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Progress in Development of a Coordinated Groundfish Survey
Program in the ICNAF Area

by

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I. INTRODUCTION

One of the recommendations of the ICNAF Working Group on Coordinated Groundfish Surveys (see Res.Doc. 71/32 for report of the first meeting held in Copenhagen in January 1971) was to promote the use of research vessel data for providing information on current status of stocks to the Assessments Subcommittee, particularly for its mid-term meetings. Sample data formats were prepared and distributed to member countries with a request for current research vessel survey data on abundance of cod and haddock, to be reviewed and evaluated at the 1971 Annual Meeting. The Working Group met again on 20 May 1971 and, among other things, considered survey abundance data which had been submitted for Subareas 3-5. Samples of these data and the formats are presented here with a brief evaluation.

A proposed stratification scheme for groundfish surveys on the Grand Bank was described by Mr. Pinhorn and it is outlined briefly in this document. Stratification plans are also being formulated for the Grand Bank by Dr. Konstantinov, and for the Laurentian Channel area by Dr. Morice. However, details of the Soviet and French surveys in these areas were not available at the time the Working Group reconvened on 20 May.

II. COD AND HADDOCK ABUNDANCE INDICES FOR DIV. 5Z AND DIV. 4X

USA survey and commercial abundance indices for haddock and cod on Georges Bank (DIV. 5Z) were summarized by 2- and 3-cm length groups respectively, for the period 1965-1970, and are shown in the attached tables and figures. Note that in the tables the numbers under the column headed "Length Group" represent the lower boundaries of the 2- and 3-cm intervals. The research indices are based on autumn surveys (October-November), and the commercial indices represent average

annual figures. Note also that for the research indices the mean catch per haul figures in terms of total numbers are usually greater than the sums over all intervals. This is because catches were small and values were carried only to one decimal place.

In the case of Georges Bank haddock, the reliability of the surveys for recruitment predictions several years in advance has already been documented (see Res.Doc. 69/89); and the consistently poor recruitment over the last six years is reflected in the figures shown here by the virtual absence of small haddock and by the steady decrease in abundance and increase in average size in both sets of data. The surveys also show promise of sufficient accuracy for monitoring annual fluctuations in total stock size. For example, the large drop from 1965 to 1966 in the fall survey catches reflected the impact of the extremely heavy fishing in the latter half of 1965 and in 1966, and in retrospect this decline proved to be a valid indication of the level of reduction in the stock as later confirmed by the drastic reduction in the commercial abundance for 1967 (see figures). Had we known then what we know now, the results of the 1966 fall survey would have indicated this major decline to the assessment group at their mid-term meeting in 1967, nearly six months before the 1966 provisional landings statistics became available (indicative level of 1966 harvest) and nearly a full year before the decline was fully confirmed by the USA commercial abundance data. This serves to illustrate what seems to be obvious - namely, that with the size and mobility of modern fleets, we need more accurate monitoring of the status of stocks on a current basis, and research vessel surveys are the only practical means for acquiring such data in time for possible effective regulatory action.

Ideally, it would be best to have current stock levels in terms of both size and age composition, but satisfactory preliminary assessments could be achieved with abundance and length data alone, particularly if pre-recruit and recruited sizes are separated. In this connection, it should be noted that haddock abundance on Georges Bank is now so low that survey catches have dropped to the point where it is no longer possible to get an accurate measure of size composition of the total stock with the standard sampling intensity. While this does not invalidate the relative abundance index in terms of total numbers or weight, it does illustrate

a practical problem of considerable importance which is relevant to the question of a standard trawl.

Survey and commercial indices are presented also for Div. 5Z cod, but they are not as well correlated as for haddock. The commercial indices are probably less reliable than for haddock, and the same is true in the case of the research indices, partly because of the small size of the catches.

Div. 4X abundance indices for cod and haddock based on USA surveys are also shown here. They show a significant decline in abundance of both species during the period 1965-1970 corresponding to similar declines in Canadian commercial data (see Res.Doc. 71/37). Again, in the case of haddock, survey catches have dropped so low as to make it difficult to estimate the size composition of the stock with standard sampling intensity. Also, it may be noted that similar to Georges Bank, recruitment has been consistently poor.

In spite of the problems noted above, these data give every indication that groundfish surveys can provide current measures of stock abundance of sufficient precision to be invaluable aids for assessment. The next step is to convert these relative measures to absolute scale, that is, in terms of actual numbers of fish divided into recruited and pre-recruit components. We are quite confident that this can be done in the near future and we urge all ICNAF scientists to evaluate their survey data along these lines. Analysis of survey results in the form shown here with appropriate interpretation would be of considerable help to the Assessment Committee.

III. COD AND HADDOCK ABUNDANCE INDICES FOR DIV. 3L, DIV. 3N, DIV. 3O, AND DIV. 3Ps.

Recent Canada (Nfld.) survey abundance indices for haddock and cod for Grand Bank and St. Pierre Bank were summarized by 2- and 3-cm length groups respectively, and some of them are shown in the attached tables and figures. In calculating these indices, only sets in depths which were considered in the range of the species at the particular time of year are used, i.e., in cases where no or very few fish were caught in any sets in the shallow and deep ends of the depth range fished, then sets were considered outside of the depth range of the species at that time of year and were not included in the total numbers of sets.

In the case of St. Pierre Bank cod, the reliability of the surveys for

recruitment prediction has been documented (Res.Doc. 71/38). One important point to note from the Div.3Ps cod series is that cod are first caught by the 41.5 Yankee trawl with 1-1/8-inch nylon line used on Canada (Nfld.) survey cruises as 2-year-olds; insignificant numbers of 1-year-old cod are caught even when it is obvious as from the May 1968 survey cruise to Div. 3Ps that large numbers of 1-year-old cod must have been present in the area in 1967. This is of considerable importance in relation to the question of the standard trawl since all evidence indicates that the headrope height of the survey trawl is an important factor in catching cod less than 2 years of age which are probably pelagic and above the range of the vertical opening of the 41.5 trawl. This fact is also evident from the survey in Div. 3L in 1965 when no 1-year-old cod of the very abundant 1964 year-class were caught.

As indicated above, the usefulness of pre-recruit catches of cod in Div. 3Ps has already been documented. In Div. 3L and Div. 3N the distinct peaks represented by the 1964 year-class in 1967 and 1968, and the evidence of the rapidly decreased abundance of this year-class in 1969 and 1970 surveys, as later evidenced by the sudden decrease in commercial catches in Div. 3N in 1969 and 1970, point to the usefulness of this type of survey data in predicting trend in catches in advance of the mid-term meeting.

IV. STRATIFICATION PROPOSAL FOR GRAND BANK

A preliminary stratification plan was drawn up for the Grand Bank by Mr. Pinhorn, using knowledge of fish distribution in relation to depth as the principal criteria for establishing stratum boundaries. A total of 5 depth zones were set up ranging from < 30 fathoms to 200 fathoms (see attached figure). It is hoped that a basically similar stratification plan can be worked out for all countries planning to conduct general groundfish surveys on the Grand Bank, since this will greatly facilitate the comparisons among different trawls which, in turn, will provide a further basis for estimating catchability coefficients upon which absolute abundance estimates depend.

Species	ICNAF Subdiv	Country	Inst or Lab	COMMERCIAL FISHERY							Length Meas.			
				Period	Geog Area	Depth Range	Gear	Mesh Size	Vessel Class	Unit of Effort	TL	FL	±	0
Haddock	5Ze	USA		Annual 65-70	Georges Bank	33-256 m	Otter Trawl	114 mm	0-455 tons	L/D Nos.		✓		

Length Group		MEAN NUMBER PER STANDARD UNIT EFFORT					
5 cm	2 cm	1965	1966	1967	1968	1969	1970
	2						
	4						
	6						
	8						
	10						
	12						
	14						
	16						
	18						
	20						
	22						
	24						
	26						
	28						
	30						
	32						
	34						
	36						
	38						
	40						
	42						
	44						
	46						
	48						
	50						
	52						
	54						
	56						
	58						
	60						
	62						
	64						
	66						
	68						
	70						
	72						
	74						
	76						
	78						
	80						
	82						
	84						
	86						
	88						
	90						
	92						
	94						
	96						
	98						
	100						
	No/Unit	5477	5636	3442	2314	1456	985
	Wt/Unit m. ton	6.36	5.97	4.57	3.61	2.87	2.34
	Length cm	47.65	46.16	49.64	52.16	56.77	60.97
	Weight kg	1.16	1.06	1.33	1.56	1.97	2.38
	No. Samples	131	137	110	83	88	61
	No. Fish Measured	12815	13052	11752	11215	8381	5774
	No. Standard Units						
	Effort in Abundance						
	Index D.F.	4611	5452	4929	4419	3536	2923

Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Average Area Swept
Haddock	5Z	U.S.A.	Woods Hole	Oct.-Nov.	Georges Bank (strata 13-25)	15-200 fm.	Yankee #36	60/80 feet	1/2 in. stretch liner	3.5 knots	30 min.	.01 miles

