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Codend Materials, Mesh Sizes and Topside Chafers used by Canadian Mainland Otter Trawlers

by F.D. McCracken[1] and D.F. Holmes[2]

Abstract

In 1954-55 about 95% of the codends used by trawlers on the Canadian Atlantic mainland were made of manila twine. Since then, a trend to synthetic materials has occurred, and by 1961 about 85% of the codends used were made of synthetic materials (polyamides, polyesters and polyethylenes).

The changes from small meshes to meshes of regulation size or over proceeded rapidly, and by 1959 most codends used for fishing cod and haddock had regulation mesh sizes. For manila codends mesh sizes in recent years have been 4½ inches or greater; for synthetic codends mesh sizes have been 4 to 4 5/8 inches.

Use of topside chafers continues to be related to vessel size, with little change in occurrence since observations were begun systematically in 1957. Topside chafers are seldom used by vessels under 75 gross tons, but they are almost always used by vessels over this size.

Since topside chafers are made most often from discarded codends, the regulation of mesh size in topside chafers has not been a problem. As mesh size of codends increased, so did that of topside chafers. Regulation of the width of topside chafers has been a difficult problem. Despite regulatory efforts, about 40-50% of the topside chafers used by the fleet in 1961 were too narrow to meet regulation specifications.

Introduction

Since the introduction of minimum mesh sizes for otter trawls used to fish cod and haddock in Subarea 4 and 3, information about mesh sizes, materials and topside chafers used by Canadian otter trawlers has been collected by enforcement officers of the Department of Fisheries. This information has been recorded on the form suggested by ICNAF (shown in Appendix I). Prior to introduction of mesh regulation, information about mesh sizes and materials was collected at irregular intervals by scientists and technicians of the Fisheries Research Board of Canada.

This report summarizes the information collected and points out the changes which have taken place, during the period 1954 to 1961 in the codends of Canadian mainland otter trawls which have been used for cod and haddock fishing.

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1) Fisheries Research Board of Canada, Biological Station, St. Andrews, New Brunswick.

2) Department of Fisheries, P.O. Box 550, Halifax, Nova Scotia.

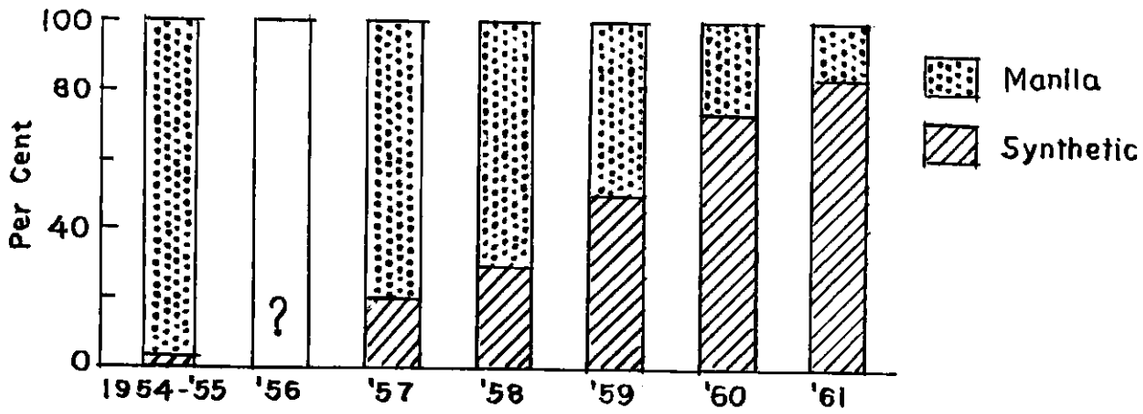

Fig. 1. Proportion of Canadian mainland otter-trawl codends of manila and synthetic materials.

Chronology of Mesh Regulations (Canada)

Following the 1952 recommendation from ICNAF of a 4½-inch minimum mesh for haddock trawling to Subarea 5, regulation was effected in Canada by June 1953. Subsequent recommendations from ICNAF in 1955 for a 4½-inch minimum mesh size in manilla codends for cod and haddock fishing in Subarea 4 and 5, and a 4-inch minimum in Subarea 3, became law in Canada by February 1957. The same regulation specified equivalent mesh sizes for synthetic materials. It also specified that topside chafers must be of netting, with a minimum mesh size similar to that of codends. In 1958 Canadian regulations were amended to prescribe the size and method of attachment for topside chafers.

