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Synthesis of Selection Curves for Atlantic Redfish,

Sebastes mentella

by

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Introduction

Selection is a major tool in fisheries management although the amount of effort put into studies on this subject has diminished in the last ten to twenty years. One reason for this reduced effort was pointed out by Clay (1979) as: "the inherent variability in mesh selection studies which raises the question of the necessity and value for further studies on species for which much data already exists". This review suggested "the possibility of utilizing past studies ... to produce general selection patterns which may be useful in analyzing the effects of mesh regulations ..." when adequate data are not available.

Historical data include selectivity of both *S. marinus* and *S. mentella*. It is assumed these are similar in selectivity and therefore they have been combined for this paper.

Technique

Figure 1 (after Clay, 1979) shows the general selection pattern of redfish. From the GM regression of these data ($TL = 3.50 m - 94.96$), where TL is total length in mm and M is codend mesh size in mm) the 50% retention points can be estimated for any mesh size. Using the historic data summarized by Holden (1971) the selection range was plotted against the mesh size (Figure 2). The selection range of any mesh size can then be estimated from the GM regression of the \ln transformation ($SR = 1.08004 \times 10^{-3} M^{2.3484}$, where SR is the selection range in mm and M is the codend mesh size in mm). Table 1 summarizes the selection parameters for 60, 90, 115, 120, 130 mm mesh codends.

From these values the selection curves can be approximated by assuming a straight line between the 25% and 75% retention points and adding the characteristic sigmoid curves on the two ends. Such synthetic curves are shown in Figure 3 with detailed selection values in Table 2.

Discussion

Although curves such as those of Figure 3 are accurate enough for general use, more quantitative estimates are often required. A computer program¹ has been written to provide ogives based on a sine transformation (Table 3).

¹ This program can calculate a synthetic selection ogive for any mesh size for several species (see Clay, 1979).

It has recently come to light that the mesh size is not always recorded when port samplers in the Maritimes take a sample. Normally this is not a serious problem - however with redfish it is. The directed fishery is entitled to use 90 mm mesh while the by-catch fishery uses 120 mm mesh. The synthesised selection ogives were used to test which mesh size was the more probable.

The selectivities by length for both the 90 and the 120 mm ogives were multiplied against the length frequencies of the Canadian R/V cruise (1978) redfish catches for ICNAF Subdivisions 4Vs and 4Vn. These results were compared to samples collected by port samplers (Maritimes) during the months June, July, and August from 4Vs and 4Vn. These comparisons indicate most of the port samples from the Maritimes region in summer are collected from vessels fishing with 120 mm meshes (Figure 4). This has been verified by personal communication with the port samplers who cover most redfish landings from the Scotian Shelf.

References

Clay, J.D. (1979) Current mesh selection studies on Scotian Shelf in relation to historical selection data. ICNAF Sel. Pap. 5:49-60.
Holden, M.J. (ed). (1971) Report of the ICES/ICNAF Working Groups on selectivity analysis. Coop. Res. Rep. ICES. 25:144 p.

Table 1. Selection parameters for Atlantic redfish (Sebastes mentella) used in synthesis of ogives.

Mesh Size (mm)	50% Retention Length (mm)	Range (mm)	Selection Factor (rounded)
60 (2 3/8 in)*	115	16	1.9
90 (3 1/2 in)	220	42	2.4
115 (4 1/2 in)	307	75	2.7
120 (4 5/8 in)	325	82	2.7
130 (5 1/8 in)	360	100	2.8

* Current minimum mesh size for foreign fleets fishing silver hake (Merluccius bilinearis).

Table 2. Selection ogives (% of each length interval retained in the codend) for the Atlantic redfish, Sebastes mentella.