Length Measurements

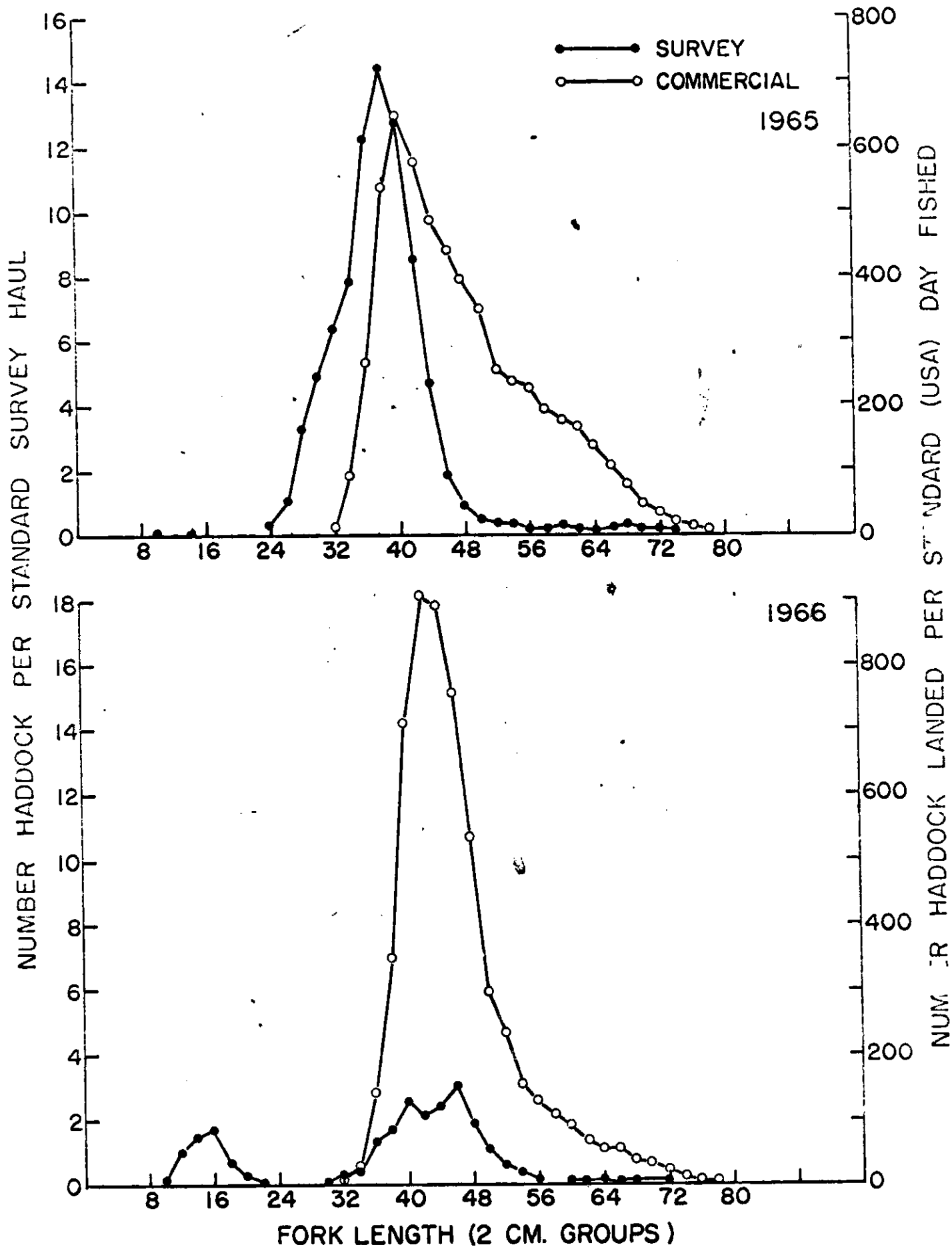
TL	FL	cm above	cm below	nearest cm
	x			

Length Group (cm)	MEAN NUMBER PER STANDARD HAUL					
	1965	1966	1967	1968	1969	1970
2						
3						
4						
5						
6						
7						
8						
9						
10	0.1	0.1	-	-	-	-
11	-	1.0	-	-	-	-
12	0.1	1.5	-	-	0.1	-
13	-	1.7	-	-	0.1	-
14	-	0.7	-	-	-	-
15	-	0.2	-	-	-	-
16	-	0.1	-	-	-	-
17	0.3	-	-	-	-	-
18	1.0	-	-	-	-	-
19	3.2	-	-	-	-	-
20	4.9	0.1	0.1	-	-	-
21	6.3	0.3	0.5	-	-	0.2
22	7.8	0.4	1.0	-	-	0.4
23	12.2	1.3	1.4	-	-	0.8
24	14.5	1.7	2.0	-	-	0.8
25	12.7	2.6	1.0	-	-	0.8
26	8.5	2.1	0.5	0.1	-	0.2
27	4.7	2.4	0.3	0.1	-	-
28	1.9	3.1	0.4	0.2	-	-
29	0.9	1.9	0.6	0.2	-	-
30	0.5	1.1	0.7	0.3	0.1	-
31	0.4	0.6	1.3	0.2	-	-
32	0.4	0.4	1.0	0.3	0.2	-
33	0.2	0.2	0.8	0.3	0.2	-
34	0.2	-	0.7	0.5	0.2	0.4
35	0.3	0.1	0.5	0.6	0.2	0.2
36	0.2	0.1	0.4	0.5	0.2	0.4
37	0.1	0.1	0.1	0.4	0.2	0.4
38	0.2	0.1	0.3	0.2	0.1	0.2
39	0.3	0.1	0.2	-	0.2	-
40	0.2	-	0.1	-	-	0.2
41	0.1	0.1	0.2	-	-	0.2
42	0.1	-	-	-	-	0.2
43	-	-	-	-	-	-
44	-	-	0.1	-	-	-
45	-	-	-	-	-	-
46	-	-	-	-	-	-
47	-	-	-	-	-	-
48	-	-	-	-	-	-
49	-	-	-	-	-	-
50	-	-	-	-	-	-
51	-	-	-	-	-	-
52	-	-	-	-	-	-
53	-	-	-	-	-	-
54	-	-	-	-	-	-
55	-	-	-	-	-	-
56	-	-	-	-	-	-
57	-	-	-	-	-	-
58	-	-	-	-	-	-
59	-	-	-	-	-	-
60	-	-	-	-	-	-
61	-	-	-	-	-	-
62	-	-	-	-	-	-
63	-	-	-	-	-	-
64	-	-	-	-	-	-
65	-	-	-	-	-	-
66	-	-	-	-	-	-
67	-	-	-	-	-	-
68	-	-	-	-	-	-
69	-	-	-	-	-	-
70	-	-	-	-	-	-
71	-	-	-	-	-	-
72	-	-	-	-	-	-
73	-	-	-	-	-	-
74	-	-	-	-	-	-
75	-	-	-	-	-	-
76	-	-	-	-	-	-
77	-	-	-	-	-	-
78	-	-	-	-	-	-
79	-	-	-	-	-	-
80	-	-	-	-	-	-
81	-	-	-	-	-	-
82	-	-	-	-	-	-
83	-	-	-	-	-	-
84	-	-	-	-	-	-
85	-	-	-	-	-	-
86	-	-	-	-	-	-
87	-	-	-	-	-	-
88	-	-	-	-	-	-
89	-	-	-	-	-	-
90	-	-	-	-	-	-
91	-	-	-	-	-	-
92	-	-	-	-	-	-
93	-	-	-	-	-	-
94	-	-	-	-	-	-
95	-	-	-	-	-	-
96	-	-	-	-	-	-
97	-	-	-	-	-	-
98	-	-	-	-	-	-
99	-	-	-	-	-	-
100	-	-	-	-	-	-
Mean No./Haul	82.3	24.1	14.2	4.8	2.4	6.2
Mean Kg./Haul						
Mean Length						
Mean Weight						
Total No. Hauls	66	67	67	69	73	70
Total Area Swept	≈ 0.7 mi ²					
Total Area Survey	15,300 mi ²					
Total No. Fish Caught	4,605	1,409	865	343	137	443
Total Kg. Fish Caught	3,230	1,369	1,373	713	291	820
Total Fish Measured	3,873	1,409	865	343	137	443

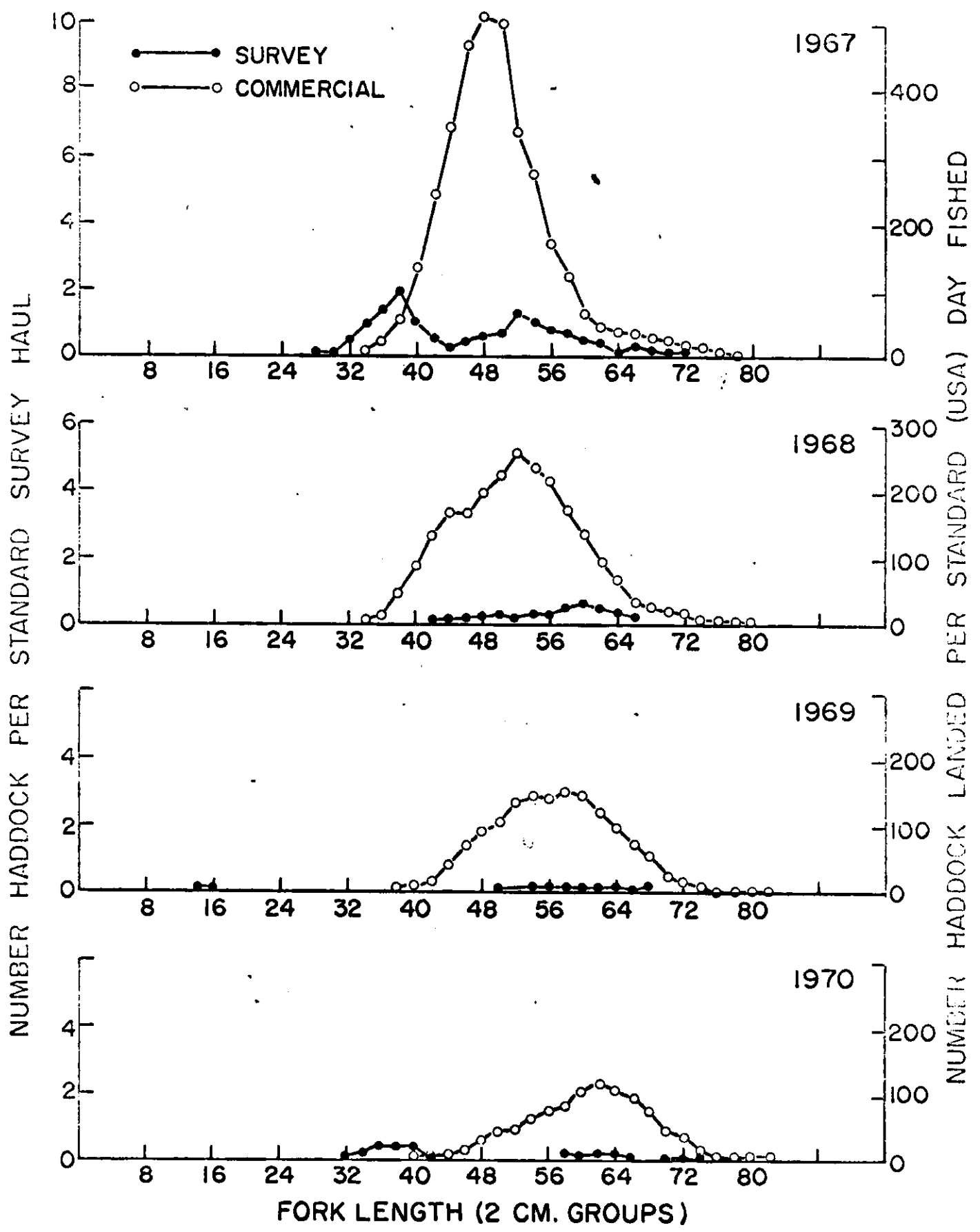
Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Avg Area Swept
Haddock	4X	U.S.A.	Woods Hole	Oct.-Nov.	Western N.S. (Strata 31, 34, 41, 42)	30-200 fm.	Yankee #36	60/80 ft.	1/2 in. stretch liner	3.5 knots	30 min.	.01 miles ²
Length Measurements			TL	FL	above	below	nearest					
				x			x					

