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 Chairman: L.A. Walford  
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REPORT OF WORKING PARTY 2.

Characteristics of the catches of the salt-cod fleet.

In the ICNAF area cod is by far the most important species; cod landings amount to two-thirds of the total ground-fish landings. Three-quarters of these cod are salted. It is accordingly of great importance that the Commission give close attention to the salt-cod fishery.

The discussion of the salt-cod working party are reported under the following headings: Participants, Fishing Equipment, Statistics of Landings, Abundance, Sizes, Conversion Factors, Biological Observations, and Proposed Research Program. A list of papers and charts presented to the working party is attached as an Appendix.

Participants

Canada : W.R. Martin, Chairman;  
 A.M. Fleming, Rapporteur.  
 Denmark : P.M. Hansen  
 France : J. Ancellin; G. Kurc  
 Portugal : M. Ruivo  
 Spain : D.O. Rodriguez; A. Rojo.

Fishing Equipment

Cod for salting are caught in the Convention area by many widely different methods: pound nets, traps, jigs, baited handlines, baited longlines, otter trawls and pair trawls. To handle these different types of gear many different types of fishing boat are employed; small rowing and motor boats for fisheries near the shore, and larger longliners, dory schooners and otter trawlers for fisheries off shore.

Inshore fisheries.

Greenland's shore fishery in Subarea 1 is carried on with jigs, baited handlines, longlines and pound nets. Rowing boats 12-26 feet in length and motor-boats 26-30 feet in length are used. The fishing season extends from July to October in the northern part of Greenland (1A) and from April to October in the southern part (1E, 1F).

Canada has the largest inshore cod fishery in the Convention Area. This fishery is conducted in Subareas 2, 3 and 4.

In Subarea 2, with traps, jigs and handlines, using motor-boats 25-35 feet in length, fishing is from June to September (2H, 2J).

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In Subarea 3, the season extends from May to November in the east Newfoundland area (3K, 3L) using traps early, and handlines and longlines throughout the fishing season. In southwestern Newfoundland (3P) fishing with lines continues throughout the year. Motor-boats 20-55 feet in length are used in these fisheries, with those 35-55 feet in length being equipped with power haulers for longlining.

In Subarea 4 the fishery is by trap, handline and longline. In the Gulf of St. Lawrence area the trap fishery is centered mainly in 4R and 4S, with line fishing predominating more to the west. The season in the Gulf extends from June until October. Outside the Gulf the fishery from Nova Scotia is mainly with handlines and longlines and the season extends throughout the year. Motor-boats used are from 25-60 feet in length, with those from 35-60 feet being used for longlining with power haulers.

In recent years, both in Greenland and Canada, there has been an increase in the number of motor-boats used in the fishery. In Canada the use of power haulers has increased the efficiency of the longline fishing.

#### Offshore fisheries.

In the offshore fisheries for cod for salting, landings are made by otter-tractlers, dory schooners, longliners, and pair trawlers, in decreasing order and importance.

Otter-tractlers. The largest fleets of otter-tractlers are operated by France, Portugal, and Spain, the ships ranging in size from about 900 to 1400 gross tons. These trawlers usually arrive in Subareas 3 and 4 each year in February and fish in Subareas 4, 3, 2 and 1 as the season advances. Most of these ships make two or three trips during the February to December fishing season. A small fleet of large-sized otter-tractlers from Italy also fished in these Subareas during the past few years. Fleets of otter-tractlers from Iceland, Denmark (Faroes Is.) and Norway (ships mainly around 500-700 gross tons) fish each year in Subarea 1 from April to November.

Dory schooners. Portugal has the most important dory schooner fleet; a small number fish entirely in Subarea 3 and the others fish in Subareas 1 and 3. These dory schooners make only one trip each year; their season is from June to September in Subarea 1, and from April to October in Subarea 3.

Canada has a small, but decreasing, dory schooner salt-cod fleet which fishes from March to October primarily in Subarea 3. These ships generally make three salt-fishing trips each year.

In Subarea 1, Denmark (Faroes Is.) carries on a small fishery by schooners.