Codend Mesh Size (mm)	60	90	115	120	130
Length Interval (cm)					
6	0*				
7	1*				
8	3*				
9	7*				
10	15*				
11	35				
12	65				
13	85*				
14	93*				
15	96*	0*			
16	99*	2*			
17	100*	5*			
18		11*			
19		18*			
20		26			
21		38		0*	
22		50	0*	2*	
23		61	2*	4*	0*
24		73	6*	6*	1*
25		82*	10*	10*	2*
26		89*	15*	14*	5*
27		94*	22*	19*	8*
28		98*	30	24*	11*
29		100*	37	30	15*
30			44	36	20*
31			53	41	25
32			60	47	30
33			68	53	35
34			75	59	40
35			82*	65	45
36			87*	70	50
37			92*	76*	55
38			96*	82*	60
39			98*	87*	65
40			100*	91*	70
41				94*	75
42				97*	80*
43				99*	85*
44				100*	89*
45					93*
46					95*
47					98*
48					99*
49					100*
50					

* values interpreted from graphs of Figure 3.

Table 3. Selection ogives for Atlantic redfish (*Sebastes mentella*) as calculated by computer (sine) simulation.

CODEND MESH SIZE (mm)						
cm	80	90	115	120	130	cm
1	0.0	0.0	0.0	0.0	0.0	1
2	0.0	0.0	0.0	0.0	0.0	2
3	0.0	0.0	0.0	0.0	0.0	3
4	0.0	0.0	0.0	0.0	0.0	4
5	0.0	0.0	0.0	0.0	0.0	5
6	0.0	0.0	0.0	0.0	0.0	6
7	0.0	0.0	0.0	0.0	0.0	7
8	0.0	0.0	0.0	0.0	0.0	8
9	0.0	0.0	0.0	0.0	0.0	9
10	9.3	0.0	0.0	0.0	0.0	10
11	34.3	0.0	0.0	0.0	0.0	11
12	65.4	0.0	0.0	0.0	0.0	12
13	90.6	0.0	0.0	0.0	0.0	13
14	100.0	0.0	0.0	0.0	0.0	14
15	100.0	0.0	0.0	0.0	0.0	15
16	100.0	.3	0.0	0.0	0.0	16
17	100.0	3.0	0.0	0.0	0.0	17
18	100.0	8.5	0.0	0.0	0.0	18
19	100.0	16.5	0.0	0.0	0.0	19
20	100.0	26.5	.2	.0	0.0	20
21	100.0	37.9	1.3	.5	.0	21
22	100.0	50.0	3.4	1.8	.4	22
23	100.0	62.0	6.3	3.7	1.3	23
24	100.0	73.4	10.0	6.5	2.8	24
25	100.0	83.4	14.5	9.8	4.7	25
26	100.0	91.4	19.6	13.8	7.1	26
27	100.0	97.0	25.3	18.4	10.0	27
28	100.0	99.7	31.5	23.5	13.3	28
29	100.0	100.0	38.1	28.9	17.0	29
30	100.0	100.0	44.8	34.7	21.0	30
31	100.0	100.0	51.7	40.7	25.4	31
32	100.0	100.0	58.5	46.9	30.0	32
33	100.0	100.0	65.2	53.1	34.8	33
34	100.0	100.0	71.6	59.2	39.8	34
35	100.0	100.0	77.5	65.3	44.8	35
36	100.0	100.0	83.0	71.0	50.0	36
37	100.0	100.0	87.8	76.5	55.1	37
38	100.0	100.0	91.9	81.6	60.2	38
39	100.0	100.0	95.3	86.1	65.2	39
40	100.0	100.0	97.8	90.1	70.0	40
41	100.0	100.0	99.3	93.5	74.6	41
42	100.0	100.0	100.0	96.2	78.9	42
43	100.0	100.0	100.0	98.2	83.0	43
44	100.0	100.0	100.0	99.5	86.7	44
45	100.0	100.0	100.0	100.0	90.0	45
46	100.0	100.0	100.0	100.0	92.8	46
47	100.0	100.0	100.0	100.0	95.3	47
48	100.0	100.0	100.0	100.0	97.2	48
49	100.0	100.0	100.0	100.0	98.7	49
50	100.0	100.0	100.0	100.0	99.6	50