Length Group		MEAN NUMBER PER STANDARD HAUL					
cm	(2 cm)	1965	1966	1967	1968	1969	1970
2	2						
4	4						
6	6						
8	8	0.2	0.3	-	0.2	-	-
10	10	0.2	0.2	-	0.1	0.3	-
12	12	-	0.2	-	0.5	3.1	-
14	14	-	-	-	0.9	5.1	-
16	16	0.1	0.1	-	0.5	1.0	-
18	18	0.4	0.4	0.3	-	-	-
20	20	2.0	0.6	1.2	0.1	0.1	0.2
22	22	5.1	0.1	1.4	0.2	0.1	1.0
24	24	6.7	0.1	0.4	0.4	0.9	1.6
26	26	6.1	0.4	0.5	0.4	2.0	1.4
28	28	5.6	1.3	0.8	0.3	0.9	0.4
30	30	5.6	3.6	0.4	0.5	0.1	-
32	32	3.2	4.2	0.8	1.1	0.4	0.2
34	34	2.6	4.1	2.4	1.0	0.1	0.2
36	36	1.4	3.7	4.0	0.6	0.1	0.6
38	38	1.3	4.4	5.0	0.5	-	0.6
40	40	1.2	2.9	4.5	0.7	0.7	0.4
42	42	1.3	2.3	4.4	1.2	0.7	0.4
44	44	1.2	1.5	2.8	1.7	0.6	0.4
46	46	1.2	1.7	2.4	1.8	-	0.6
48	48	1.1	1.3	1.3	1.8	0.3	0.6
50	50	1.5	1.4	1.0	1.3	0.7	0.6
52	52	1.7	1.8	0.7	1.5	0.4	1.0
54	54	1.2	1.1	0.6	1.1	0.6	1.0
56	56	1.4	0.8	0.4	0.7	0.1	0.6
58	58	0.8	0.8	0.4	0.8	0.1	0.4
60	60	0.4	0.9	0.3	0.2	0.1	0.6
62	62	0.2	0.5	0.2	0.2	-	0.6
64	64	0.3	0.1	0.1	0.1	-	0.2
66	66	-	0.2	-	0.1	-	-
68	68	-	-	-	0.1	0.1	-
70	70	-	-	-	-	-	-
72	72						
74	74						
76	76						
78	78						
80	80						
82	82						
84	84						
86	86						
88	88						
90	90						
92	92						
94	94						
96	96						
98	98						
100	100						
Mean No./Haul		54.1	41.0	36.7	20.5	22.8	13.6
Mean Kg/Haul							
Mean Length							
Mean Weight							
Total No. Hauls		25	26	27	30	30	43
Total Area Swept		.25 mi ²	.26 mi ²	.27 mi ²	.3 mi ²	.3 mi ²	.4 mi ²
Total Area Survey		9865 mi ²					
Total No. Caught		1454	1771	1126	959	904	621
Total Kg. Caught		824	1344	841	881	540	650
Total Fish Measured		1454	1332	1126	959	904	621

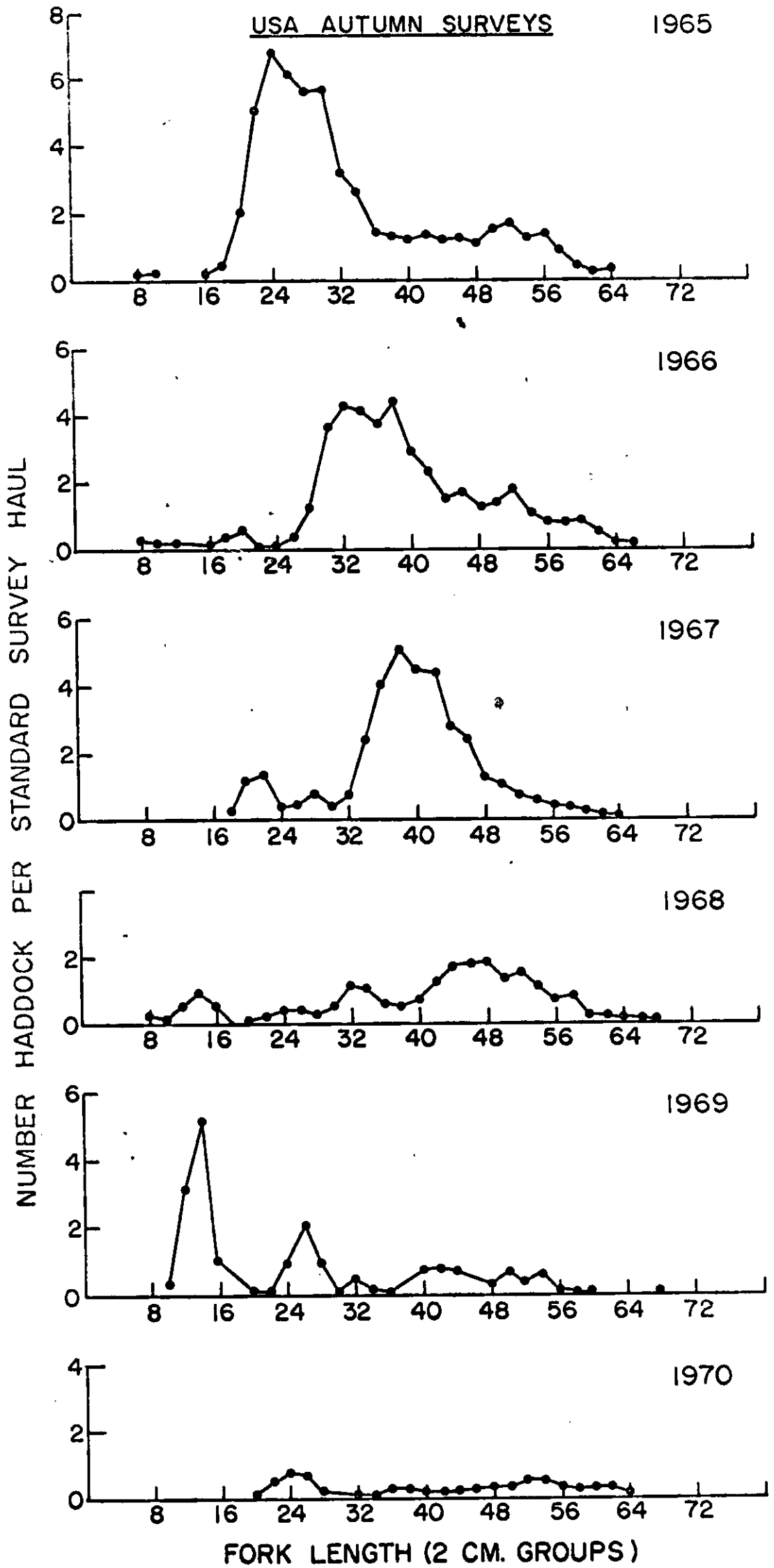
GEORGES BANK HADDOCK



GEORGES BANK HADDOCK



DIVISION 4X HADDOCK



Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Dura- tion	Av Area Swept
Cod	5Z	U.S.A.	Woods Hole	Oct.-Nov.	Georges Bank (strata 13-25)	15-200 fm	Yankee #36	60/80 ft.	1/2 in. stretch liner	3.5 knots	30 min.	.01 mi ²
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				x			x					

Length Group	MEAN NUMBER PER STANDARD HAUL							
	1 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2							
4	3							
5	4							
6	5							
7	6							
8	7							
9	8							
10	9							
11	10		-	0.3	-	-	-	0.2
12	11		-	0.4	-	-	-	-
13	12		-	0.4	-	-	-	-
14	13		0.1	0.1	-	-	-	-
15	14		0.1	0.1	0.1	-	-	-
16	15		-	0.1	0.2	-	-	-
17	16		-	0.1	0.2	-	-	-
18	17		0.1	0.2	1.3	-	-	-
19	18		0.2	0.2	1.3	-	-	0.2
20	19		0.2	0.2	1.3	-	0.1	0.2
21	20		0.2	0.2	1.3	-	0.1	0.2
22	21		0.1	0.2	0.8	0.1	0.1	0.2
23	22		0.2	0.2	0.4	0.1	0.1	0.2
24	23		0.1	0.1	0.1	0.2	-	-
25	24		0.1	0.1	0.1	0.3	-	0.2
26	25		0.1	0.1	-	0.3	0.1	0.2
27	26		0.2	0.2	0.1	0.4	0.1	0.2
28	27		0.1	0.1	0.1	0.1	0.1	0.2
29	28		0.2	0.1	0.1	0.1	0.1	0.4
30	29		0.2	0.1	0.1	0.1	0.1	0.2
31	30		0.1	-	-	0.1	0.2	0.2
32	31		0.1	-	-	0.1	0.1	0.2
33	32		0.1	0.1	0.1	-	0.1	0.2
34	33		0.1	0.1	0.1	0.3	-	0.2
35	34		0.1	0.1	-	0.3	0.1	0.2
36	35		0.2	0.2	0.1	0.4	0.1	0.2
37	36		0.1	0.1	0.1	0.1	0.1	0.2
38	37		0.1	0.1	0.1	0.1	0.1	0.4
39	38		0.2	0.1	0.1	0.1	0.1	0.2
40	39		0.1	-	-	0.1	0.2	0.2
41	40		0.1	-	-	0.1	0.1	0.2
42	41		0.1	-	-	0.1	0.1	0.2
43	42		0.1	-	-	0.1	0.1	0.2
44	43		0.1	0.1	0.1	-	0.1	0.2
45	44		0.1	-	-	-	0.1	0.2
46	45		0.1	-	-	0.1	-	-
47	46		-	0.1	0.1	-	-	-
48	47		-	-	-	-	-	-
49	48		-	-	-	-	-	-
50	49		-	-	-	-	-	-
51	50		0.1	-	0.1	-	-	-
52	51		-	0.1	-	-	0.1	-
53	52		0.1	-	0.1	-	-	-
54	53		-	-	-	-	-	-
55	54		-	-	-	-	-	-
56	55		-	-	-	-	-	-
57	56		-	-	-	-	-	-
58	57		-	-	-	-	-	-
59	58		0.1	-	-	-	-	-
60	59		-	-	-	-	-	-
61	60		-	-	-	-	-	-
62	61		-	-	-	-	-	-
63	62		-	-	-	-	-	-
64	63		-	-	-	-	-	-
65	64		-	-	-	-	-	-
66	65		-	-	-	-	-	-
67	66		-	-	-	-	-	-
68	67		-	-	-	-	-	-
69	68		-	-	-	-	-	-
70	69		-	-	-	-	-	-
71	70		-	-	-	-	-	-
72	71		-	-	-	-	-	-
73	72		-	-	-	-	-	-
74	73		-	-	-	-	-	-
75	74		-	-	-	-	-	-
76	75		-	-	-	-	-	-
77	76		-	-	-	-	-	-
78	77		-	-	-	-	-	-
79	78		-	-	-	-	-	-
80	79		-	-	-	-	-	-
81	80		-	-	-	-	-	-
82	81		-	-	-	-	-	-
83	82		-	-	-	-	-	-
84	83		-	-	-	-	-	-
85	84		-	-	-	-	-	-
86	85		-	-	-	-	-	-
87	86		-	-	-	-	-	-
88	87		-	-	-	-	-	-
89	88		-	-	-	-	-	-
90	89		-	-	-	-	-	-
91	90		-	-	-	-	-	-
92	91		-	-	-	-	-	-
93	92		-	-	-	-	-	-
94	93		-	-	-	-	-	-
95	94		-	-	-	-	-	-
96	95		-	-	-	-	-	-
97	96		-	-	-	-	-	-
98	97		-	-	-	-	-	-
99	98		-	-	-	-	-	-
100	99		-	-	-	-	-	-
101	100		-	-	-	-	-	-
Mean No/Haul			2.7	3.1	6.7	2.1	1.4	3.2
Mean Kg/Haul								
Mean Length								
Mean Weight								
Total No. Hauls			66	67	67	69	73	70
Total Area Swept			=0.7 mi ²					
Total Area Survey			15,300 mi ²					
Total No. Fish Caught			201	263	431	205	104	256
Total Fish Measured			All					

Species	ICNAF Subdiv	Country	Inst or Lab	COMMERCIAL FISHERY							Length Meas.		
				Period	Geog Area	Depth Range	Gear	Mesh Size	Vessel Class	Unit of Effort	TL	FL	3-0
Cod	5Ze	USA		Annual 65-70	Georges Bank	33-256 m	Otter Trawl	114mm	0-455 T	L/D Nos.		✓	

