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Effects of changes in codend mesh size on cod catches in the Flemish Cap area

by

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INTRODUCTION

STACRES agreed in 1978 (*Redbook* 1978, page 45) that, with respect to the Canadian proposal to suspend mesh regulations for redfish on the Flemish Cap, certain lines of research be pursued including analyses of the effects on the cod stock of decreasing the minimum mesh size for redfish. The current minimum mesh size for both cod and redfish is 130 mm.

MATERIALS AND RESULTS

Selection ogives for cod were taken from Hodder (1964) and the ogives for 3-, 4-, 4-1/2-, and 5-inch meshes are shown in Table 1. Selection ogives by age derived from these ogives are shown in Tables 2 and 3 and in Fig. 1.

A length composition of the catch before discards from the Spanish commercial fishery in May 1978 was available from the Canadian Observer Program. The ratios at length between the 4-inch selection ogive at length and the ogive for the 5-inch mesh was applied to derive an estimated catch if 4-inch mesh had been used in 1978 instead of the 5-inch mesh. It is assumed that cod of 41 cm and less were discarded. Table 4 shows that, in that case, the gain in kept catch would have been 26% in numbers and 16% in weight. However, discards would have been increased from 16% to 34% by numbers and from 6% to 14% in weight.

Following the same procedure for a change from 5-inch mesh to 3-inch mesh, the gain in kept catch would have been 34% in numbers and 21% in weight. Discards would have increased from 16% to 50% in numbers and from 6% to 22% in weight.

For the long-term change in yield, yield per recruit curves were calculated using the percentage retention shown in Table 3, the average weight-at-age values given in Wells (1979), and assuming cod remain available to the fishery until 19 years of age. These curves, shown in Fig. 2, indicate that, for cod on the Flemish Cap, the yield per recruit increases substantially up to at least a mesh size of 6 inches.

CONCLUSIONS

1. A decrease in 1978 in the current mesh size of 5 inches would have resulted in an increase in kept catch but also an increase in the catch of cod of 41 cm and less which are presumably discarded.
2. In the long term, given a substantial overlap in cod and redfish distributions by depth on the Flemish Cap, a decrease in mesh size in the redfish fishery would be detrimental to the cod stock.

REFERENCES

- HODDER, V. M. MS 1964. Assessment of the effects of fishing and of increases in the mesh size of trawls on the major commercial fisheries of the Newfoundland area. Fish. Res. Bd. Canada, MS Rept. Biol. No. 801.
- WELLS, R. MS 1979. Status of the cod stock in Division 3M. ICNAF Res. Doc. 79/VI/79, Serial No. 5425.

Table 1. Selection ogives by length for cod on the Flemish Cap (from Hodder, 1964).

Length (cm)	Selection ogives				Ratios between ogives		
	Mesh size (inch)				3:5	4:5	4-1/2:5
	3	4	4-1/2	5			
13	4	-	-	-	-	-	-
16	9	-	-	-	-	-	-
19	17	1	-	-	-	-	-
22	30	3	1	-	-	-	-
25	44	7	2	-	-	-	-
28	60	14	5	1	60.00	14.00	5.00
31	75	25	11	4	18.75	6.25	2.75
34	86	40	20	9	9.56	4.44	2.22
37	93	53	34	17	5.47	3.12	2.00
40	97	70	50	30	3.23	2.33	1.67
43	99	83	66	45	2.20	1.84	1.47
46	100	91	79	61	1.64	1.49	1.30
49	-	96	89	76	1.32	1.26	1.17
52	-	98	95	87	1.15	1.13	1.09
55	-	100	98	94	1.06	1.06	1.04
58	-	-	99	98	1.02	1.02	1.01
61	-	-	100	99	1.01	1.01	1.01
64	-	-	-	100	1.00	1.00	1.00
67	-	-	-	-	-	-	-

Table 2. Selection ogives by age for cod on the Flemish Cap. The selection ogives by length were taken from Hodder (1964) and the age-at-length material from Wells (1979).