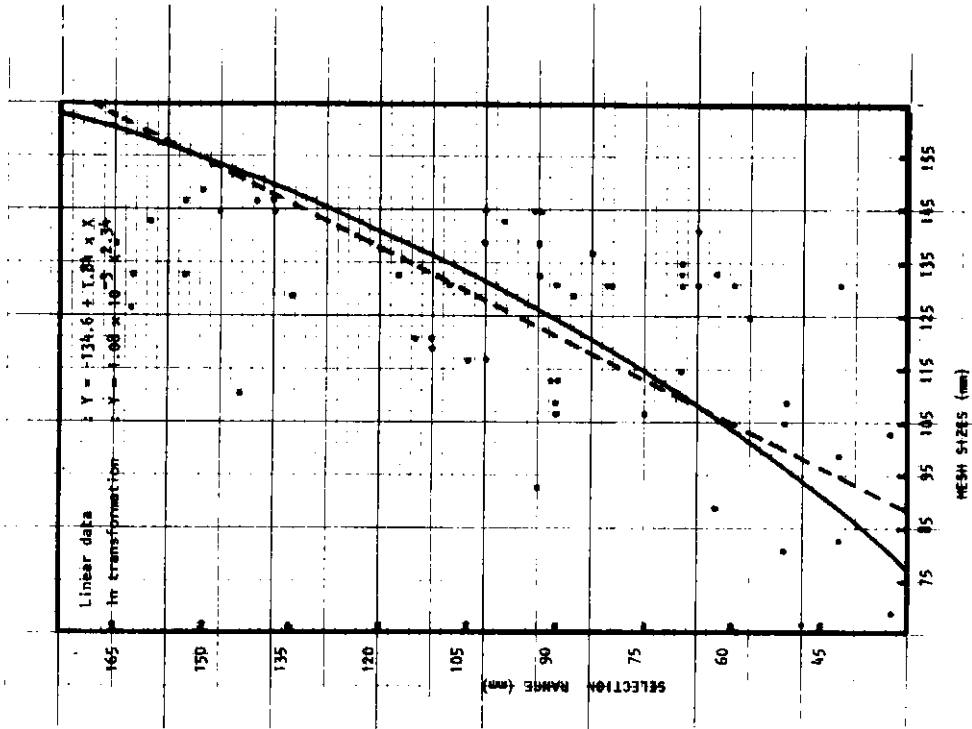


Fig. 2 Computer scatter graph of selection range vs. mesh size for Atlantic redfish (*Sebastes mentella*).

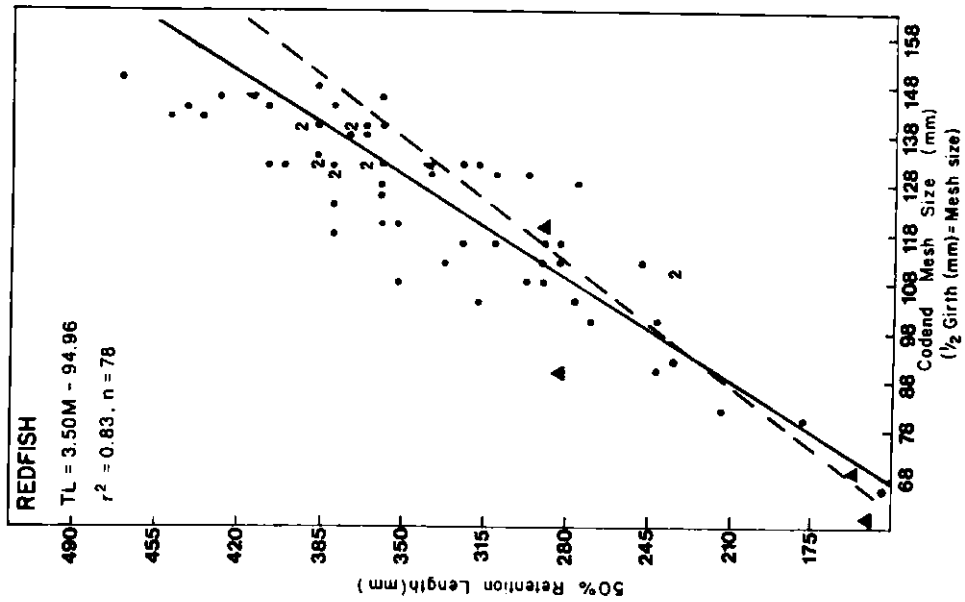


Fig. 1 General selection pattern for redfish based on historical mesh selection studies. (Each dot represents a single observation and numbers indicate points with two or more observations; triangles indicate points from the 1977 studies; the dashed line represents the length-girth relationship. The scatter graphs used throughout this paper are computer plots and as such have lower resolution than was found in the original data.)