MEAN NUMBER PER STANDARD UNIT EFFORT

Length Group	1965	1966	1967	1968	1969	1970
2 cm						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22				1	1	-
24	3	6	3	5	4	-
26	14	23	20	31	15	5
28	31	41	42	62	28	15
30	41	50	54	88	54	30
32	40	33	42	63	75	45
34	39	34	50	60	101	49
36	29	22	46	77	115	57
38	28	26	42	67	90	70
40	23	32	37	45	48	95
42	17	22	30	32	31	78
44	16	12	23	30	17	57
46	10	18	12	25	18	46
48	13	17	7	18	9	25
50	13	9	10	12	9	18
52	10	12	6	9	7	16
54	10	12	7	8	7	18
56	9	7	2	1	8	14
58	5	7	2	5	6	9
60	5	6	-	4	2	7
62	3	3	1	4	2	6
64	1	9	-	2	3	5
66	1	2	-	1	1	2
68	-	2	-	-	1	2
70	-	3	-	-	2	2
72	-	1	-	-	1	1
74	-	1	-	-	-	1
76	-	-	-	-	-	1
78	-	-	-	-	-	-
80	-	-	-	-	-	-
82	-	-	-	-	-	1
84						
86						
88						
90						
92						
94						
96						
98						
100						
Nos/day No./Unit	361	415	436	650	655	675
Mean Wt./Unit m.ton	0.92	1.11	1.02	1.41	1.65	2.05
Length cm	60.29	61.54	57.37	57.70	58.66	65.22
Weight kg	2.54	2.67	2.33	2.17	2.52	3.04
No. LF Samples	46	17	13	14	18	22
No. Fish Measured	4888	1663	1587	1500	2045	2561
No. Standard Units						
Effort in Abundance Index D.F.	7273	6036	8511	5076	5874	4296

Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Cod	4X	U.S.A.	Woods Hole	Oct.-Nov.	31-34 41,42	30-200 fm.	Yankee #36	60/80 ft.	1/2 in. Stretch liner	3.5 knots	30 min.	.01 mi ²

Length Measurements	TL	FL	cm above	cm below	nearest cm
			x		

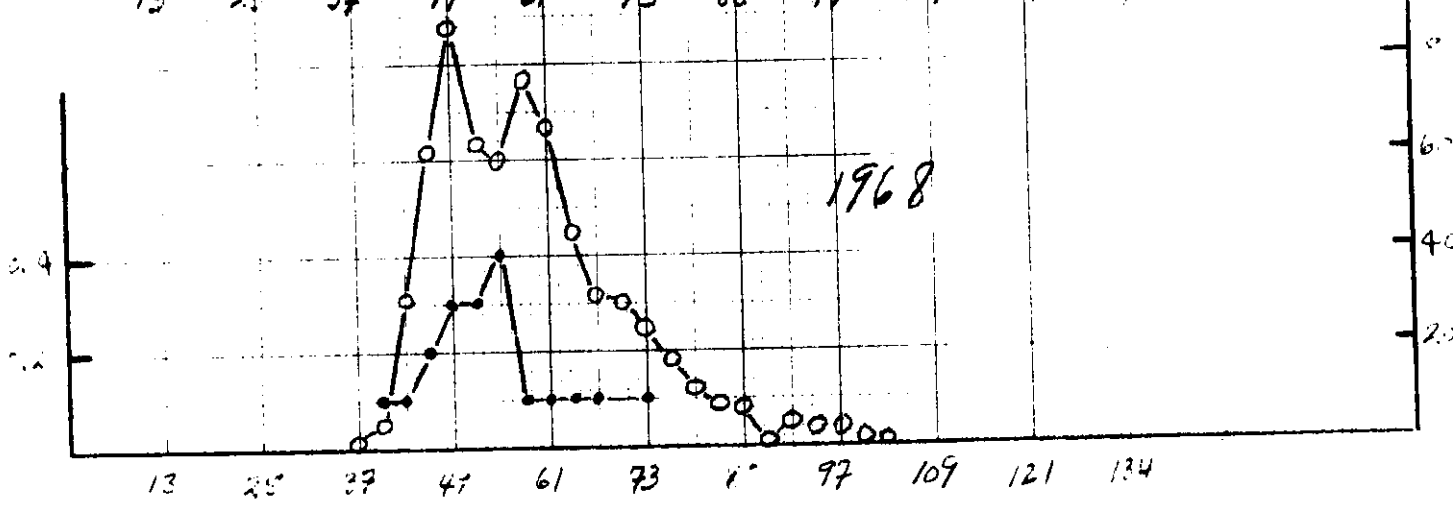
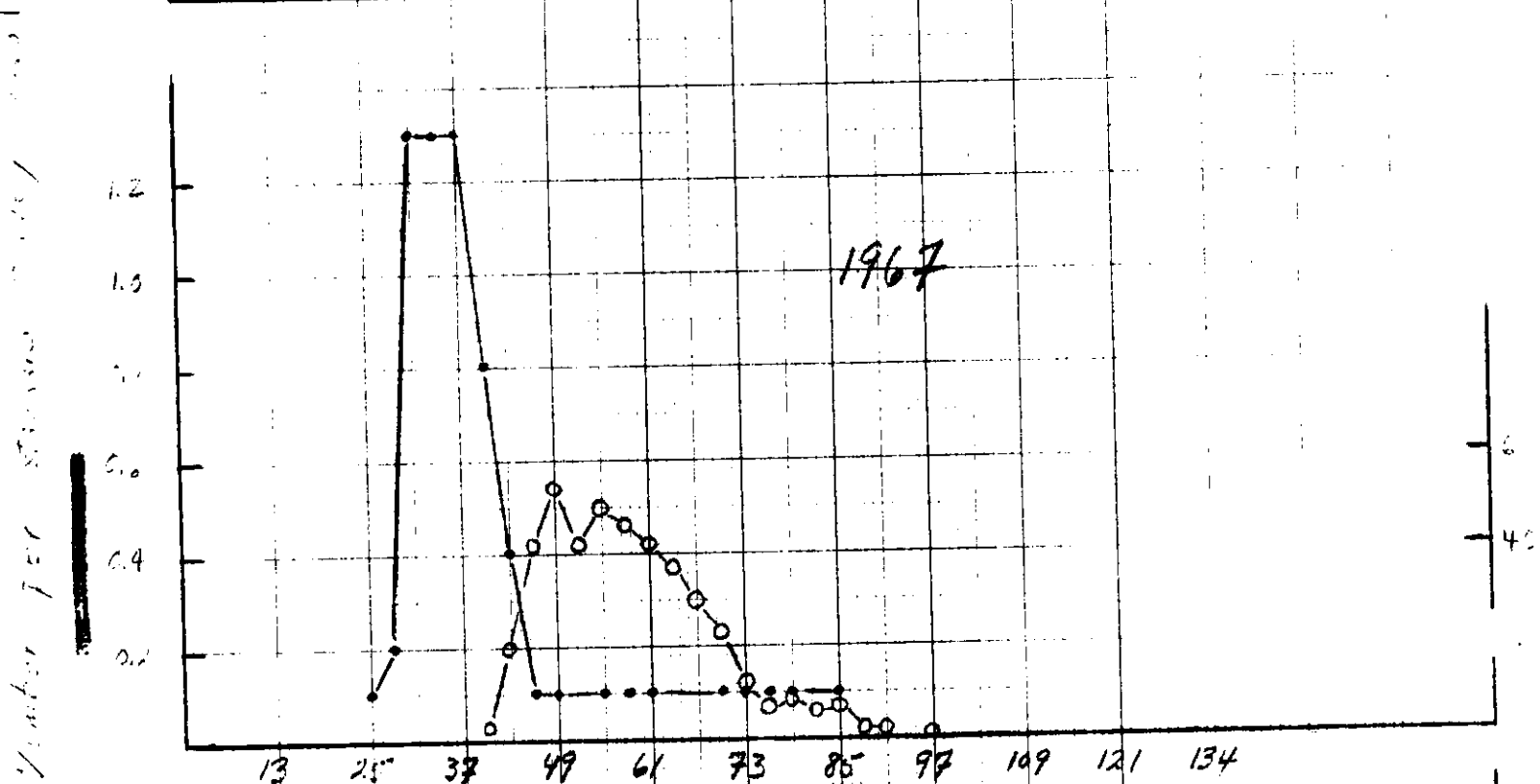
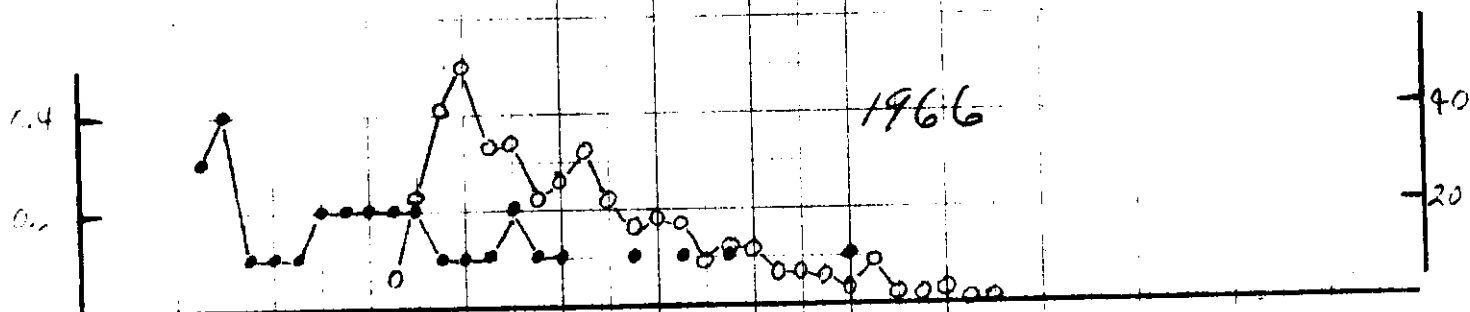
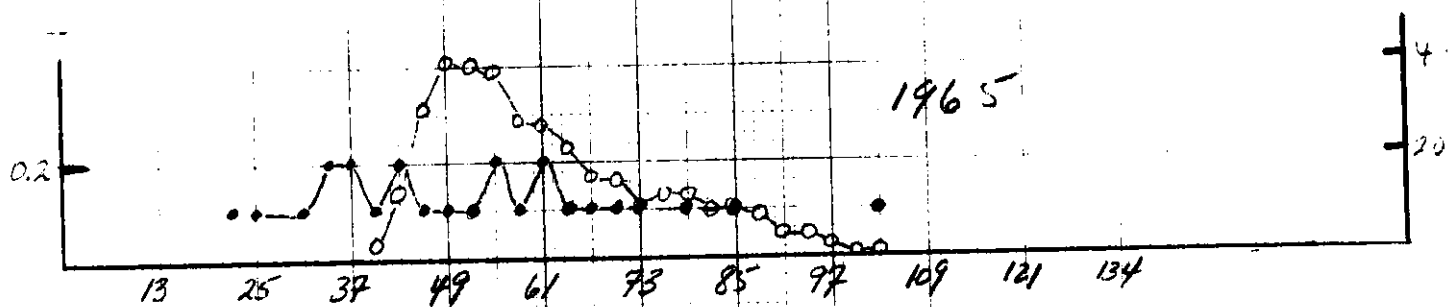
Length Group		MEAN NUMBER PER STANDARD HAUL					
1 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2						
7	4						
9	6						
12	8						
15	10	-	-	0.1	0.1	0.3	-
18	12	0.1	-	-	-	-	-
21	14	0.2	-	0.1	0.1	-	-
24	16	0.1	-	0.1	-	0.1	0.2
27	18	0.5	-	-	-	-	0.2
30	20	0.3	0.1	0.1	-	0.1	-
33	22	0.5	0.2	0.1	0.2	-	-
36	24	0.4	0.4	0.1	0.1	-	-
39	26	0.5	0.5	-	-	-	-
42	28	0.7	0.3	0.2	-	-	-
45	30	0.5	0.2	0.1	0.1	-	-
48	32	0.3	0.2	0.1	-	0.1	-
51	34	0.2	0.3	0.3	0.1	0.1	-
54	36	-	0.2	0.3	0.1	0.2	0.2
57	38	0.3	0.3	0.3	0.1	0.1	-
60	40	0.4	0.3	0.2	0.1	0.2	-
63	42	0.2	0.2	0.5	0.2	0.2	-
66	44	0.4	0.1	0.2	0.1	0.1	0.2
69	46	0.2	0.2	0.3	0.1	0.1	-
72	48	0.5	0.1	0.1	0.1	0.1	-
75	50	0.1	-	0.1	0.1	0.1	0.2
78	52	0.3	0.2	0.1	-	0.2	0.2
81	54	0.1	0.1	-	0.1	-	-
84	56	0.1	-	-	-	0.1	-
87	58	0.2	0.1	0.1	-	0.1	0.2
90	60	0.2	-	0.2	-	-	-
93	62	0.1	0.1	-	0.1	0.1	-
96	64	0.1	0.1	-	-	-	-
99	66	-	0.1	-	-	-	-
102	68	-	-	-	-	-	-
105	70	-	0.1	-	-	-	-
108	72	-	0.1	-	-	-	-
111	74	-	0.1	-	0.1	-	-
114	76	-	-	-	-	-	-
117	78	0.1	-	-	-	-	-
120	80	0.1	-	-	-	-	-
123	82	0.1	-	-	-	-	-
126	84	-	-	-	-	-	-
129	86	-	-	-	-	-	-
132	88	-	-	-	-	-	-
135	90	-	-	-	-	-	-
138	92	-	-	-	-	-	-
141	94	-	-	-	-	-	-
144	96	-	-	-	-	-	-
147	98	-	-	-	-	-	-
150	100	-	-	-	-	-	-

