bottom water over the central part of the Grand Bank was slightly warmer in 1956 than in 1955.

B. Cod.

Canadian researches were concerned mainly with age and growth and other population studies.

Samples of cod from the Portuguese fishing fleet were collected and investigated; the results have not yet been worked up. However, results from similar samplings in 1955 are summarized in the 1956 Research Report.

Investigations were carried out by Spain onboard a commercial trawler in the central and southern Grand Bank Area, and results reported. In the years 1953, 54, and 55 the 1949 year-class predominated the Spanish catches. During 1955 a new rather rich year-class 1951 appeared in the catches. In 1956 the 1951 year-class predominated, and the older rich 1949 year-class had greatly decreased in importance. (see Fig. 5 in Spanish Res. Rep.). This change in age caused a decrease in mean size of cod caught as follows:

1953	—	43.7 cm.
1954	—	54.4 cm.
1955	—	57.2 cm.
1956	—	52.3 cm.

Experimental hauls with trawls of manila and nylon and with multiple and single cod ends were carried out by France.

C. Haddock.

Canadian researches showed that on the Grand Bank and the St. Pierre Bank nearly all commercially caught haddock belonged to the rich 1949 year-class. On the Grand Bank the two fairly rich year-classes 1952 and 1953 were approaching commercial size and the 1955 year class showed good survival on the Grand Bank and the St. Pierre Bank.

The Spanish investigations showed about the same picture, the year-classes dominating the catches being 1949, 1952, and 1953, however with the 1952 year-class leading, and the two others closely following. The Spanish researches also indicated a good survival of the 1955 year-class.

D. Redfish.

Canadian fishing experiments with trawl in an area North of Flemish Cap showed good fishing possibilities between 200-250 fathoms depth. It was shown that 2 varieties of redfish occur, the scarcer shallow-water form *Sebastes marinus marinus* and the far more abundant deeper water form *Sebastes marinus mentella.*

SUBAREA 4.

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

A. Hydrography.

Three sections off Halifax across the Scotian Shelf, Feb., Aug. and Nov.
Seasonal surveys over the Scotian Shelf, in the Bay of Fundy and in the St. Lawrence Bay, observations at shore stations. (Canada).
One section across the Cabot Strait, June, France.

On the Scotian Shelf the surface water was colder in 1956 than in 1955; also the cold-water layer showed lower temperatures. On the other hand the warmer Gulf Stream water was nearer to the slope of the shelf in 1956 than in 1955 (see Fig. 4).

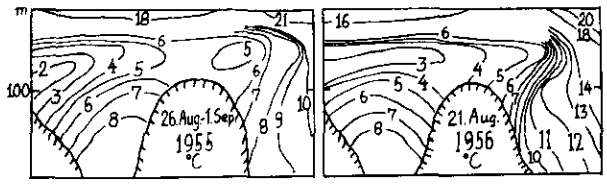


Fig. 4. Comparison of water temperatures on the Scotian Shelf off Halifax in August 1955 and 1956.

B. Cod and Haddock.

Only Canada has reported on its investigations. Taggings of cod and haddock were carried out. The ages of haddock were studied jointly by Canada and U.S.A. The Canadian Report further deals with the study of landings of cod and of quantities and sizes of cod discarded. Experiments on mesh selection and with double codends were carried out (see Canadian Research Report).

Portugal has carried out extensive sampling in this subarea of its spring fishery, but details have not yet been reported to the Commission.

SUBAREA 5.

Researches were carried out only by the United States. The investigations were centered on haddock and redfish. The cod were studied not only in Subarea 5 but also in its southern area of distribution off the New Jersey coast. The silver hake, *Merluccius bilinearis* (Mitchell) and the red hake, *Urophycis chuss* (Walb.) were made the object of intensive studies, the latter in connection with its greatly increased importance for the processing industry. The U. S. research report finally gives a survey of the extensive U. S. hydrographic studies over the whole of the Convention Area.

ALL SUBAREAS.