Length	Age	Mesh size (inch)					
		3	4	4-1/2	5	5-1/2	6
10	1.380	0	-	-	-	-	-
13	1.569	4	-	-	-	-	-
16	1.762	9	-	-	-	-	-
19	1.959	17	1	-	-	-	-
22	2.162	30	3	1	-	-	-
25	2.371	44	7	2	-	-	-
28	2.585	60	14	5	1	-	-
31	2.805	75	25	11	4	1	-
34	3.031	86	40	20	9	2	1
37	3.264	93	53	34	17	5	2
40	3.504	97	70	50	30	11	4
43	3.752	99	83	66	45	21	9
46	4.007	100	91	79	61	34	17
49	4.272	-	96	89	76	50	30
52	4.545	-	98	95	87	66	44
55	4.828	-	100	98	94	79	60
58	5.122	-	-	99	98	89	75
61	5.427	-	-	100	99	95	86
64	5.745	-	-	-	100	98	93
67	6.076	-	-	-	-	99	97
70	6.421	-	-	-	-	100	99
73	6.782	-	-	-	-	-	100

Table 3. Percentage retention at age for Flemish Cap cod.

Age	Length	Mesh size (inch)						Average weight
		3	4	4-1/2	5	5-1/2	6	
1	10.00	1	-	-	-	-	-	0.01
2	19.54	19	1	1	-	-	-	0.05
3	33.84	85	39	20	9	2	1	0.31
4	45.77	99	90	78	60	33	16	0.81
5	56.59	100	100	99	94	84	68	1.61
6	66.13	-	-	100	100	99	96	2.65
7	74.54	-	-	-	-	100	100	3.89
8	-	-	-	-	-	-	-	5.27
9	-	-	-	-	-	-	-	6.73
10	-	-	-	-	-	-	-	8.24
11	-	-	-	-	-	-	-	9.75
12	-	-	-	-	-	-	-	11.22
13	-	-	-	-	-	-	-	12.64
14	-	-	-	-	-	-	-	13.99
15	-	-	-	-	-	-	-	15.26
16	-	-	-	-	-	-	-	16.44
17	-	-	-	-	-	-	-	17.54
18	-	-	-	-	-	-	-	18.55
19	-	-	-	-	-	-	-	19.46

Table 4. Estimated percentage gain in numbers and in weight of cod on the Flemish Cap if the mesh size in 1978 had been 4-inch instead of the actual mesh size of 5-inch.

Length (cm)	By number		Estimated catch 4-inch	Average weight	By weight	
	Commercial catch 5-inch mesh	4-inch: 5-inch ratio			Mesh size (inch)	
					5	4
24	0.58	-	-	-	-	-
27	1.75	14.00	24.50	0.18	0.32	4.41
30	13.43	6.25	83.94	0.25	3.33	20.99
33	27.44	4.44	121.83	0.33	9.05	40.20
36	50.79	3.12	158.46	0.43	21.76	68.14
39	69.47	2.33	161.87	0.54	37.86	87.41
42	91.07	1.84	167.57	0.68	62.05	113.95
45	135.43	1.49	201.79	0.84	113.64	169.50
48	200.82	1.26	253.03	1.02	204.81	258.09
51	137.19	1.13	155.02	1.23	168.09	190.67
54	86.40	1.06	91.58	1.46	125.88	133.71
57	60.13	1.02	61.33	1.72	103.22	105.49
60	37.95	1.01	38.33	2.01	76.12	77.04
63	25.10	-	25.10	2.32	58.39	-
66	22.18	-	22.18	2.68	59.44	-
69	12.84	-	12.84	3.07	39.39	-
72	4.67	-	4.67	3.49	16.31	-
75	7.01	-	7.01	3.95	27.72	-
78	1.17	-	1.17	4.45	5.21	-
81	1.17	-	1.17	4.99	5.85	-
84	2.34	-	2.34	5.58	13.08	-
87	1.17	-	1.17	6.22	7.28	-
90	1.75	-	1.75	6.89	12.07	-
93	1.75	-	1.75	7.62	13.34	-
96	1.17	-	1.17	8.40	9.83	-
99	1.75	-	1.75	9.22	16.15	-
102	1.17	-	1.17	10.11	11.83	-
105	-	-	-	-	-	-
108	0.58	-	0.58	12.04	6.99	-
111	0.58	-	0.58	13.09	7.60	-
114	0.58	-	0.58	14.21	8.24	-
117	-	-	-	-	-	-
120	0.58	-	0.58	16.63	9.64	-
Total	1000.01		1606.8		1254.5	1598.1
Kept catch	836.55		1056.3		1182.2	1376.9
% dis- cards	16		34		6	14
% gain (excl. discards)	-		26		-	16