0.2

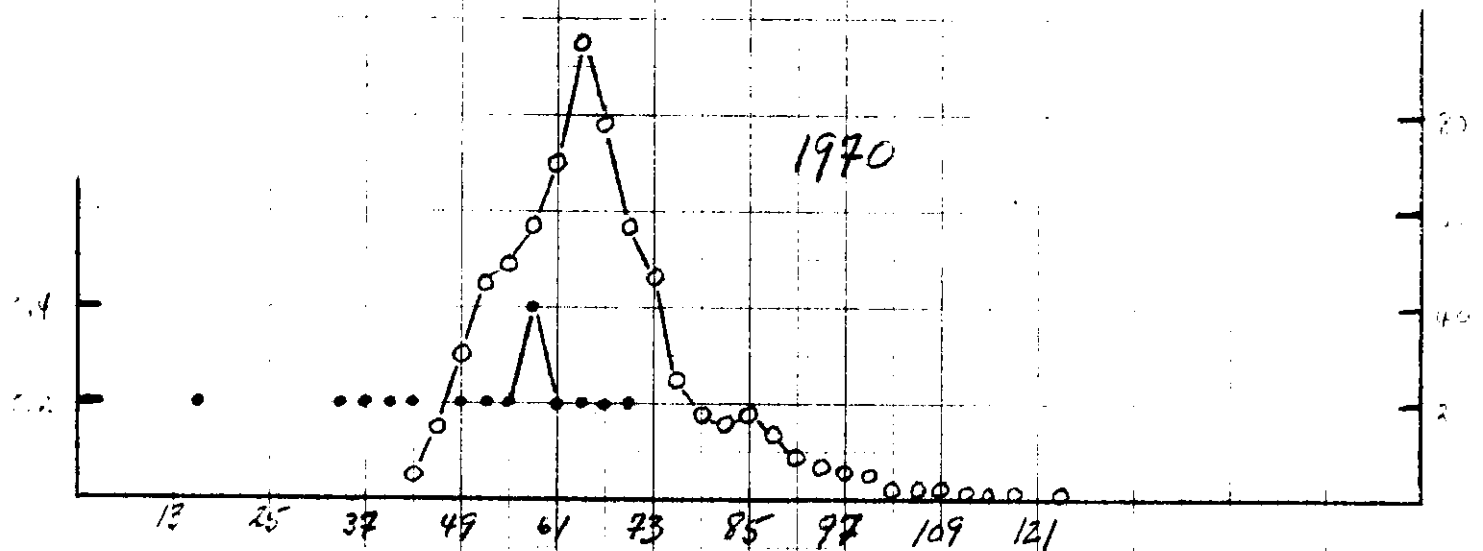
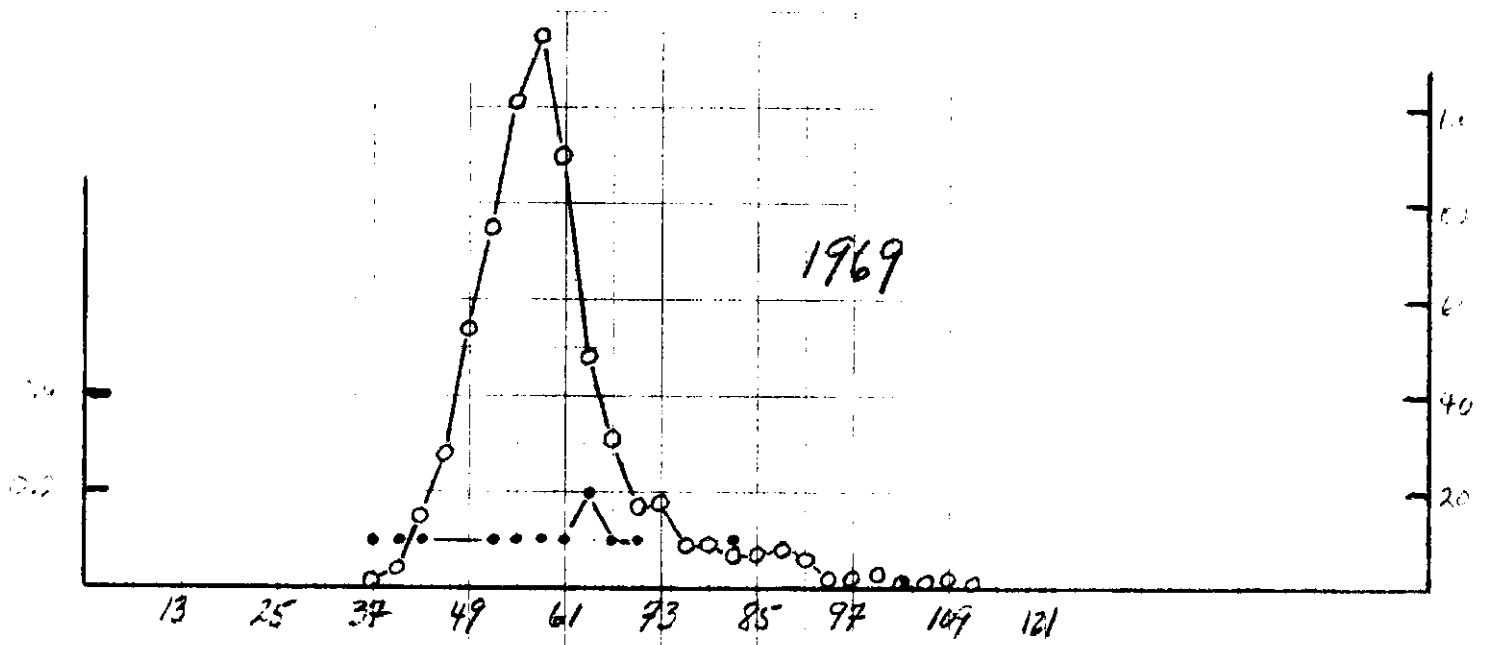
Mean	No/Haul	7.8	4.5	3.8	1.8	2.4	2.2
	Kg/Haul						
	Length						
	Weight						
Total No. Hauls		25	26	27	30	30	43
Total Area Swept							
Total Area Survey		9865 mi ²					
Total Fish Caught	No. Kg.	245	151	102	68	79	94
Fish Measured		All					

●—● USA A.T. Survey
○—○ USA Survey '61

Division 5 Z COD

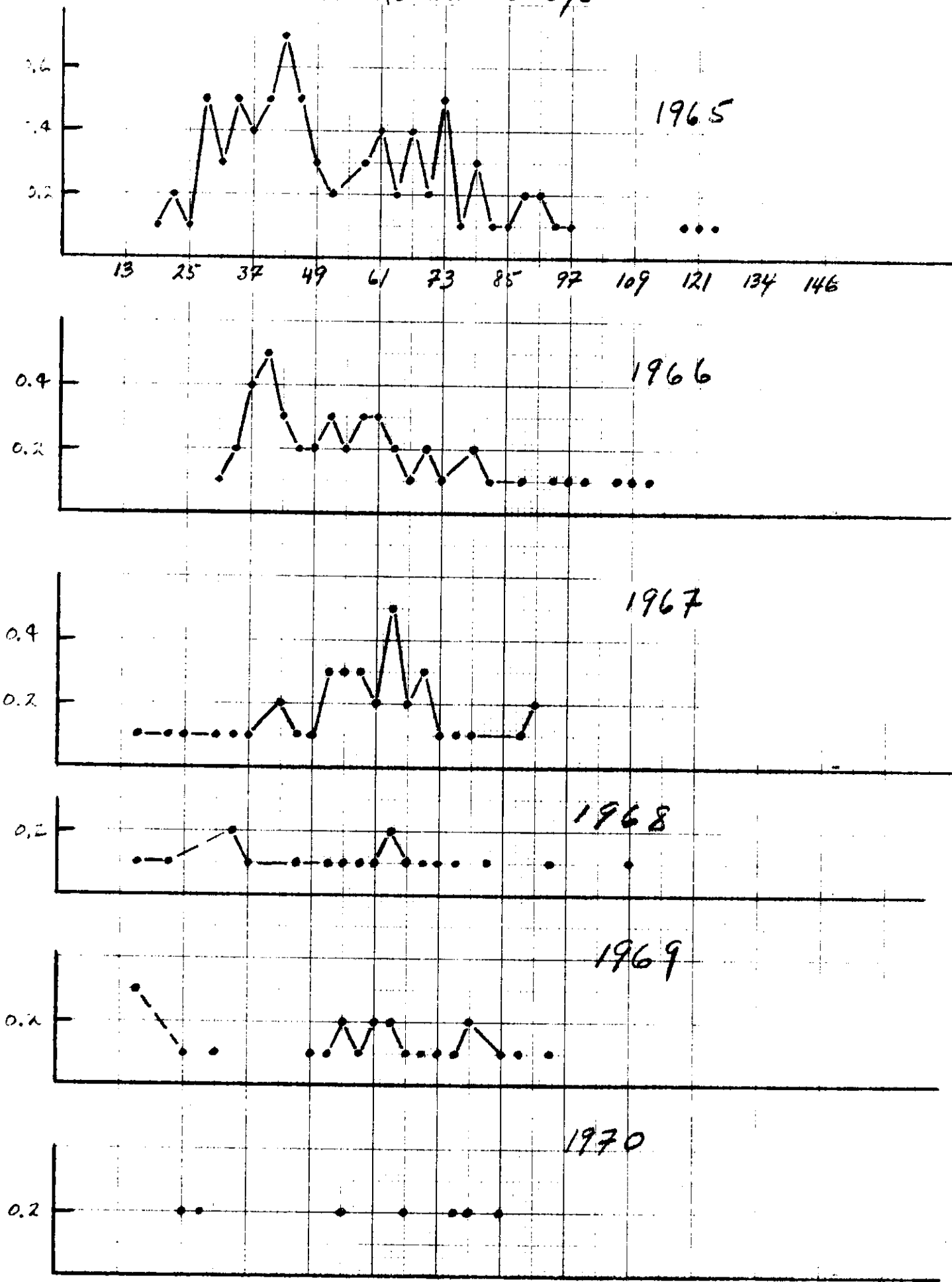


Division 5Z Cod



Division 4X Cod
USA Autumn surveys

Number Cod per trawl haul



Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Haddock	3Ps	Canada (Nfld)	St. John's	May	St. Pierre Bank	30-80 fms	41.5	24.1 m 30.5 m	90 mm with 29 mm Liner	3.5 knots	30'	.0172 sq. mi.