A. Hydrography.

Figure 5 shows, based on Canadian, Danish, Norwegian and U.S.A. observations from the

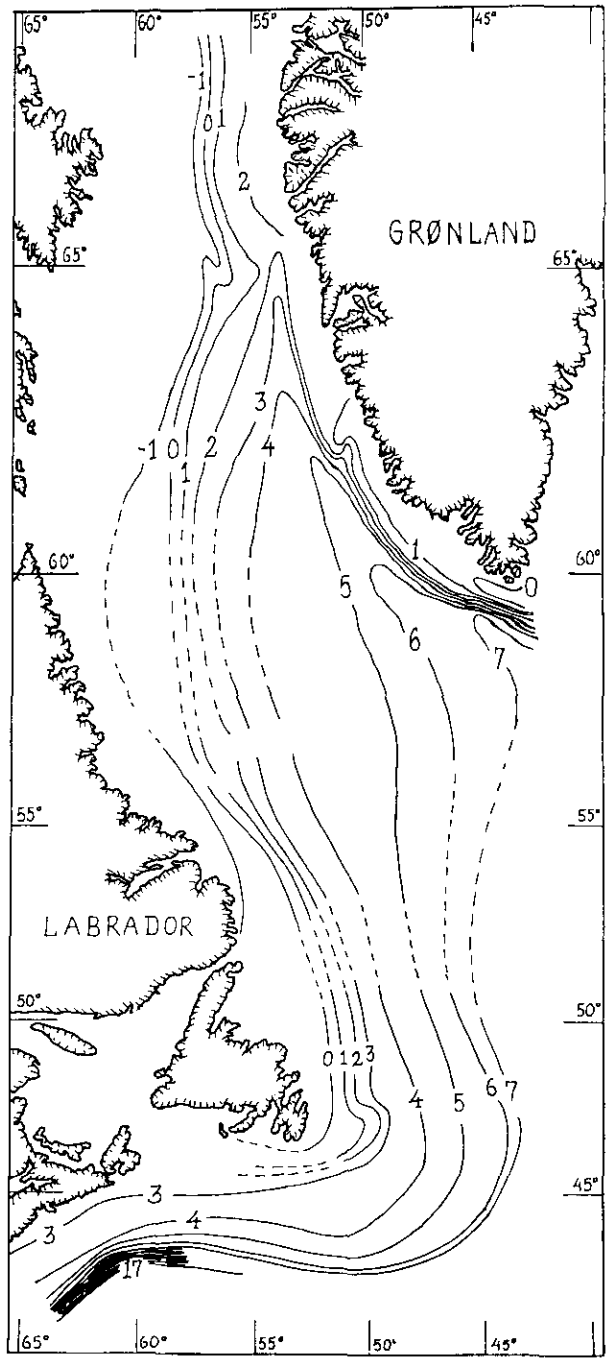


Fig. 5. Isotherms (°C) in 50 m. depth in the Convention Area in the latter half of July and first half of August 1956 based on Canadian, Danish, Norwegian and U.S.A. observations.

latter half of July and first half of August 1956, the temperature at 50 metres depth in the Convention Area. The main difference between 1955 and 1956 is found in Subarea 1, where the temperatures on and off the central and southern W. Greenland banks were higher in 1956 than in 1955. Farther south the reverse was the case; at the Newfoundland Banks the water mass with temperatures below +1°C reached farther eastwards from the coast in 1956 than in 1955.

B. Cod.

The age-distribution of cod in 1956 in various parts of the Convention Area appears from Figure 6, which is compiled from data from the Danish, Norwegian, Portuguese and Spanish research reports.