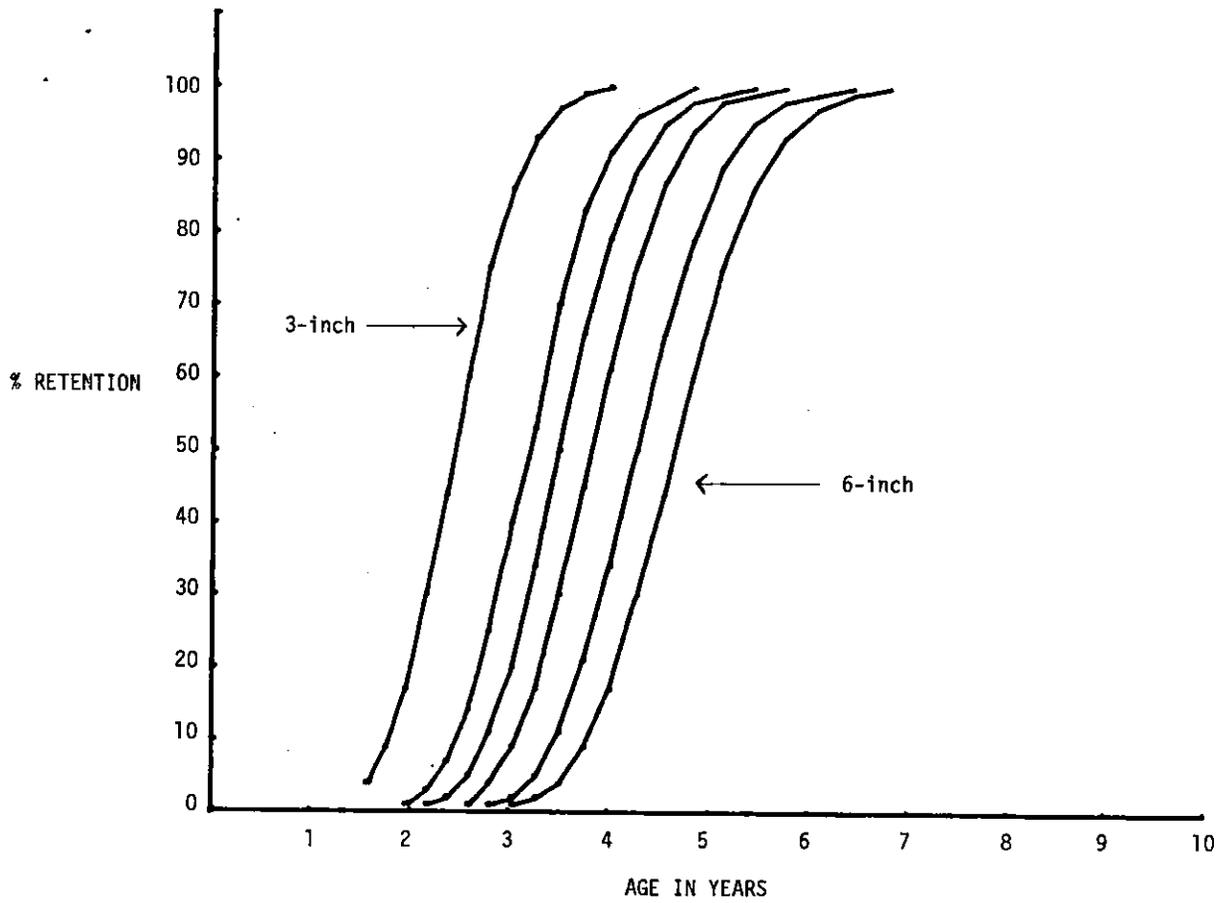


Fig. 1. Retention at age by various mesh sizes of cod on the Flemish Cap (3, 4, 4-1/2, 5, 5-1/2, and 6 inches).