Length Measurements	TL	FL	cm above	cm below	nearest cm
			x		

Length Group		MEAN NUMBER PER STANDARD HAUL					
3 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2						
4	4						
5	6						
6	8						
7	10						
8	12						
9	14				0.18		
10	16				3.45		
11	18				12.55		
12	20				15.82		
13	22				21.27		
14	24				17.91		
15	26				14.55		
16	28				7.64		
17	30				5.91		
18	32				3.00		
19	34				1.09		
20	36				0.18		
21	38				0.18		
22	40				0.18		
23	42				0.18		
24	44				0.18		
25	46				0.09		
26	48				0.18		
27	50				0.09		
28	52				-		
29	54				0.18		
30	56				-		
31	58				0.09		
32	60				-		
33	62				-		
34	64				0.09		
35	66				-		
36	68				0.09		
37	70				-		
38	72				-		
39	74				-		
40	76				0.09		
41	78				-		
42	80				-		
43	82				-		
44	84				-		
45	86				-		
46	88				0.09		
47	90				-		
48	92						
49	94						
50	96						
51	98						
52	100						
Mean:	No/Haul				105.27		
	Kg/Haul				15.35		
	Length				24.21		
	Weight				0.15		
Total No. Hauls					11		
Total Area Swept					0.1892 sq. mi.		
Total Area Survey							
Total Fish Caught					1158		
Total Fish Measured					168.80		
					1158		

			Lab	Period	Area	Range	Type	TK/GK	Mean	Speed	Tide	Swept
Haddock	3Ps	Canada (Nfld)	St. John's	Feb.-Mar.	St. Pierre Bk.	40-50 fms	41.5	24.1 m 30.5 m	90 mm	3.5 knots	30'	.0172 sq. mi.
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				x			x					

Length Group		MEAN NUMBER PER STANDARD HAUL					
1 cm	2 cm	1965	1966	1967	1968	1969 (1)	1970 (2)
3	2						
6	4						
9	6						
12	8						
15	10						
18	12					0.09	-
21	14					0.09	0.58
24	16					2.05	3.92
27	18					1.41	8.77
30	20					0.41	6.50
33	22					0.55	5.00
36	24					2.00	5.19
39	26					2.64	2.62
42	28					9.50	2.62
45	30					13.45	3.15
48	32					17.09	1.85
51	34					20.73	0.88
54	36					24.91	1.38
57	38					26.45	2.15
60	40					28.05	2.65
63	42					16.45	3.19
66	44					7.77	3.92
69	46					2.27	6.15
72	48					1.50	6.81
75	50					1.73	5.38
78	52					1.77	3.38
81	54					1.32	2.42
84	56					1.23	1.12
87	58					1.00	0.92
90	60					1.05	0.50
93	62					0.64	0.46
96	64					0.32	0.46
99	66					0.45	0.69
102	68					0.41	0.38
105	70					0.27	0.31
108	72					0.18	0.19
111	74					0.23	0.15
114	76					0.09	0.19
117	78					0.14	0.12
120	80					0.05	-
123	82					-	0.12
126	84					-	0.04
129	86						
132	88						
135	90						
138	92						
141	94						
144	96						
147	98						
150	100						
Mean	No/Haul					188.50	84.19
	Kg/Haul					118.06	62.73
	Length					37.57	36.23
	Weight					0.63	0.75
Total No. Hauls						22	26
Total Area Swept						0.3784sq.mi	0.4472 sq.mi.
Total Area Survey							
Total Fish Caught	No.					4147	2189
	Kg.					2597.33	1631.00
Fish Measured						3206	2189

(1) Codend Liner = 6.3 mm mesh
 (2) Codend Liner = 12.7 - 29 mm mesh

Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Cod	3L	Canada (Nfld)	St. John's	April-June	N Grand Banks	33-152	O/T 41.5	24.1 m 30.5 m	90 mm with liner 29 mm	3.5 knots	30 min	0.0172 sq. mi.
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				✓			✓					

Length Group		MEAN NUMBER PER STANDARD HAUL					
3 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2						
6	4						
9	6						
12	8			.01	.10		
15	10	.60			.32	.12	
18	12			.15	1.43	.12	
21	14	.80		.47	1.16	.12	
24	16	1.80		1.35	1.30	.25	
27	18	1.60		5.61	2.49	.50	
30	20	5.00		21.40	2.27	.25	
33	22	5.20		34.40	2.32	1.13	
36	24	3.00		29.76	5.41	1.50	
39	26	2.40		20.35	10.16	3.88	
42	28	3.00		13.69	12.27	2.13	
45	30	3.00		11.11	11.92	2.75	
48	32	1.60		10.42	9.14	3.63	
51	34	1.80		8.17	6.16	4.13	
54	36	1.60		6.56	3.68	6.38	
57	38	1.40		4.64	2.78	7.38	
60	40	.60		3.68	1.95	4.63	
63	42	1.40		2.96	2.38	2.25	
66	44	1.20		1.89	1.84	.88	
69	46	1.60		.76	1.41	1.13	
72	48	1.20		.42	.81	.75	
75	50	.40		.43	.51	.50	
78	52	.60		.33	.54		
81	54	.80		.17	.46	.12	
84	56	.40		.08	.43		
87	58	.60		.17	.46		
90	60	.60		.22	.38	.12	
93	62			.07	.43		
96	64			.11	.43		
99	66	.20		.08	.56		
102	68			.03	.54		
105	70	.20		.03	.49		
108	72			.13	.89	.12	
111	74			.03	.35		
114	76			.03	.62		
117	78				.22		
120	80			.01	.22		
123	82				.16		
126	84			.01	.05		
129	86				.08		
132	88				.03		
135	90						
138	92						
141	94						
144	96						
147	98						
150	100						
Mean	No/Haul	42.60	-	179.73	89.16	44.64	-
	Kg/Haul	64.10	-	128.92	161.91	88.30	-
	Length	46.85	-	41.23	49.96	52.82	-
	Weight	1.50	-	.71	1.82	1.97	-
Total No. Hauls		5	-	72	37	8	-
Total Area Swept		0.0860	-	1.2384	0.6364	0.1376	-
Total Area Survey							
Total Fish Caught	No.	213	-	12941	3299	358	-
	Kg.	320.50	-	9282.48	5990.53	706.42	-
Total Fish Measured		213	-	8154	2079	337	-

Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Cod	3N	Canada (Nfld)	St. John's	Feb-Mar	Eastern Grand Banks	65-175 f	41.5	24.1m / 30.5m	90 mm with 29 mm liner	3.5 knots	30'	.0172
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				✓			✓					

Length Group		MEAN NUMBER PER STANDARD HAUL					
5 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2						
4	4						
6	6						
10	8						
15	10						
18	12				0.08		
21	14				0.15		
24	16				0.46		
27	16				2.62		
30	20				5.31		
33	22				2.15		
36	24				4.85		
39	24				18.31		
42	26				47.08		
45	28				98.15		
48	30				108.15		
51	32				75.31		
54	34				37.23		
57	36				15.69		
60	36				8.62		
63	40				5.15		
66	42				4.08		
69	44				2.62		
72	46				2.69		
75	48				1.77		
78	50				1.54		
81	52				0.85		
84	54				0.54		
87	56				-		
90	58				-		
93	60				0.08		
96	62				0.15		
99	64				-		
102	66				-		
105	68				-		
108	70				-		
111	72				-		
114	74				-		
117	76				-		
120	78				0.15		
123	80				-		
126	82				-		
129	84				-		
132	86				0.08		
135	88				-		
138	90				-		
141	92				-		
144	94				-		
147	96				-		
150	98				-		
153	100				-		
Mean	No/Haul				443.85		
	Kg/Haul				474.43		
	Length				46.30		
	Weight				1.07		
Total No. Hauls					13		
Total Area Swept					0.2236 sq. mi.		
Total Area Survey					-		
Total Fish Caught					5770		
Total Fish Measured					6167.59		
					3036		

Species	Subdiv	Country	or Lab	Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Cod	3N	Canada (Nfld)	St. John's	May June	S.E. Grand Banks	25-150 fms		24.1 m 30.5 m	90 mm with 29-12.6mm liner	3.5 knots	30'	.0172 sq. mi.
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				x			x					
Length Group		MEAN NUMBER PER STANDARD HAUL										
3 cm	2 cm	1965	1966	1967	1968	1969	1970					
						May-June	June(1)					
3	2											
6	4											
9	6											
12	8											
15	10							0.15				
18	12							0.11	1.15			
21	14							0.33	7.42			
24	16							3.11	6.61			
27	18							4.11	3.82			
30	20							5.44	1.91			
33	22							14.89	1.70			
36	24							38.94	4.12			
39	26							57.78	11.58			
42	28							51.61	11.06			
45	30							30.17	7.33			
48	32							22.17	5.45			
51	34							23.39	3.27			
54	36							23.11	1.18			
57	38							21.67	0.97			
60	40							15.11	1.06			
63	42							10.44	0.73			
66	44							8.94	0.64			
69	46							5.67	0.36			
72	48							2.22	0.21			
75	50							2.17	0.21			
78	52							2.33	-			
81	54							1.17	0.06			
84	56							0.78	-			
87	58							0.50	0.03			
90	60							0.22	-			
93	62							0.28	-			
96	64							0.06	0.03			
99	66							0.28	0.06			
102	68							0.06	0.03			
105	70							0.06	-			
108	72							0.06	0.03			
111	74							0.06	0.03			
114	76							0.06	0.09			
117	78							0.11	0.09			
120	80							-	-			
123	82							0.11	0.03			
126	84							-	0.15			
129	86							0.28	0.03			
132	88							0.28	-			
135	90							-	-			
138	92											
141	94											
144	96											
147	98											
150	100											
Mean	No/Haul							348.06	71.70			
	Kg/Haul							438.61	60.37			
	Length							47.64	39.72			
	Weight							1.26	0.84			
Total No. Hauls								18	33			
Total Area Swept								0.3096 sq. mi.	0.5676 sq. mi.			
Total Area Survey												
Total Fish Caught	No.							6265	2366			
	Kg.							7895.06	1992.15			
Total Fish Measured								2836	1631			

(1) Flounder Survey - 27 of the 33 sets in depths <50 fms.