Methods

All mesh measurements were made at the wharf, usually after vessels had returned from a fishing trip. Nets measured were almost always used, and in the case of manila and cotton they were wet. Some of the synthetic fibres, particularly those of polyethylene, were almost completely dry by the time the vessels had returned to port. Relatively few nets were measured in winter months as nets were usually frozen when vessels arrived in port.

Measurements were made with a standard ICNAF wedge gauge, exerting a presure of between 12 and 15 pounds.

Since 1957, codend meshes were measured along a row on top of the codend, as specified in the regulation; chafing-gear meshes were measured in series across a row of meshes in the netting, again as specified by regulation.

Results

The observations on codend materials, mesh sizes and topside chafers used in Canadian mainland otter trawls are presented graphically in the following figures. More details and regional or vessel size groupings are presented in the Appendix tables.

Codend Materials. Figure 1 shows a marked change between 1954 and 1961 in the materials of which codends are made. In 1954-55 about 95% of the codends were of manila and only a few were of cotton and synthetic materials. Since then a progressively greater proportion of synthetic codends have been used, and in 1961 about 85% of the codends were of synthetic twine.

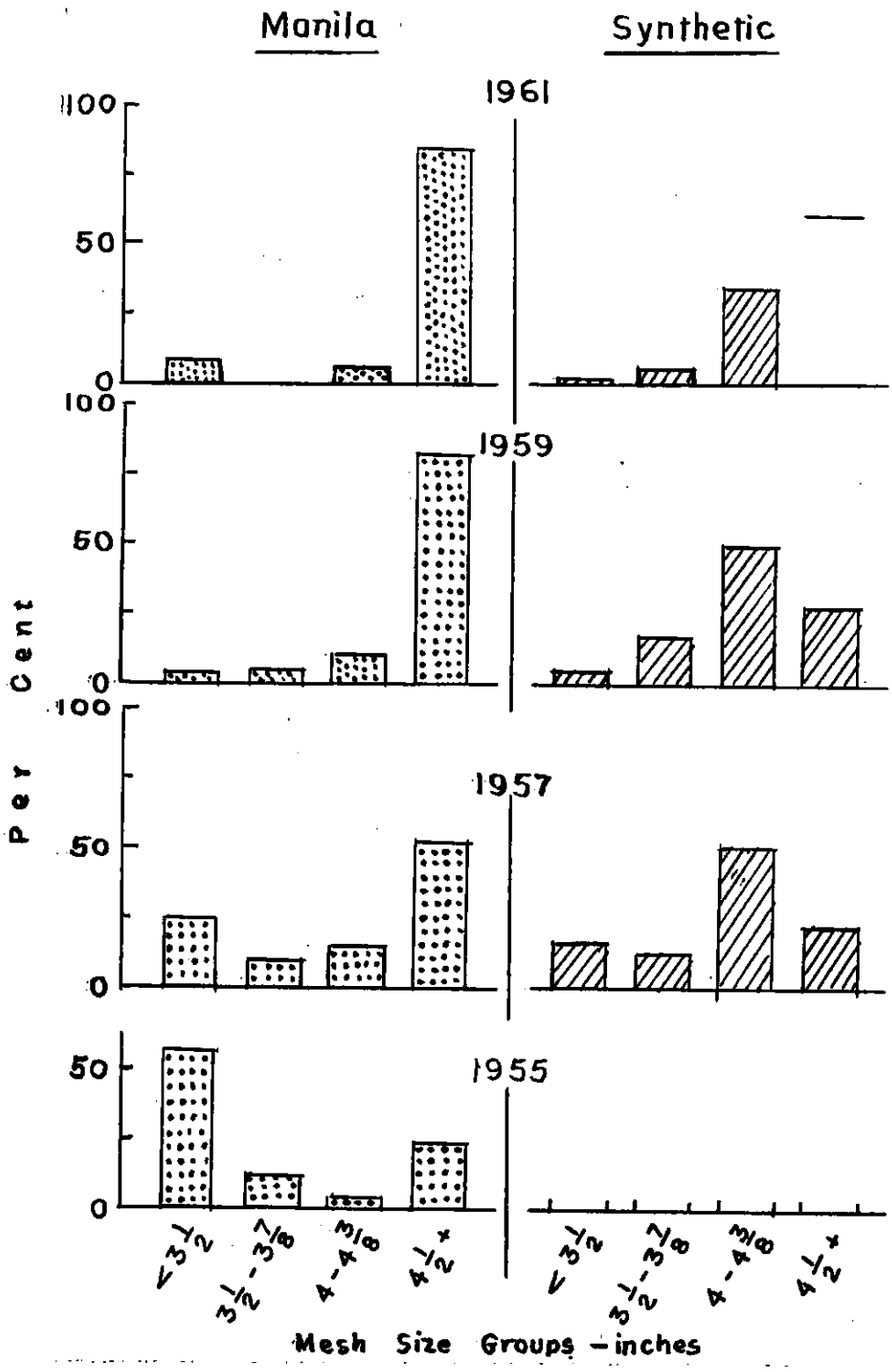

Fig. 2. Comparisons of mesh sizes in codends used by Canadian otter trawlers, 1955-1961.

As shown in Appendix Table I, there has been some variation by area and size of vessel in the use of synthetics. The earliest and most complete change to codends of synthetic material was for otter trawlers in Division 4X. The change in Division 4T, while a little later, has been almost as complete. The change to synthetics for larger vessels fishing mainly Divisions 4W, 4V and Subarea 3 has been less pronounced, reaching about 50% in 1961.

Although not shown in the table, the kinds of synthetics used have varied both in time and place. Codends of polyamide material (nylon or anzalon) have been most common. Codends of polyester (terylene) and polyethylene (drumlene and courlene) fibres have been used more recently, but also less frequently. These latter materials have been more often used in the body of the trawl.

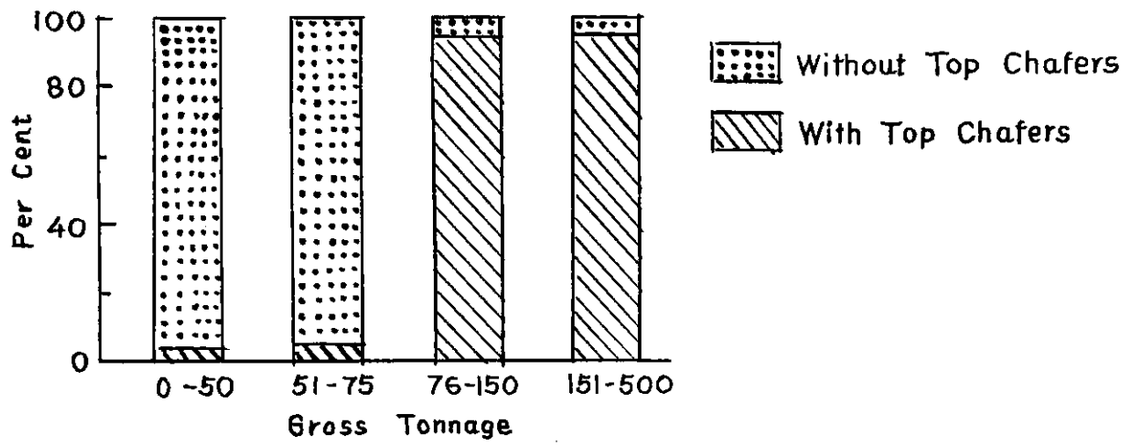

Fig. 3. Proportion of different sizes of otter trawlers using top chafers on codends (1960-61 average).

