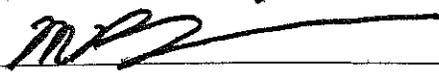


STATUS OF SEA HERRING FISHERIES OF THE
GULF OF MAINE - GEORGES BANK REGION

by

M.P. Sissenwine and G.T. Waring

<input checked="" type="checkbox"/>	Approved for Distribution
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INTRODUCTION

Sea herring fisheries off the northeastern coast of the USA can be categorized as follows: Maine inshore fishery; western Gulf of Maine fishery; Georges Bank fishery (including offshore mid Atlantic winter fishery); and southern New England fishery. Sea herring fisheries are also prosecuted to the north in the Bay of Fundy and on the Scotian Shelf. The degree of intermixing between stocks of herring exploited by these fisheries is unknown, although some intermixing certainly occurs. In the past, catches from the Georges Bank and southern New England (NAFO SA 5Z+6) have been lumped together for assessment and management purposes. This paper reviews 1979 catch data and research vessel survey data relevant to sea herring fisheries. Based on these data, the outlook for the fisheries off the northeastern USA is described. Catch data for the period 1960-1979 are given in Tables 1 and 2.

REVIEW OF FISHERY PERFORMANCE

The 1979 catch of the inshore Maine fishery totaled 41,000 tons. This was the highest catch observed since 1963. The catch was dominated by the 1977 year class (age 2) which accounted for about 26,000 tons. The bulk of the remainder of the catch was comprised of 1976 year class fish (age 3). The catch in numbers at age 2 was the highest observed since 1968 when the fishery depended on the strong 1966 year class. The catch of age 3 fish in 1979 was comparable to that of the 1973 year class, which later contributed significantly to the western Gulf of Maine fishery. The catch at age 1 during 1979 was the lowest observed since 1972 when the weak 1971 year class first became vulnerable to the Maine inshore fishery.

If it is assumed (as has been done in the past) that catch in the Maine inshore fishery is an indicator of year class strength, then the 1976 and 1977 year classes should be strong contributors to the future western Gulf of Maine fishery. On the other hand, the available evidence indicates that the 1978 year class may be small. It is difficult to interpret the significance of the low catch of age 1 herring in 1979, because the great abundance of the 1976 and 1977 year classes may have discouraged the landing of smaller one year old fish. In the past, the catch of one year old fish has been low when older fish are abundant, but since such year-classes (poor performance at age one) were generally weak (like 1971 year-class), the significance of the abundance of other fish is unknown.

The 1979 catch in the western Gulf of Maine fishery was 23,500 tons. The 1975 year class (age 4) was the predominant contributor to the catch, 6,900 tons. The catch from the 1976, 1974, and 1973 year classes (age 3, 5, and 6) were 4,700, 3,700 and 4,100 tons, respectively.

Adult sea herring (age 3+) were readily available to the western Gulf of Maine commercial fishery during 1979 as was expected based on the assessment reported by Sissenwine and Waring (1979), although the contribution of the 1976 year class was not as large as was expected. This probably reflects the fact that only a small proportion of sea herring at age 3 are sexually mature, and therefore most are not available to autumn fisheries prosecuted on the spawning grounds.

The catch in the western Gulf of Maine increased by approximately 25% in 1979. Since the fishery was closed twice during that year, it is likely that the total catch would have been substantially higher if left unregulated.

The total catch from the SA 5Z+6 during 1979 was about 2,000 tons. The fishery was dominated by the 1976 year-class. This was taken during winter in the southern New England area. There was no autumn spawning ground fishery on Georges Bank as has been the case since 1976. No foreign fishing was permitted.

RESEARCH SURVEYS

Catch of sea herring during the 1979 spring bottom trawl survey conducted by the Northeast Fisheries Center varied between area (Table 3). The catch in the Gulf of Maine (with the 1977 year-class dominant) was the highest observed since 1968 when surveys first began. The catch on Georges Bank increased slightly over the 1978 value but still below historical levels. The southern New England catch was the highest since 1970 (significant 1973 year-class) but the mid Atlantic catch was the lowest observed since 1968. Thus, there is little evidence of recovery of the offshore stocks. In addition an autumn survey of Georges Bank by the FRG R/V ANTON DOHRN failed to locate significant spawning concentrations. Note that the R/V ANTON DOHRN did not survey the northeast peak of Georges Bank. In aerial surveys conducted by Zapata Corporation under contract to NMFS also failed to locate spawning concentrations. This may reflect the possibility that the 1976 year-class did not mature at age 3, and therefore did not recruit to the spawning grounds. To date, only the 1960, 1966, and 1970 year-classes (all strong) have show evidence of significant spawning activitiy at age 3.

CONCLUSION

Available information (biostatistical and survey) indicates that the Gulf of Maine herring fishery has begun its recovery from the depressed state of the late 1970's and will continue to rebuild this year as a result of the 1976 and 1977 year-classes unless the catch in 1980 increases sharply. Given the poor performance of the 1978 year-class in the inshore Maine fishery. These year-classes (1976, 1977) may have to sustain the fishery through at least 1981.

The spring 1979 NEFC bottom trawl survey does not indicate that significant rebuilding in SA 5Z+6 has begun. Only in southern New England is there survey evidence of rebuilding. Spawning concentrations were not detected on Georges Bank during the autumn of 1979. However, a significant increase in spawning stock size might be expected during the autumn of 1980.

REFERENCE

Sissenwine, M.P., and G.T. Waring. 1979. An analysis of sea herring fisheries of the northwest Atlantic from Cape Hatteras to southwest Nova Scotia. ICES C.M. 1979/H:56.