- 22 -	ICNAF		Inst	SURVEY			TRAWL			STANDARD HAUL		
Species	Subdiv	Country	or Lab	Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Duration	Av Area Swept
Cod	3Ps	Canada (Nfld)	St. Johns	June	St. Pierre Bk.	25-100 fms	36	$\frac{18.3 \text{ m}}{24.4 \text{ m}}$	90 mm with 29 mm liner	3.5 knots	30'	0.0134 sq. mi.

Length Measurements	TL	FL	cm above	cm below	nearest cm
		x			x

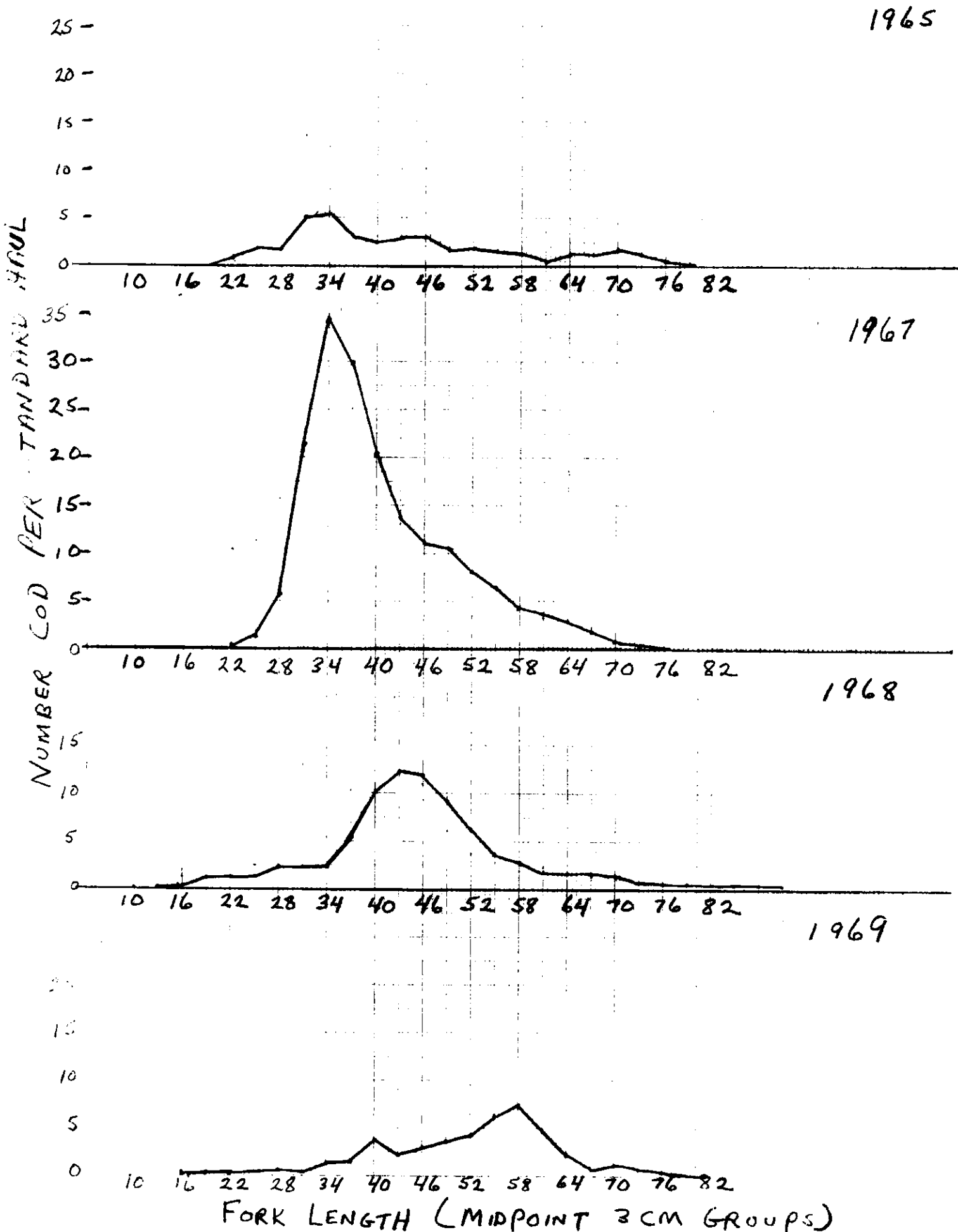
Length Group		MEAN NUMBER PER STANDARD HAUL					
3 cm	2 cm	1965	1966	1967	1968	1969	1970
3	2						
4	4						
5	6	0.11					
10	8	1.37					
15	10	1.70					
18	12	2.63					
21	14	5.19					
24	16	3.41					
27	18	3.15					
30	20	6.19					
33	22	7.81					
36	24	9.15					
39	26	5.96					
42	28	5.78					
45	30	3.63					
48	32	2.93					
51	34	2.26					
54	36	1.81					
57	38	0.81					
60	40	1.07					
63	42	0.56					
66	44	0.15					
69	46	0.11					
72	48	0.07					
75	50	0.07					
78	52	0.11					
81	54	0.04					
84	56	0.07					
87	58	0.11					
90	60	0.11					
93	62	0.11					
96	64	0.15					
99	66	0.19					
102	68	0.07					
105	70	0.04					
108	72	0.04					
111	74	0.04					
114	76	0.07					
117	78	-					
120	80	-					
123	82	0.04					
126	84	-					
129	86	0.04					
132	88	-					
135	90	0.04					
138	92						
141	94						
144	96						
147	98						
150	100						
Mean	No/Haul	67.19					
	Kg/Haul	50.06					
	Length	37.15					
	Weight	0.75					
Total No. Hauls		27					
Total Area Swept		0.362 sq. m.					
Total Area Survey							
Total No.		1814					
Fish Caught Kg.		1352					
Fish Measured		1456					

Species	ICNAF Subdiv	Country	Inst or Lab	SURVEY			TRAWL			STANDARD HAUL		
				Period	Geog Area	Depth Range	Type	HR/GR	Cod End Mesh	Speed	Dura- tion	Av Area Swept
Cod	3Ps	Canada (Nfld)	St. Johns	March April May	St. Pierre Bk	25-100 fms.	41.5	24.1 m 30.5 m	90 mm	3.5 knots	30'	.0172 sq. mi.
Length Measurements			TL	FL	cm above	cm below	nearest cm					
				x			x					

Length Group		MEAN NUMBER PER STANDARD HAUL					
3 cm	2 cm	1965	1966	1967 Apr.-May (1)	1968 May (1)	1969 March (2)	1970 March (3)
3	2						
6	4						
9	6	-	-	0.44	-	-	0.39
12	8	-	-	0.76	1.29	0.18	1.39
15	10	-	-	1.20	7.71	0.29	13.89
18	12	-	-	8.56	68.00	5.24	25.22
21	14	-	-	6.32	69.21	11.71	16.17
24	16	-	-	7.68	28.86	16.82	5.72
27	18	-	-	10.96	24.50	32.06	8.44
30	20	-	-	12.28	17.07	27.76	11.33
33	22	-	-	9.44	11.64	21.41	10.28
36	24	-	-	6.68	9.14	16.06	11.72
39	26	-	-	4.76	11.57	12.24	11.77
42	28	-	-	6.16	10.57	8.59	10.89
45	30	-	-	7.44	9.43	5.53	9.89
48	32	-	-	5.68	9.00	5.12	10.33
51	34	-	-	5.72	5.07	5.65	7.06
54	36	-	-	5.04	3.00	5.65	5.83
57	38	-	-	4.36	2.29	4.24	3.94
60	40	-	-	2.64	1.21	3.53	2.00
63	42	-	-	2.08	1.21	2.53	1.56
66	44	-	-	1.56	0.93	1.76	0.61
69	46	-	-	0.88	0.36	0.76	0.50
72	48	-	-	0.72	0.43	0.59	0.39
75	50	-	-	0.56	0.36	0.65	0.17
78	52	-	-	0.28	0.50	0.47	0.11
81	54	-	-	0.16	0.29	0.24	0.06
84	56	-	-	0.12	0.29	0.24	-
87	58	-	-	0.16	0.21	0.12	0.06
90	60	-	-	0.04	-	-	-
93	62	-	-	0.08	-	0.06	-
96	64	-	-	0.08	0.07	0.12	-
99	66	-	-	0.12	-	0.18	0.06
102	68	-	-	0.08	0.07	0.18	-
105	70	-	-	0.20	0.21	-	-
108	72	-	-	0.08	0.07	-	-
111	74	-	-	-	-	-	-
114	76	-	-	0.04	0.07	-	-
117	78	-	-	-	-	-	-
120	80	-	-	0.12	0.14	-	-
123	82	-	-	-	-	-	0.06
126	84	-	-	0.04	0.07	-	-
129	86	-	-	-	-	-	0.06
132	88	-	-	-	-	-	-
135	90	-	-	-	-	-	-
Mean	No/Haul	-	-	113.52	294.86	189.98	169.83
	Kg/Haul	-	-	88.73	102.21	112.06	87.62
	Length	-	-	38.71	28.69	36.12	34.08
	Weight	-	-	0.78	0.35	0.59	0.52
Total No. Hauls		-	-	25	14	17	18
Total Area Swept		-	-	0.4300sq.mi.	0.2408sq.mi.	0.2924sq.mi.	0.3096 sq.mi.
Total Area Survey		-	-	-	-	-	-
Total Fish Caught	No.	-	-	2838	4128	3228	3057
	Kg.	-	-	2218.24	1431.00	1904.98	1577.20
Total Fish Measured		-	-	1915	4128	3228	3057