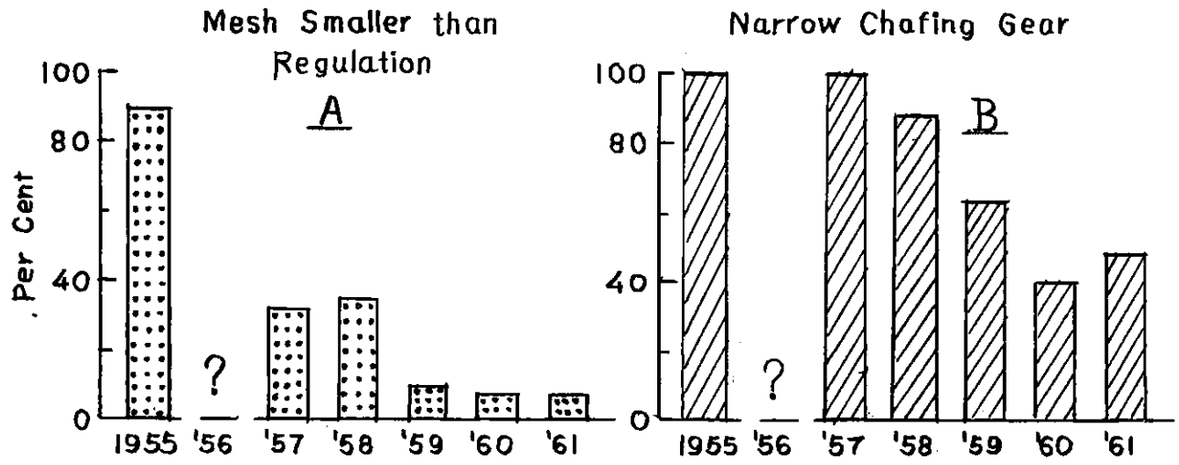

Fig. 4. Percentage of otter trawlers using chafing gear with
A. mesh size less than 4½ inches;
B. width less than 1½ times.

Mesh sizes. Changes in mesh size, for both manila and synthetic codends, are presented graphically in Figure 2, and in more detail by region in Appendix Table II. In 1955 mesh sizes of the manila codends used were generally below 4 inches, with most below 3½ inches. The year 1957 was a period of transition, and the mesh sizes of manila codends (the most common material) ranged from below 3½ inches to over 5 inches, but over 50% were 4½ inches or more. Mesh sizes between 4 and 4 3/8 inches were most common for the relatively small number of synthetic codends used.

By 1959 the transition to large meshes had been completed, and about 85% of the manila codends in use had mesh sizes 4½ inches or over. Synthetic codends, which had grown in importance, most often had mesh sizes between 4 and 4 3/8 inches. Since most of these were of single-strand construction, they were above the equivalent of the 4½-inch mesh manila mesh size required by regulation.

In 1961 the mesh sizes of manila codends were little changed from those of 1959. For synthetics a much higher proportion of the codends had mesh sizes of 4½ inches or over. Although not shown in this tabulation, the increase in mesh size reflects an increased use of double-strand construction for synthetic codends.

Detailed examination of Appendix Table II shows some variation in mesh size by region. Thus, trawlers operating in Division 4X have tended to use smaller meshes than vessels of similar size in the Gulf of St. Lawrence. Those for the Gulf of St. Lawrence tended to have somewhat larger meshes than required by regulation, and this large mesh size probably reflects the fact that these vessels are fishing mainly for larger cod and flounders. Large vessels fishing 4V-W have also tended to use mesh sizes above those required by regulation.

Use of Topside Chafers. The use of topside chafers continues to be a problem only with larger otter trawlers (Fig. 3 and Appendix Table III). Vessels up to about 75 gross tons seldom use topside chafers. Most of those over about 75 tons use topside chafers.

Although not shown in the figure, there has been little change in this fishing practice since information about topside chafers was first systematically recorded in 1957 (Appendix Table III). Irregular observations in earlier years also suggest that only larger vessels used topside chafers.

A knowledge of the distribution of otter trawlers by size allows certain areas to be designated as virtually free from the use of topside chafers by the Canadian mainland fleet. Thus, practically all Canadian otter trawlers fishing for cod or haddock in Divisions 4S, 4T and 4X do not use topside chafers. However, most of the Canadian mainland vessels fishing Division 4W and Subarea 3 do use topside chafers.