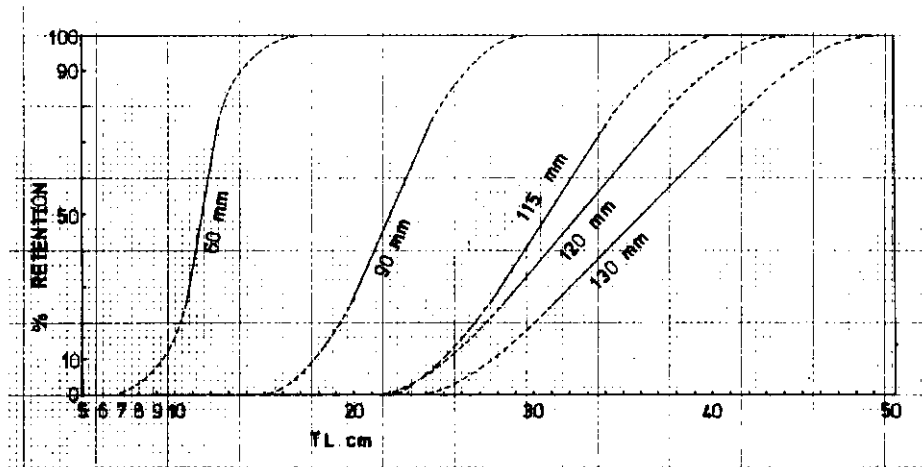


Fig. 3 Selection ogives for Atlantic redfish (*Sebastes mentella*) synthesised from historic data.

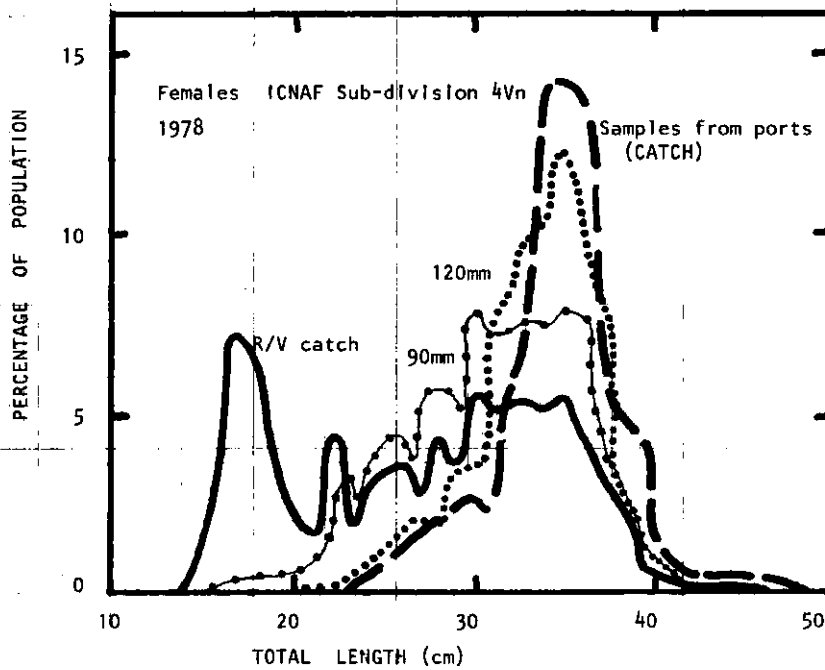


Fig. 4 Comparison of "true" catch with R/V populations (which are from the same time and area) that have been fished with 90mm and 120mm codend selectivities (synthesised).