Longliners. The only offshore longline fishery for cod is in Subarea 1. A Norwegian fleet of longliners ranging between 100 and 500 gross tons fishes from April to September. Denmark (Faroes Is.) operates a small fleet of longliners in Subarea 1 during the same season.

Pair trawlers. Spain is the only country operating pair trawlers in the Convention area. These fish in Subarea 3 mainly during the summer months but their season extends from about March until October.

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Table I - Selectivity of gear used in the salt-cod fishery

Country	Otter trawling cod-end mesh size#(mm)	Line Fishing Size of hooks (Mustad)
Canada		11 (a) 14-17 (b)
France	120-125 (about)	
Portugal	110-115	14-15 (b)
Spain	90-127 (1) 89-101 (2) 110-131 (3)	

# As measured with ICNAF or Scottish gauge.

- (1) Measurement of first cover for one section of fleet using double cod-ends.
  - (2) Measurement of second cover for a second section of fleet using triple cod-ends.
  - (3) Pair trawler cod-end (no cover).
- (a) Handline  
(b) Longline.

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In the offshore fishery, in a move toward more efficient fishing, practically all otter-trawlers are now fitted with depth-recorders, many have Loran and Radar for more accurate navigation, many have radio-telephones for communication, and many are now being fitted with sonar equipment to aid in detecting the presence of fish schools. Many of the dory-schooners are now fitted with similar equipment. In the longlining fleets more ships are now using power haulers than in previous years.

#### Statistics of Landings

The following countries, listed in decreasing order of importance of landings, participate in the salt-cod fishery in the Convention area : Canada, Portugal, France, Spain, Denmark, Iceland and Italy. The order of importance of subareas producing salt-cod is 3, 1, 2 and 4.

Recent trends in the salt-cod fishery may be summarized as follows:

1. The Canadian salt-cod fishery has been declining. Schooners have been reduced to very small numbers. The bank fishery for salt-cod has been replaced by an otter-trawl fishery for fresh groundfish.
2. The Portuguese salt-fishery has been increasing. Schooner landings, which exceeded those of otter trawlers until 1949, have now levelled off while otter-trawler landings have continued to increase.
3. The French salt-fishery has fluctuated greatly. It virtually disappeared during both world wars and during the depression in the "thirties". French dory schooners have been completely replaced by large otter-trawlers which catch more cod for salting than any other otter-trawl fleet.

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4. The Spanish salt-fishery has grown steadily from 1927 except for a ten year war-time decrease beginning in 1936. Recent developments have included (a) large catches of haddock for salting (b) an increasing fleet of large otter trawlers and (c) a salt-cod fishery in Subarea 3 by pair-trawlers.
5. The Danish salt-fishery has increased sharply during recent years. The shore fishery from Greenland has increased, and the Faroese schooner and trawler fishery developed quickly following the last war.
6. The Norwegian salt-fishery gained prominence after 1948. The development of a pelagic line-fishery for large cod is the major factor responsible for the increased landings. A few otter-trawlers have also contributed to the Norwegian catch.
7. The Icelandic fishery became important in Subarea 1 in 1951.
8. An Italian fishery by a few large otter-trawlers has contributed to salt-cod landings since 1950.

Table II - Landings of salt-cod for 1953

In thousands of metric tons (round fresh)

	Can- ada	Den- mark	Fran- ce	Ice- land	Italy	Nor- way	Por- tugal	Spain	Total
Otter trawlers (1)									
- very large	-	-	114	-	14	-	97	59	284
- large	-	14	-	14	-	4	-	-	32
Pair trawlers	-	-	-	-	-	-	-	23	23
Dory schooners(2)									
- very large	-	-	-	-	-	-	67	-	67
- large	16	2	-	-	-	-	-	-	18
Longliners	-	8	-	-	-	27	-	-	35
Inshore boats	155	26	4	-	-	-	-	-	185
<b>Total</b>	<b>171</b>	<b>50</b>	<b>118</b>	<b>14</b>	<b>14</b>	<b>31</b>	<b>164</b>	<b>82</b>	<b>644</b>

- (1) For details of otter trawler sizes refer to section on fishing equipment.
- (2) Very large dory schooners - 250 to 1200 gross tons.  
Large dory schooners - 100 to 250 gross tons.