Characteristics of Topside Chafers. For Canadian mainland otter trawlers the topside chafer has always been a single sheet of netting, usually a portion of a discarded codend. Prior to regulation this was usually one section of the codend about 6 meshes wider than the top of the codend (the width of the selvage or laceage) attached at various distances forward of the splitting strap, and extending to the cod line mesh. The mesh size in the chafer was almost always the same as that in the codend, and manila was used almost exclusively for chafers.

Regulation of codend mesh size was followed by a rapid change to large mesh in topside chafers, without many enforcement problems, as shown in Figure 4A. Currently, almost all chafers are of regulation mesh size, or larger. Recently, as synthetic codends have increased in number, most chafers are also of synthetics, i.e., used codends.

Regulation of width of topside chafers has been less effective in bringing about a complete change from narrow to wide chafing gear (Fig. 4B). Prior to regulation all topside chafers were narrower than subsequently specified in the regulation. Since the width of topside chafers was regulated in 1958 the proportion of vessels using narrow topside chafers has decreased to about 40-50% in 1960 and 1961.

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Appendix I

OTTER TRAWL MESH MEASUREMENTS

Name of Trawler_____Main Landing Port_____Date_____

Gross Tonnage_____Type and size of Net_____

For last fishing trip give Subarea_____ and Landings in thousands of pounds: Cod_____Haddock_____Total_____

Remarks: _____

_____

	Material	Aver. Mesh Size	Braiding Single or Double	Length in No. of Meshes
Codend				
Lengthening Piece				
Chafing Gear				
Belly				
Wings				

Measurements (ICNAF Guage) of 50 consecutive meshes starting at the codline mesh (aft) : ⟶

Number of trips codend used ☐

Measured:
Dry ☐
Wet ☐

If chafing gear is used on top of the codend state:

Number codend meshes from codline mesh to splitting strap_____

Number codend meshes from splitting strap to forward attachment of chafing gear _____

Number meshes between lacings (width): In codend _____

In chafing gear _____

Is chafing gear attached to codend along aft edge? _____

Measured and reported by _____

Revised
4/9/59

Appendix Table I. Number of Canadian mainland otter-trawl codends examined by year and area and proportion using synthetic materials

Year	4T 0-150 gross tons Northern N.B.-P.E.I.		4V-4W 0-150 gr.tons		4V-4W 151-500 gr.tons		4X 0-150 gr.tons Nova Scotia		4X 0-150 gr. tons New Brunswick		Total	
	No. codends	% synth.	No. codends	% synth.	No. codends	% synth.	No. codends	% synth.	No. codends	% synth.	No. codends	% synthetic.
1953					2	0					2	0
1954	22	0			1	0					23	0
1955	2	50			34	0					36	3
1956					10[x]	50					10	50
1957	94	6	18	17	63	17	38	34	21	76	234	21
1958	118	9	13	31	44	34	16	44	32	91	223	30
1959	80	34	17	18	72	42	45	87	31	81	245	51
1960	91	82	20	55	52	42	57	93	15	100	235	75
1961	83	98	22	59	52	48	47	96	25	100	229	83

[x] Special sample of synthetic nets.

Appendix Table II. Mesh sizes in synthetic and manila codends of Canadian mainland otter trawls by year and region.