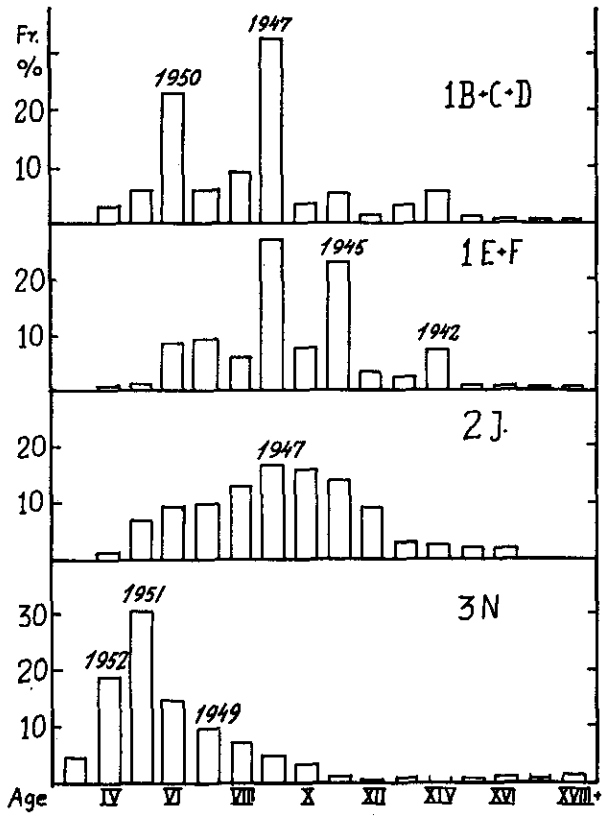


Fig. 6. Cod, age distribution in 1956. Subarea 1—Danish, Norwegian and Portuguese samples, Subarea 2—Portuguese samples, Subarea 3—Spanish samples.

In Subareas 1 and 2 the 1947 year-class predominates. In the northern and central part of Subarea 1 it is followed by the 1950 year-class, in the southern part of Subarea 1 by the 1945 year-class, and in Subarea 2 very closely by the 1946 year-class.

The Spanish investigations in Subdivision 3N show quite another picture of age-distribution with the young 1952 and 1951 year-classes constituting the large bulk of the catches. This age-distribution can, however, not be taken as representative for Subarea 3; it is representative for the area, the season, and the fishery from which it arrives. To make this clear Figure 7 shows age-distribution of cod caught by Portuguese trawlers in 1955 in Subdivisions 1D, 2J and 3K. In 3K, just as in Subareas 1 and 2, the older year-classes 1945-47 predominate.

The two completely different age-distributions found for trawl-caught cod in 3N (1956) and 3K (1955) show that a valid picture of age- (and length-) composition can only be achieved through comprehensive sampling, covering different seasons, wide areas, and various gears.

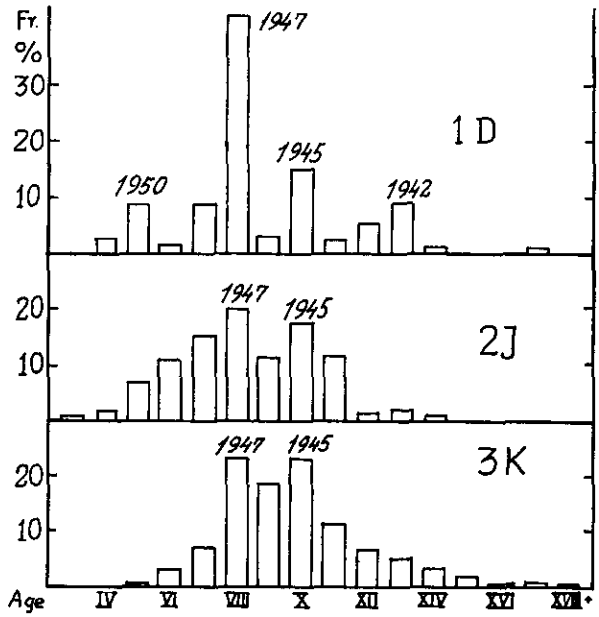


Fig. 7. Cod, age distribution, Portuguese samples in 1955 from Subdivisions 1D, 2J, and 3K.

PART 4.