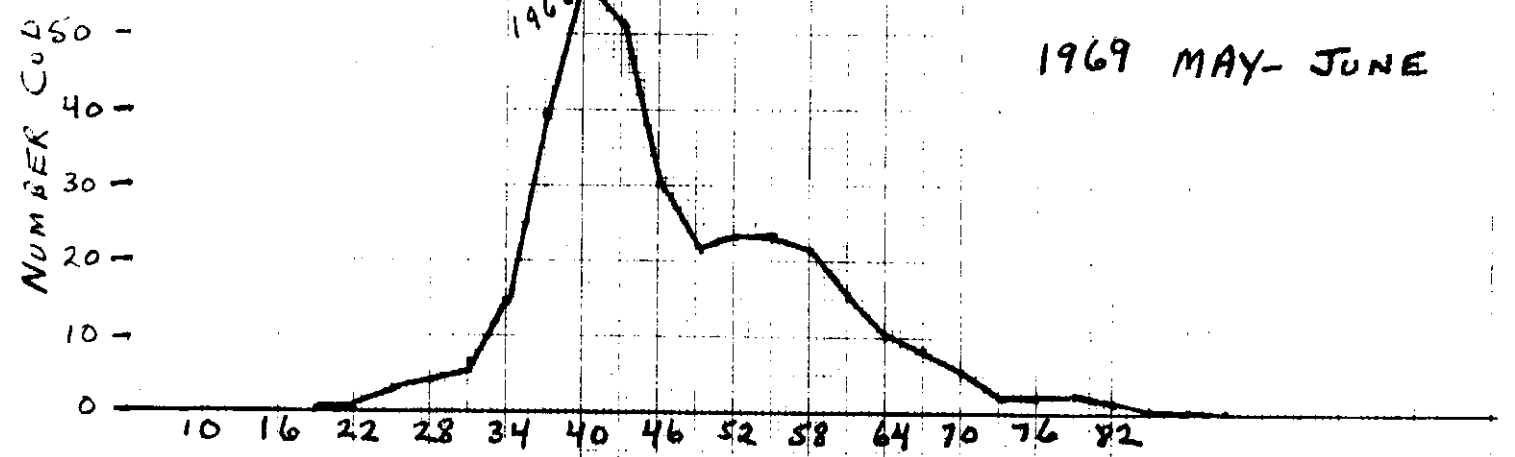
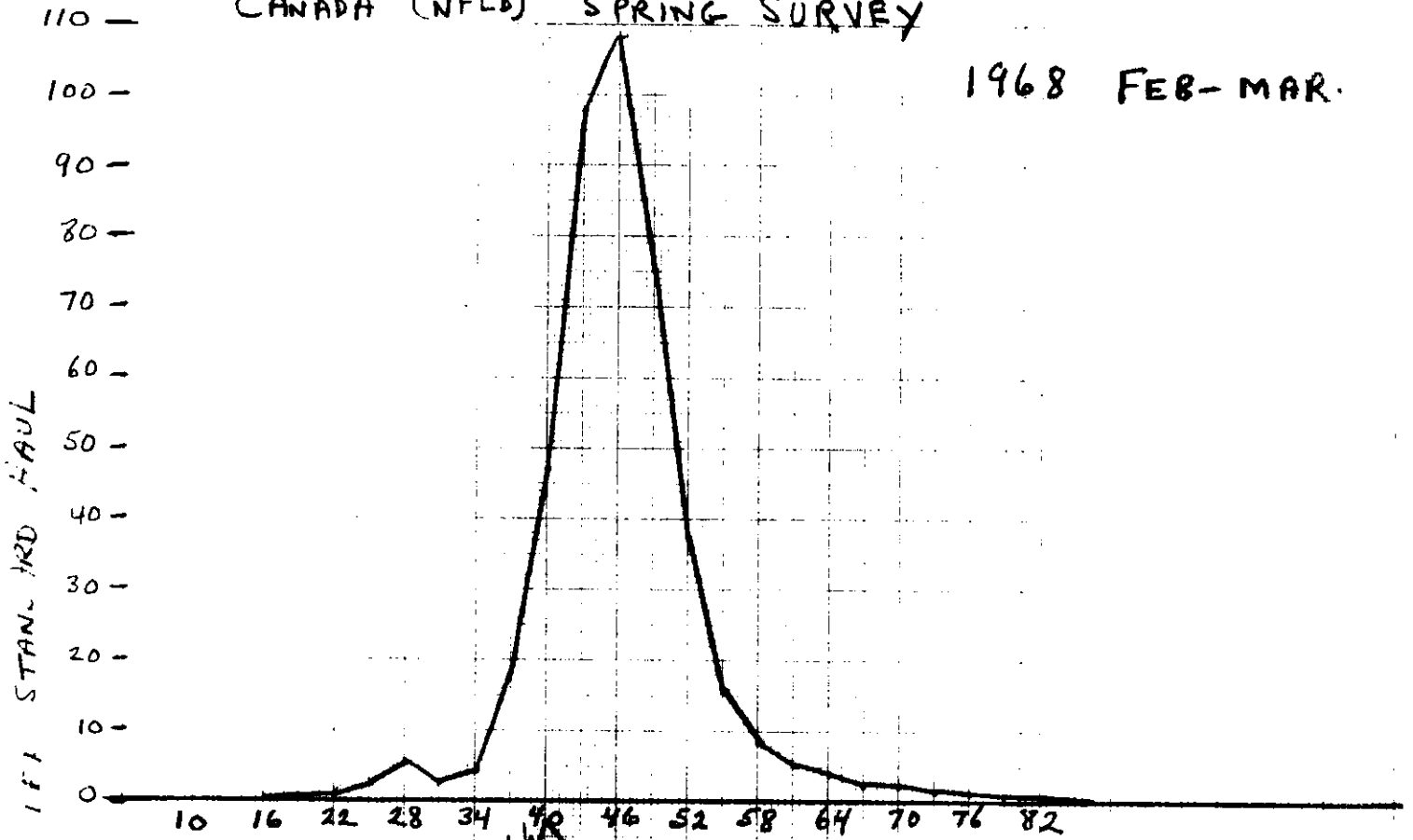
- (1) Codend Liner = 29 mm mesh
- (2) Codend Liner = 6.3 mm mesh
- (3) Codend Liner = 12.6-29 mm mesh

DIVISION 3L COD
CANADA (NFLD) SURVEYS - 2ND QUARTER

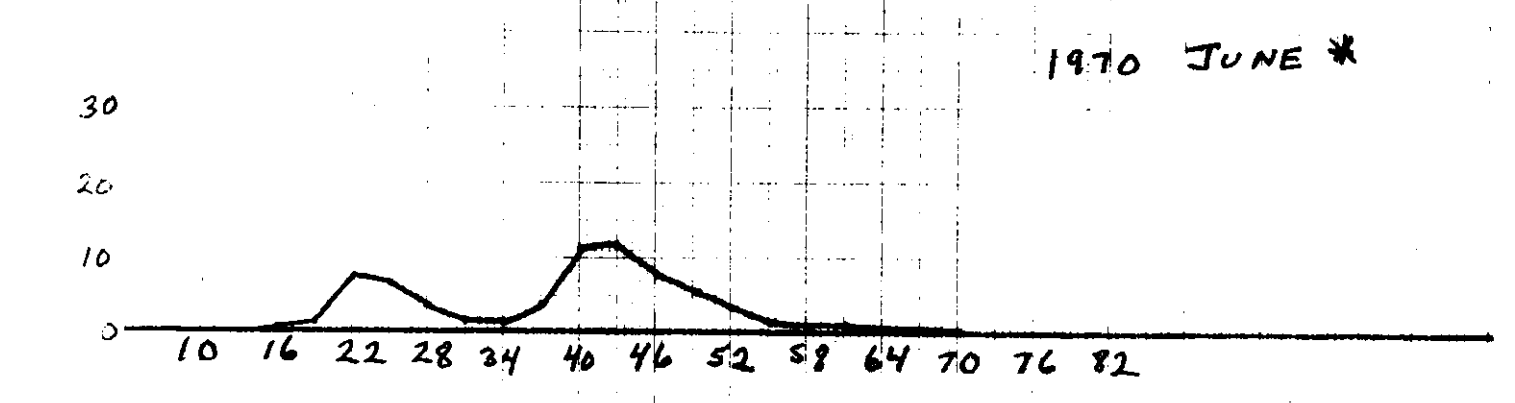


DIVISION 3N COD
CANADA (NFLD) SPRING SURVEY

1968 FEB-MAR.



1969 MAY-JUNE



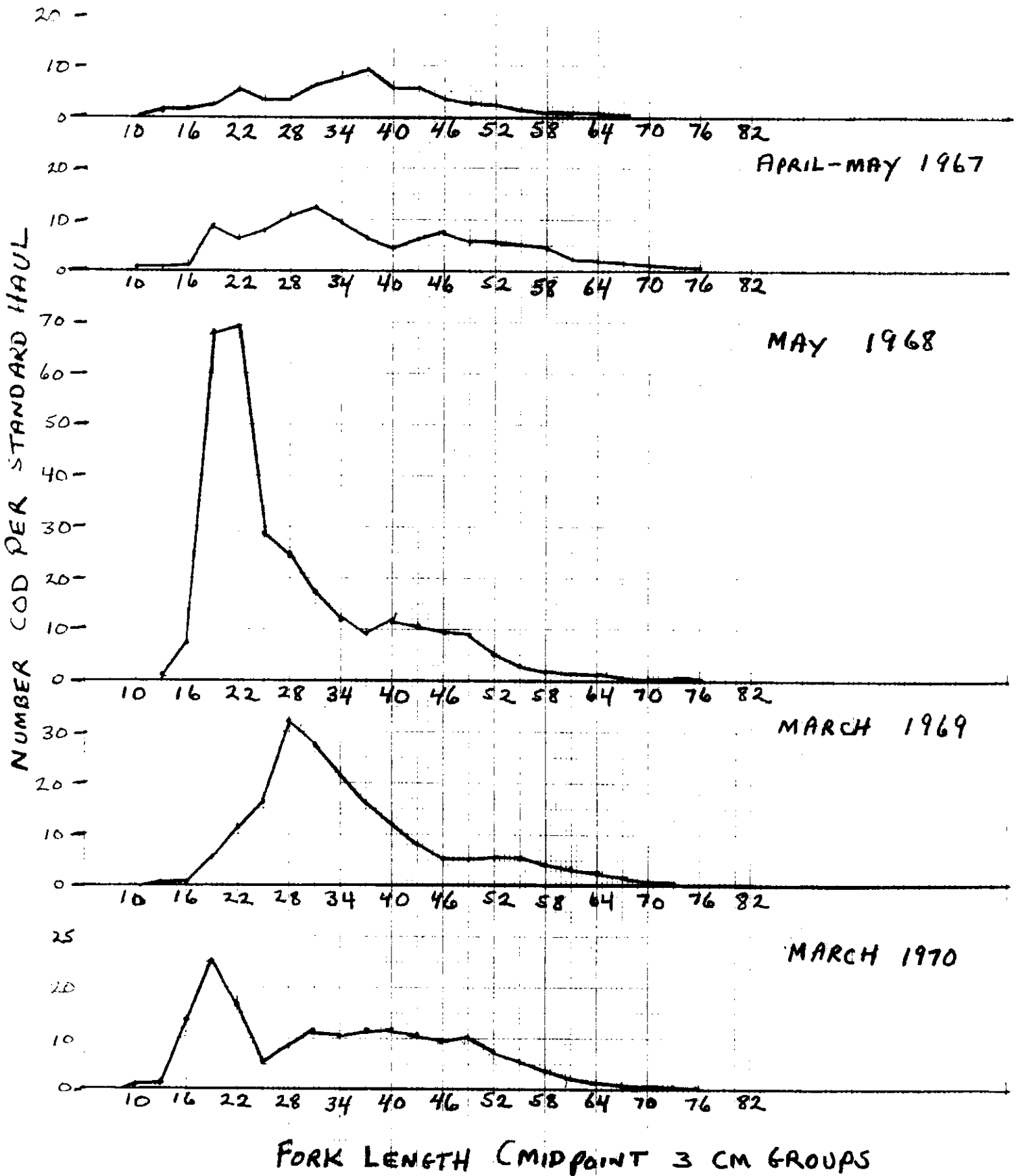
1970 JUNE *

FORK LENGTH (MIDPOINT 3CM GROUP)

* FLOUNDER SURVEY - 27 of 33 SETS IN DEPTHS < 50 FATHS

DIVISION 3Ps COD
CANADA (NFLD) SPRING SURVEYS

JUNE 1965



DIVISION 3Ps HADDOCK
CANADA (NFLD) SPRING SURVEYS