Year	Mesh size-group	Synthetic 4X N.B.	4X N.S.	4V-W Small trawler	4V-W large trawler	4T	Other (Manila) 4X N.B.	4X N.S.	4V-W Small trawler	4V-W Large trawler	4T	% synth.	Total % manila
	(inches)	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		
1961	<3 1/2	--	1	--	--	—	--	--	3	1	--	0.5	10.8
	3 1/2-3 7/8	5	3	1	--	--	--	--	--	--	--	4.8	--
	4-4 3/8	10	25	7	7	16	--	--	1	1	--	34.4	5.4
	4 1/2-4 7/8	10	16	5	18	62	--	2	5	19	2	58.7	75.7
	5+	--	--	--	--	3	--	--	--	3	--	1.6	8.1
1960	<3 1/2	--	--	--	--	--	--	--	--	--	--	--	--
	3 1/2-3 7/8	2	7	--	--	--	--	--	--	--	--	5.1	--
	4-4 3/8	9	37	2	7	19	--	2	--	2	1	42.0	11.3
	4 1/2-4 7/8	4	11	7	15	56	--	2	8	12	15	52.8	84.1
	5+	--	--	--	--	--	--	--	--	2	--	--	4.5
1959	<3 1/2	4	1	--	--	--	2	1	--	--	--	4.0	2.8
	3 1/2-3 7/8	12	6	--	3	--	1	2	--	1	--	16.9	3.8
	4-4 3/8	9	30	--	11	12	2	1	--	7	--	50.0	9.4
	4 1/2-4 7/8	--	2	2	15	14	1	2	4	24	51	26.6	77.4
	5+	--	--	--	2	1	--	--	--	5	2	2.4	6.6
1958	<3 1/2	9	2	--	1	--	3	6	--	3	4	18.8	10.1
	3 1/2-3 7/8	10	1	1	4	--	--	--	--	5	5	25.0	6.3
	4-4 3/8	8	3	1	3	9	--	2	--	7	17	37.5	16.5
	4 1/2-4 7/8	2	1	1	6	1	--	1	4	16	73	17.2	59.5
	5+	--	--	--	--	1	--	--	--	4	8	1.5	7.6
1957	<3 1/2	7	1	--	--	--	--	13	2	4	26	16.0	24.3
	3 1/2-3 7/8	4	---	2	--	--	1	--	1	4	12	12.0	9.7
	4-4 3/8	2	12	1	4	6	--	3	2	6	16	50.0	14.6
	4 1/2-4 7/8	3	--	1	7	--	4	9	4	26	33	22.0	41.1
	5+	--	--	--	--	--	--	--	--	18	1	--	10.3

(Continued next page)

Appendix Table II (continued).

Year	Mesh size-group (inches)	Synthetic 4X N.B. No.	4X N.S. No.	4V-W Small trawler No.	4V-W Large trawler No.	4T No.	Other (Manila) 4X N.B. No.	4X N.S. No.	4V-W Small trawler No.	4V-W Large trawler No.	4T No.	Total % Synthetic	% Manila
1956	<3 1/2	--	--	--	--	--	--	--	--	--	--	--	--
	3 1/2-3 7/8	--	--	--	--	--	--	--	--	2	--	--	40.0
	4-4 3/8	--	--	--	3	--	--	--	--	3	--	60.0	60.0
	4 1/2-4 7/8	--	--	--	2	--	--	--	--	--	--	40.0	--
	5+	--	--	--	--	--	--	--	--	--	--	--	--
1955	<3 1/2	--	--	--	--	1	--	--	--	19	1	100.0	57.1
	3 1/2-3 7/8	--	--	--	--	--	--	--	--	4	--	--	11.4
	4-4 3/8	--	--	--	--	--	--	--	--	2	--	--	5.7
	4 1/2-4 7/8	--	--	--	--	--	--	--	--	9	--	--	25.7
	5+	--	--	--	--	--	--	--	--	--	--	--	--
1954	<3 1/2	--	--	--	--	--	--	--	--	1	17	--	78.2
	3 1/2-3 7/8	--	--	--	--	--	--	--	--	--	5	--	21.7
	4-4 3/8	--	--	--	--	--	--	--	--	--	--	--	--
	4 1/2-4 7/8	--	--	--	--	--	--	--	--	--	--	--	--
	5+	--	--	--	--	--	--	--	--	--	--	--	--
1953	<3 1/2	--	--	--	--	--	--	--	--	1	--	--	50.0
	3 1/2-3 7/8	--	--	--	--	--	--	--	--	1	--	--	50.0

Appendix Table III. Proportion of Canadian mainland otter-trawl codends protected with topside chafers by year and vessel size.

Gross tonnage	1953 No.	%	1954 No.	%	1955 No.	%	1956 No.	%	1957 No.	%	1958 No.	%	1959 No.	%	1960 No.	%	1961 No.	%
0-50									4	3	3	2	3	2	2	2	3	3
51-75									4	18	2	6	0	0	1	3	3	7
76-150									4	100	2	33	5	71	10	100	9	90
151-500					34	100			59	92	33	75	69	100	50	93	46	94