Recent changes in the salt-cod fishery may be summarized as follows:

1. There has been a post-war increase in the landings from the Convention Area. This is largely due to increased fishing in Subareas 1 and 2. In Subareas 3 and 4 the total cod production has been maintained at a high level.
2. There has been a sharp increase in the landings by otter trawlers; about half the salt-cod landings were taken by otter trawls in 1953. Line-fishing from dory schooners has become relatively less important.

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Abundance

Abundance indices are available for some salt-cod fisheries in Subareas 1 to 4. In Subarea 1 favourable climatic conditions have resulted in the production of a series of very rich year-classes of cod. In Subarea 2 cod abundance has not changed appreciably during the past 25 years. In Subarea 3 catch per unit of effort has increased with increased efficiency of fishing methods, but abundance indices have not changed significantly during recent years. In some years favourable hydrographic conditions concentrate cod along the Newfoundland coast and in those years landings increased. In Subarea 4 cod indices of abundance have decreased since the last war as a result of a decline in the numbers of large cod.

There is good evidence that the large salt-cod fishery can be increased substantially from the present level of production. Post-war developments of otter-trawl and pair trawl fisheries; recent introduction of pelagic longlining in Subarea 1 and deep water longlining in Subarea 3, both for large cod; and finally the known, but little-fished, cod stocks of Subarea 2 all support the conclusion that the cod fisheries in Subareas 1, 2 and 3 can be increased.

Sizes

Table III - Recent observations on sizes of cod taken by different gears

	<u>Gear</u>	<u>Length range (cm.)</u>	<u>Mode (cm.)</u>	<u>Subarea</u>
Canada	Trap	35 - 95	53 )	3L
	Handline	35 - 105	63 )	
	Longlines	40 - 120	65 - 68 )	
	Dory schooners	50 - 140	65	
Portugal	Dory schooners	55 - 100	67	1D
	Otter trawlers	40 - 90	70	1C
		32 - 70	52	2J
Spain	Otter trawlers	38 - 83	60	3L
		32 - 71	52	3N
		44 - 83	63	3O
		41 - 74	50	4V

The decreasing relative importance of linefishing and the increasing importance of otter-trawling have resulted in a reduction in the sizes of cod taken from the Convention area. Since large cod are of special interest to the salt-fish industry, because of greater market demand and higher value, it is important to study the relation between landings of small and of large cod. If the proportion of large cod in landings could be increased, it is possible that fishing effort and total production of cod could be increased. Increased long-term total production is the aim of the Commission.

Conversion Factors

New studies of conversion factors for landed weights of salt-cod provided data which conform with the conversion factors tentatively accepted by the Commission in June, 1955. Preliminary data were presented on conversion factors for landed lengths of salt-cod to lengths of round fish.

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### Biological Observations

Some of the highlights in biological observations presented in papers and charts to the salt-cod working party are listed below:

1. Dr. Hansen (Denmark) presented a figure showing the decreasing growth rate in recent year-classes as compared with that found in Greenland in the "twenties". An earlier age of maturity has also been observed. Good year-classes continue to appear frequently at Greenland and catches have accordingly continued at a high level. Some recent signs of a return to a period of low landings have been observed.
2. Dr. Rodriguez (Spain) reported on recent studies of cod taken by Spanish otter-trawlers from the southern Grand Bank. The 1949 year-class has predominated in the catches and the modal sizes taken have increased from 43 to 60 cm. during the period 1953 to 1955.
3. Mr. Rojo (Spain) reported on discards of cod at sea by Spanish trawlers, showing wastage by numbers to be 0.5 to 37%. He also presented data on catch per unit of effort for cod and haddock, showing that Spanish trawlers concentrate either on cod or haddock.
4. Dr. Ancellin (France) presented an interesting chart describing the seasons fished by French otter trawlers in the various ICNAF subdivisions.
5. Dr. Ruivo (Portugal) presented valuable information on conversion factors, sex ratios and age composition.
6. Growth rate studies by Canada, Denmark, Portugal, and Spain were considered and good agreement was observed for areas where two countries sampled the same stock. Great variation in growth rate was observed throughout the Convention Area. The fastest growth rates have been found on the southern Grand Bank and at Greenland; the slowest growth was observed on Labrador, and along the east coast of Newfoundland.