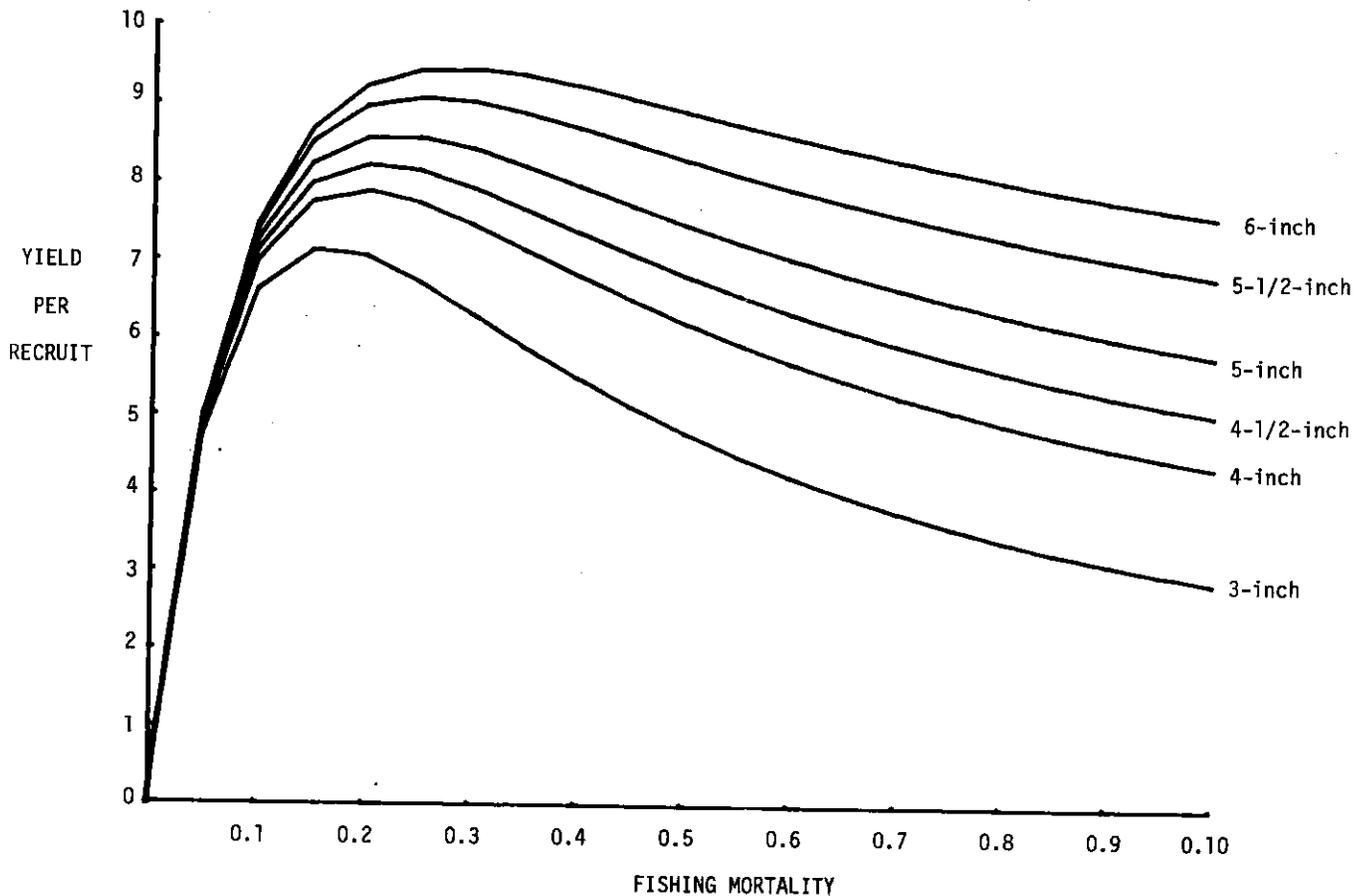


Fig. 2. Yield per recruit of Flemish Cap cod for selection patterns corresponding to various mesh sizes.

