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Selectivity and gilling of redfish in codends of 58 mm manila and 76 mm nylon

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Tests to determine the selectivity and gilling of redfish by a 3-inch (76 mm.) mesh, nylon codend and a 2. 3-inch (58 mm.) double manila codend were conducted by the Exploratory Fishing and Gear Research Base of the Bureau of Commercial Fisheries, Gloucester, Massachusetts. The manila codend is of the size commonly used by commercial fishermen. The tests were conducted on the R. V. Delaware in the waters off southeast Nova Scotia.

Methods

Two types of codends were used in alternate hauls. A double manila net averaging 2. 3 inches (58 mm.), and a nylon net averaging 3. 0 inches (76 mm.); both averages composed of rows of stretched meshes, measured several times during the experiment. Two similar nets of each type were used.

All of the fish gilled in the codend were measured and weighed. A random sample of one or two bushels of the fish retained in the codend was taken for measurement and count. The total number of fish in the codend was estimated by prorating upward on the basis of total bushels caught.

Some fish were gilled in the forward part of the net, but these were of negligible proportions and were not considered in the analysis.

Results

Table 1 shows the pertinent data for each tow, except that certain tows did not contain enough fish to work with and were omitted. Averages for all tows are also given.

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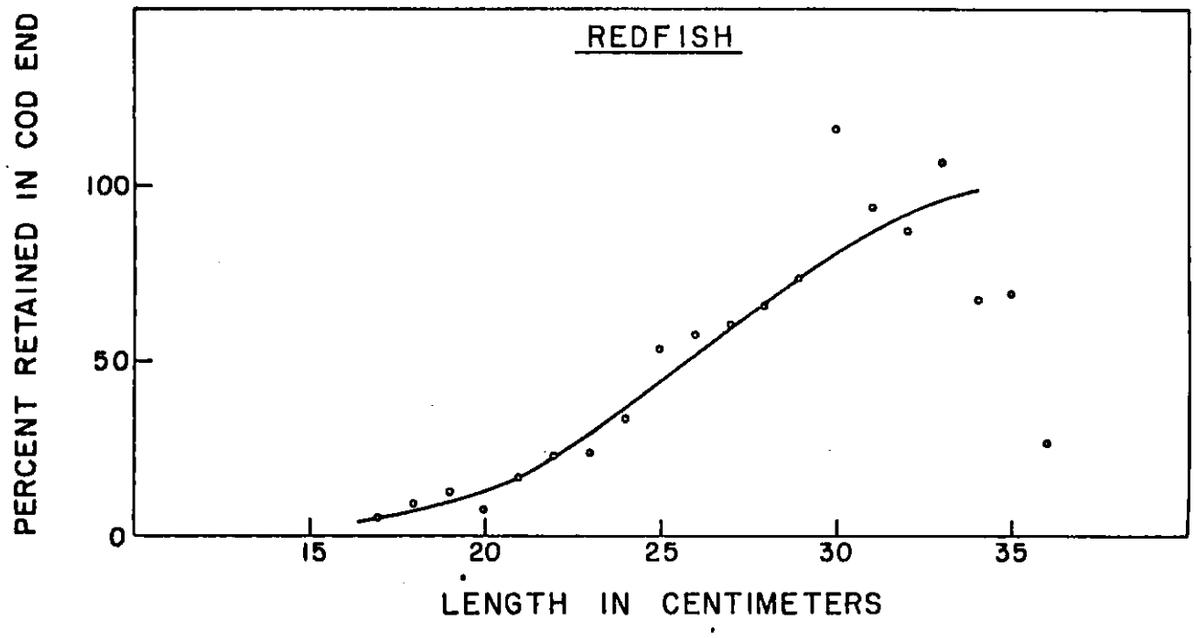
Figure 1 shows the length-frequency of the total and gilled catch for both types of nets, and the selectivity of the 76 mm. nylon relative to the 58 mm. manila. The totals for the manila net were adjusted upward to compensate for the discrepancy of one less tow.

Table 1.--(Cont.)

Tow No.	Mesh Size (inches) and net No.	Number Meshes in Codend	Total Catch (bu.)	Fish Per Bu. Calc/Count	Total Number Fish	Number Fish Gilled in Codend	Percent Catch Gilled	Percent Meshes Filled	Mean Length of Fish: Caught in Codend	Mean Length of Fish: Gilled in Codend
50	2-1/4(#2)	10,800	50	149/149	7450	260	3.49	2.41	22.76	20.75
51	2-1/4(#2)	10,800	33	117/123	3861	152	3.94	1.41	23.22	20.18
52	2-1/4(#2)	10,800	25	125/124	3125	191	6.08	1.76	23.19	20.56
53	3(#2)	12,000	11	75/77	825	121	14.55	1.00	27.58	24.58
54	3(#2)	12,000	17	90/90	1530	159	10.39	1.33	25.69	23.55
55	3(#2)	12,000	12	87/75	1044	182	17.43	1.52	26.62	23.41
56	2-1/4(#2)	10,800	12	109/109	1308	13	0.99	1.21	24.35	19.31
57	2-1/4(#2)	10,800	56	145/-	8120	366	4.51	3.39	21.63	20.13
58	2-1/4(#2)	10,800	14	173/171	2422	169	6.89	1.55	21.41	19.79
59	3(#2)	12,000	10	91/89	910	187	20.55	1.56	25.58	23.25
60	3(#2)	12,000	5	108/100	540	91	16.85	0.76	24.68	23.79
61	2-1/4(#2)	10,800	11	90/88	990	14	1.41	0.13	26.26	21.64
62	2-1/4(#2)	10,800	11	125/118	1375	24	1.75	0.22	23.84	21.21
63	3(#2)	12,000	38	119/130	4522	638	13.91	5.24	24.01	23.27
Totals										
19	2-1/4	--	647	--	68636	1346	2.0	--	24.6	20.2
20	3	--	351	--	29639	3022	10.2	--	27.1	24.3