### Proposed Research Program

#### 1. Statistics

- (a) The Commission has made outstanding progress with the collection and publication of statistics of landings. It is believed that these statistics are approaching adequate detail and accuracy for Commission purposes, and that increased energy in this field is not required.
- (b) Studies of available log-book records of past fishing are needed in order to allocate landings of cod by subarea of capture and by fishing effort.
- (c) Studies of conversion factors for weights landed to round weights have reached the point of diminishing returns. All material should now be reviewed. It is proposed that research in this field should now be directed to studies of conversion factors for lengths as landed to total lengths as caught.

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2. Sampling:

- (a) Progress has been made with the study of sizes of fish caught and landed, but it is proposed that work in this field should be increased. Consideration might be given to the publication of size compositions along with statistics in ICNAF publications. The basic data should include detailed information on fishing ground, depth, and selectivity of gear fished (mesh or hook size). These data should be grouped for publication. In order to advise the Secretariat on such grouping of data, the proposed cod symposium in June, 1956 might give consideration to division of stocks, and to horizontal and vertical movements of cod in relation to sex and size.
- (b) Sampling can be improved by shore sampling of landings taken from restricted areas. Landings by pair trawlers and by dory schooners might be studied in this way. Such sampling would require length conversion data (see 1(c) above).
- (c) Sampling at sea must be continued in order to sample trips which move from one area to another, and in order to assess differences between sizes caught and sizes landed. Observers should move from vessel to vessel for sampling.

3. Gear selection

- (a) Studies of mesh selectivity should be extended to nets with double cod-ends.
- (b) Mesh selection data for otter trawls should be studied in relation to the selectivity of other gears such as pair trawls, hand lines, long lines, pound nets and traps.

4. Population dynamics

- (a) Studies of recruitment, growth, and mortalities must be pursued in order to determine optimum size for first capture and optimum fishing intensity for each stock.
- (b) It is of special interest for salt-cod to study the possibility of increasing total production by providing for increased catches of large cod.

5. Prediction

- (a) A number of basic biological studies must be continued in order to predict changes in the commercial fishery e.g. (I) studies of abundance of pre-recruits from egg, larval and small-fish surveys; (II) studies of the factors controlling year-class strength; (III) studies of changes in growth rate, maturity, and conditions factors; (IV) studies of distribution in relation to such factors as depth and temperature; (V) studies of efficiency of different baits in relation to analysis of indices of abundance.

W.R. Martin  
Chairman

A.M. Fleming  
Rapporteur

APPENDIX

List of papers and charts presented.

- Ancellin, J. - La Campagne de Pêche morutière des Chalutiers Français dans l'Atlantique N.W. en 1954.  
- Campagne de Pêche à la Morue dans l'Atlantique Nord-Ouest en 1954 (1 chart)
- Fleming, A.M. - Characteristics of Canadian (Newfoundland) salt-cod fleet.  
- Landings, sizes, and growth of cod caught by Canadian (Newfoundland) salt-cod fleet (8 charts)
- Hansen, P. - Special study of the characteristics of the catches of the Greenland salt-fish fleet.  
- Changes in growth rates of year classes in Greenland waters (1 figure)
- Martin, W.R. - Characteristics of the fishing and landings by the Canadian dory-schooner salt-fishing fleet (12 charts)
- Rodriguez, D.O. - Report on the cruise carried out by the Spanish vessel Cierzo in the waters off Newfoundland, June - July, 1955.  
- Short history of the Spanish cod-fishery.  
- Conversion factors (Subarea 3, Cierzo, June - July, 1955).
- Rojo, A. - Total capture of cod and haddock; catch per unit of effort; and haddock sizes taken by 10 Spanish trawlers, 1955 (Graphic presentation)
- Ruivo, M. - Conversion factors for cod. Portuguese investigations in Subareas 1 and 3 in 1955.

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