Lists of Scientists and Laboratories Engaged in the Various Branches of the Commission's Work

Canada

W. Templeman	Director, groundfish-biology	Fisheries Research Board of Canada, Biological Station, St. John's, Nfld.
A. M. Fleming	Groundfish population studies, cod	,, ,, ,, ,,
Marjorie E. Prouse	Groundfish population studies, cod	,, ,, ,, ,,
S. J. Olsen	Research vessel operations, exploratory fishing	,, ,, ,, ,,
E. J. Sandeman	Redfish	,, ,, ,, ,,
T. K. Pitt	Pleuronectids	,, ,, ,, ,,
R. M. Chilvers	Pleuronectids	,, ,, ,, ,,
H. J. Squires	Plankton, groundfish food	,, ,, ,, ,,
V. M. Hodder	Mathematical statistics	,, ,, ,, ,,
J. L. Hart	Director	Fisheries Research Board of Canada, Biological Station, St. Andrews, N. B.
W. R. Martin	Groundfish biology, liaison with ICNAF	,, ,, ,, ,,
F. D. McCracken	Groundfish, fishing gear	,, ,, ,, ,,
Y. Jean	Cod, plaice	,, ,, ,, ,,
P. M. Powles	Cod, plaice	,, ,, ,, ,,
A. C. Kohler	Cod, haddock, age and growth	,, ,, ,, ,,
D. M. Scott	Cod, parasites	,, ,, ,, ,,
J. E. Paloheimo	Mathematical statistics	,, ,, ,, ,,
H. B. Hachey	Chief Hydrographer	Fisheries Research Board of Canada, Atlantic Oceanographic Group, St. Andrews, N. B.
L. M. Lauzier	Hydrography	,, ,, ,, ,,
W. B. Bailey	Hydrography	,, ,, ,, ,,
N. J. Campbell	Arctic hydrography	,, ,, ,, ,,
A. E. H. Collin	Arctic hydrography	,, ,, ,, ,,
F. Forgeron	Arctic hydrography	,, ,, ,, ,,
R. W. Trites	Hydrography	,, ,, ,, ,,
D. G. MacGregor	Hydrography	,, ,, ,, ,,
A. Marcotte	Director	Quebec Dept. of Fisheries, Station de Biologie Marine, Grande Rivière, Gaspé, P. Q.
K. Ronald	Groundfish, parasites	,, ,, ,, ,,
P. Montreuil	Director	Quebec Dept. of Fisheries, Station de Biologie Marine, Grindstone, Magdalens, P. Q.

Denmark

Paul M. Hansen	Chief, cod, statistics	Grønlands Fiskeriundersøgelser, Charlottenlund Slot, Charlottenlund.
Sv. Aa. Horsted	Groundfish	,, ,,
J. Nielsen	Groundfish	,, ,,
E. Smidt	Groundfish	,, ,,
Å. Vedel Tåning	Director, redfish, cod	Danmarks Fiskeri- og Havundersøgelser. Charlottenlund Slot, Charlottenlund.
K. P. Andersen	Hydrography	,, ,, ,,
Frede Hermann	Hydrography	,, ,, ,,

France

P. Desbrosses	Cod, haddock	Inst. Scient. et Techn. des Pêches Maritimes, 59 Av. Raymond Poincaré, Paris XVI^{e}.
R. Letaconnoux	Haddock	Laboratoire de l'Office des Pêches, 74 Allée du Mail, La Rochelle.
J. Ancellin	Pleuronectidae, cod, haddock	Laboratoire d'Oceanographie, Boulogne sur Mer.
C. Nédelec	Redfish	,, ,,
A. Gougenheim	Hydrography	Serv. Hydr. de la Marine, 13 Rue de l'Université, Paris.