Table 1. --Consolidated data taken on each tow during Delaware Cruise 64-1 (January-February 1964)

Tow No.	Mesh Size (inches) and net No.	Number Meshes in Codend	Total Catch (bu.)	Fish Per Bu. Calc/ Count	Total Number Fish	Number Fish Gilled in Codend	Percent Catch Gilled	Percent Meshes Filled	Mean Length of Fish	
									Caught in Codend	Gilled in Codend
1	2-1/4(#1)	12,000	8	84	672	6	0.89	0.050	26.01	18.66
2	2-1/4(#1)	12,000	14	103	1442	8	0.55	0.067	24.82	24.50
3	3(#1)	12,000	8	86	688	48	6.98	0.400	26.99	25.27
4	3(#1)	12,000	3	72	216	45	20.83	0.375	27.71	25.58
	- -	-	-	-	-	-	-	-	-	-
8	3(#1)	12,000	3	72	216	23	10.65	0.19	27.04	24.83
	- -	-	-	-	-	-	-	-	-	-
12	3(#1)	12,000	60	90	5400	463	8.57	3.86	26.31	25.13
13	3(#1)	12,000	52	82	4264	369	8.65	3.07	26.76	25.08
	- -	-	-	-	-	-	-	-	-	-
15	2-1/4(#1)	12,000	9	126	1134	7	0.62	0.058	23.14	19.43
16	2-1/4(#1)	12,000	50	122	6100	42	0.69	0.350	23.69	18.98
	- -	-	-	-	-	-	-	-	-	-
24	2-1/4(#1)	12,000	36	95	3420	0	0.00	0.00	26.06	0
25	2-1/4(#1)	12,000	29	94	2726	47	1.72	0.39	25.41	18.74
26	3(#2)	12,000	3	58	174	5	2.87	0.042	30.36	25.60
27	3(#2)	12,000	25	62	1550	51	3.29	0.425	28.78	24.49
28	2-1/4(#2)	10,800	4	51	204	0	0.00	0.00	31.03	0
29	2-1/4(#2)	10,800	82	111/101	9102	34	0.37	0.315	25.73	21.29
30	3(#2)	12,000	32	75/79	2400	55	2.29	0.458	27.21	24.33
31	3(#2)	12,000	16	68/74	1088	236	21.69	1.967	28.03	25.11
32	2-1/4(#2)	10,800	54	78/79	4212	0	0.00	0.00	26.92	0.0
33	2-1/4(#2)	10,800	114	72/72	8208	5	0.06	0.046	27.58	18.4
34	3(#2)	12,000	8	66/60	528	92	17.23	0.758	28.91	24.85
35	3(#2)	12,000	15	51/50	765	5	0.65	0.042	30.01	27.40
36	2-1/4(#2)	10,000	35	79/85	2765	8	0.25	0.065	27.06	22.00
	- -	-	-	-	-	-	-	-	-	-
38	3(#2)	12,000	7	84/88	588	48	8.16	0.400	26.53	23.15
	- -	-	-	-	-	-	-	-	-	-
48	3(#2)	12,000	11	96/99	1056	104	9.85	0.87	26.10	24.16
49	3(#2)	12,000	15	89/81	1335	100	7.49	0.83	27.18	24.38