Germany

J. Lundbeck	Statistics, liaison with ICNAF	Bundesforschungsanstalt für Fischerei; Institut für Seefischerei. Neuer Wall 72, Hamburg 36.
A. Meyer	Cod, haddock	,, ,,
A. Kotthaus	Redfish	Bundesforschungsanstalt für Fischerei; Biologische Anstalt Helgoland; Abtl. für Fischereibiologie. F.A.- Pust-Platz, Bremerhaven-F.
A. von Brandt	Fishing gear	Bundesforschungsanstalt für Fischerei; Institut für Netz- und Materialforschung. Neuer Wall 72, Hamburg 36.

Iceland

Jón Jónsson	Director, cod	Atvinnudeild Háskólans Fiskideild, Borgartun 7, Reykjavík.
Jakob Magnússon	Redfish	,, ,, ,,
Unnstein Stefánsson	Hydrography	,, ,, ,,
Adalsteinn Sigurdsson	Pleuronectids	,, ,, ,,
Ingvar Hallgrímsson	Zooplankton	,, ,, ,,
Mrs. Thorunn Thordardóttir	Phytoplankton	,, ,, ,,
Ingimar Óskarsson	Cod, shellfishes	,, ,, ,,

Italy

Norway

G. Rollefsen	Director, cod	Fisheries Directorate, Institute of Marine Research, Bergen.
B. Rasmussen	Fishery consultant, cod	,, ,,
J. Eggvin	Fishery consultant, hydrography	,, ,,
S. Olsen	Fishery consultant, halibut	,, ,,
E. Bratberg	Fishery consultant, redfish	,, ,,
B. Berland	Assistant, parasites	,, ,,

Portugal

Tavares de Almeida	Cod, hydrography	Comissao Cons. Nac. das Pescarias do Noroeste do Atlantico, Gabinete de Estudos das Pescas, Av. da Liberdade, 211, 4°, D°, Lisbon.
Mario Ruivo	Cod, haddock	,, ,, ,, ,,
G. Quartin	Fishes	,, ,, ,, ,,
L. Nunes-Ruivo	Parasites	Museu de Historia Natural, Lisbon.

Spain

J. M. Guitian Vieito	Hydrography, statistics	Direccion General de Pesca Maritima, Alarçon 1, Madrid.
A. Varela Reducto	Statistics	,, ,, ,, ,,
O. Rodrigues Martin	Fishes	,, ,, ,, ,,
R. Lopez Costa	Hydrography	Laboratorio Oceanografico, Felipo Sanches 20, Vigo
Alfonso Rojo	Cod, haddock	Spanish Cod Fishing Industries Association, Madrid.

United Kingdom

C. E. Lucas	Director, fishery ecology	Marine Laboratory, Victoria Road, Torry, Aberdeen, Scotland.
J. H. Fraser	Plankton	,, ,, ,, ,,
B. B. Parrish	Population theory	,, ,, ,, ,,
A. D. McIntyre	Redfish, halibut	,, ,, ,, ,,
R. Jones	Haddock	,, ,, ,, ,,
M. Graham	Director, cod	Fisheries Laboratory, Lowestoft, Suffolk, England.
R. S. Wimpenny	Fishery ecology	,, ,, ,, ,,
G. C. Trout	Cod, redfish	,, ,, ,, ,,

United States

L. A. Walford	Chief	Branch of Fishery Biology, U. S. Fish and Wildlife Service, Washington 25, D. C.
Herbert W. Graham	Director, fishery biology	U. S. Fish and Wildlife Service, Woods Hole, Mass.
J. R. Clark	Haddock	,, ,, ,,
J. B. Colton	Hydrography, plankton	,, ,, ,,
R. L. Edwards	Industrial fishery	,, ,, ,,
R. L. Fritz	Silver hake	,, ,, ,,
G. F. Kelly	Redfish	,, ,, ,,
F. E. Lux	Yellowtail flounder	,, ,, ,,
J. A. Posgay	Sea scallop	,, ,, ,,
C. C. Taylor	Population dynamics	,, ,, ,,
R. L. Wigley	Bottom ecology	,, ,, ,,
J P. Wise	Cod	,, ,, ,,