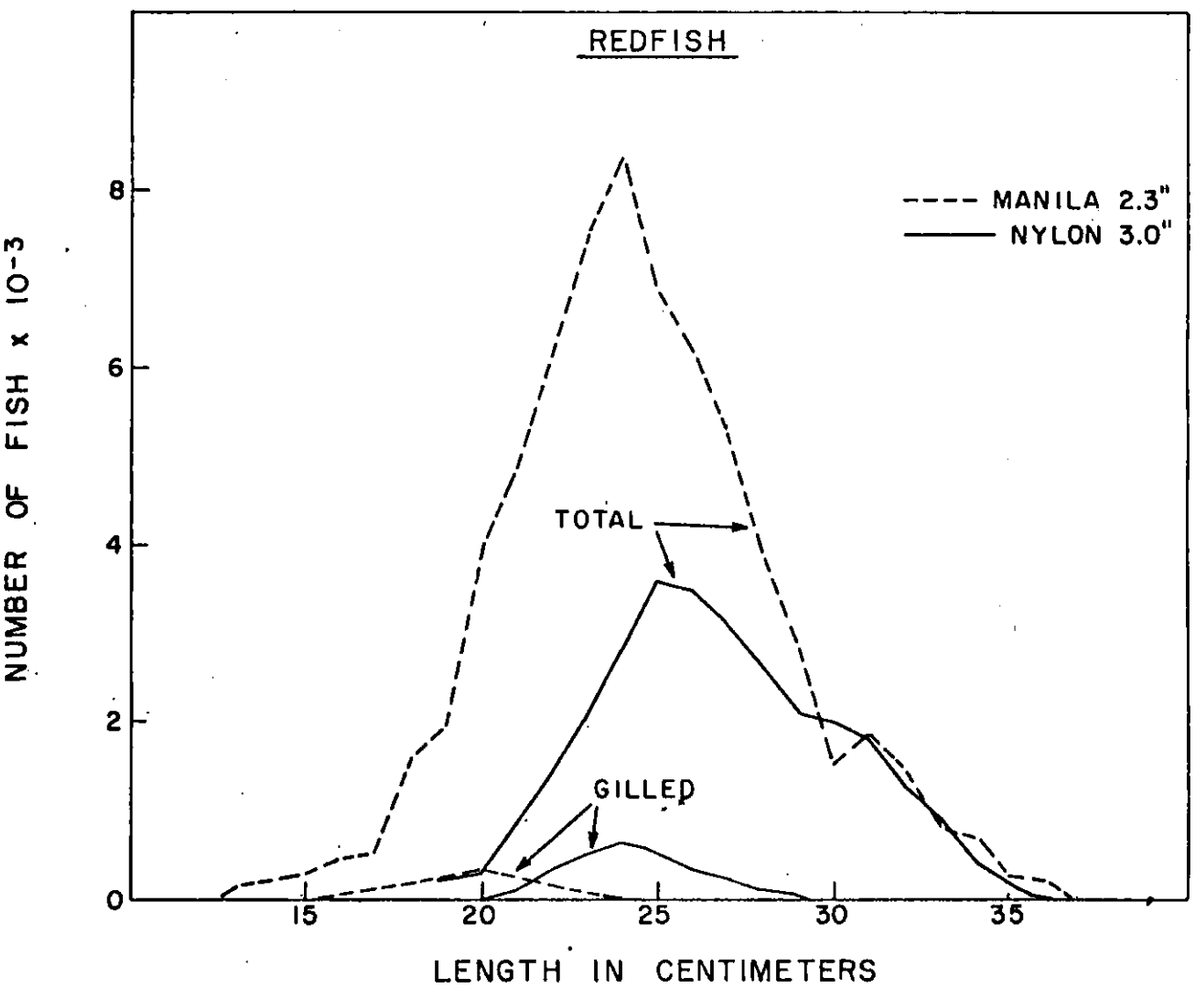


Figure 1. Length-frequency of total and gilled catch of Redfish, and selectivity of 3 inch nylon related to 2-1/2 inch manila cod ends.

The length frequency of the catch of the manila codend corresponds closely to that observed in the commercial catches from the area. Doubtless there was escapement of smaller fish from

the manila codend, but that is not of concern in these experiments. The shape of the selective ogive, and the close correspondence of catches of larger sized fish - those beyond the effect of selectivity - indicate that the two nets were fishing essentially on the same population. There is no observed differential catching efficiency of the two nets not accounted for by the escapement related to size of mesh.

The percentage of total catch gilled was 10.2 for the 76 mm. nylon and 2.0 for the 58 mm. manila codend. The higher percentage resulted because the lengths of fish which gill in the 76 mm. net correspond to lengths of fish which are more abundant in the population. Thus, if we take the ratio of numbers of available fish at the lengths corresponding to the mean of the gilled fish for the nylon and manila codends, 8441/3997 = 2.1, we find it of the same order as the ratio of the actual numbers of fish gilled by the two nets, 3002/1346 = 2.2. The nylon material of itself does not seem to gill more fish. Given this length distribution of population, the effects observed by the fisherman are the same in any case - more gilled fish in the larger mesh. Given a different length distribution of population, different results would be anticipated.

The percentage of meshes which contained gilled fish was also higher for the nylon net; however, the absolute values were very low; exceeding one percent in only a few tows. The question of what degree of gilling can be tolerated in fishing operations is not, of course, answered here.

Perhaps more important than the gilling is the selectivity of the 76 mm. nylon. The selective range spans almost the entire length range of the catch. The 50 percent selection point is at about 26 cm. and corresponds generally to that obtained in a 4- or 4-1/2-inch double manila net. The net retains only 40 percent by number of the fish caught by the 58 mm. manila. A good share of the releases are in the "desirable" length range.

Even allowing for a very low natural mortality rate of redfish, and with the known slow growth rate, this net probably releases too many fish for purposes of sustaining maximum yields.

The average catch-per-tow is rather low, certainly in the lower range of commercial catches. Thus the applicability of these data to commercial operations can only be considered provisional, until the effects of larger catches can be ascertained.