Table 1. Catch in 1000's of metric tons by fishery

Year	Maine Inshore	Western Gulf of Maine	SA 52+6 Georges Bank-Southern New England
1960	57		
1961	24		67
1962	68		152
1963	67		98
1964	26		131
1965	32		43
1966	26		143
1967	29	7	219
1968	31	33	372
1969	24	32	311
1970	16	41	247
1971	12	39	267
1972	20	43	174
1973	16	16	202
1974	19	18	149
1975	15	22	146
1976	30	20	42
1977	32	18	2
1978	29	19	2
1979	41	23	2

Table 2. Catch in millions by age, year and fishing ground.

Year	Southwest Nova Scotia (4Wax)										
	AGE										
	1	2	3	4	5	6	7	8	9	10	11+
65	237.99	1756.80	93.90	293.00	56.30	10.80	1.80	0.60			
66	147.00	948.80	837.80	118.60	349.30	46.60	14.00	7.70	1.70	0.20	
67	743.30	738.80	199.40	368.80	121.90	163.30	59.00	4.60	0.40	0.30	0.10
68	153.90	2932.50	159.10	104.80	318.20	76.70	93.50	32.70	15.40	5.70	1.10
69	159.40	617.60	612.50	136.00	171.50	119.70	68.60	24.50	6.60	2.70	0.70
70	621.70	831.70	83.60	297.70	206.80	123.80	114.10	42.10	21.30	7.00	2.70
71	157.70	535.60	216.90	113.90	117.20	77.50	96.50	51.10	36.90	7.50	5.70
72	14.70	1567.50	84.00	164.10	85.30	89.40	59.60	60.70	31.30	15.10	12.50
73	29.80	255.30	902.40	130.30	35.40	26.10	19.40	17.80	19.80	9.70	11.10
74	16.20	372.50	86.00	644.70	54.30	15.30	8.10	5.30	11.00	5.80	7.40
75	16.10	713.40	235.00	102.60	400.00	52.80	10.50	4.20	3.80	3.00	4.80
76	51.80	247.70	280.80	150.60	87.20	229.90	20.50	5.40	4.10	2.00	3.20
77	516.20	179.60	29.50	213.80	113.40	62.50	155.50	12.70	2.90	1.30	3.40
78	249.16	1241.09	88.31	15.00	116.60	61.49	59.03	65.41	9.84	2.17	1.50
	Inshore Maine										
65	40.90	932.90	57.80	2.40	4.20						
66	21.00	291.70	208.50	2.20	10.10	1.30	0.40	0.20			
67	21.50	248.10	122.10	33.70	17.70	3.50	0.00	0.00	1.80		
68	7.80	877.30	151.60	5.60	2.00	0.00	0.00	0.00	0.00		
69	5.70	216.60	249.00	11.50	0.60	0.50	0.30	0.20	0.20		
70	1.90	183.10	45.20	17.20	8.40	3.40	1.70	1.60	0.50		
71	109.00	61.90	17.70	21.00	7.80	1.60	0.50	0.40	0.30		
72	0.20	338.90	7.10	3.10	1.20	1.40	0.90	0.00	0.00		
73	10.60	154.90	72.40	1.10	0.80	0.40	0.50	0.20	0.20		
74	30.50	174.90	52.60	20.80	1.20	0.30	0.60	0.00	0.00		
75	35.20	171.80	25.20	4.70	5.50	0.40	0.00	0.00	0.40		
76	24.80	310.10	111.40	6.40	5.30	5.80	0.40	0.20	0.60		
77	81.74	440.17	75.76	11.41	2.27	1.48	5.02	0.10	0.10		
78	17.70	307.10	62.80	8.00	10.70	1.20	2.10	8.60	0.30		
79	3.33	746.95	131.74	8.97	0.88	1.27	0.93	0.34	0.52		
	Western Gulf of Maine										
67	0.00	0.30	3.00	7.40	13.40	8.20	0.60	0.30	0.20	0.20	
68	0.00	0.60	17.70	17.40	29.50	29.30	28.00	18.40	3.20	2.40	2.00
69	0.00	1.70	39.00	6.20	9.90	22.50	26.70	21.10	11.00	2.60	1.70
70	0.00	3.40	9.30	26.40	18.40	26.80	26.90	23.30	28.00	13.80	2.70
71	0.00	0.60	23.10	22.70	34.00	36.80	26.30	16.00	11.00	7.30	3.20
72	1.10	21.20	17.00	37.50	39.80	42.40	27.50	9.30	1.40	1.30	0.80
73	0.00	2.20	18.60	5.70	10.40	13.20	15.60	7.20	2.10	0.40	0.20
74	0.00	4.00	15.00	62.80	7.20	5.10	3.60	3.00	1.40	0.80	0.30
75	0.00	0.30	20.30	19.80	61.40	5.20	3.80	1.80	1.40	0.80	0.30
76	0.00	0.00	22.50	13.60	11.90	53.90	3.90	0.70	0.90	0.20	0.10
77	0.00	1.50	7.20	27.60	10.60	9.50	39.70	2.60	0.20	0.30	0.20
78	0.00	2.09	17.39	10.61	24.23	4.25	6.43	22.65	1.03	0.42	0.17
79	0.00	4.25	37.23	34.11	14.27	14.26	2.63	3.14	6.38	0.29	0.01
	SA 52+6 Georges Bank - Southern New England										
65	0.00	0.40	10.30	34.90	103.00	25.50	12.70	9.30	0.00	0.00	0.00
66	0.00	0.30	12.80	34.60	178.00	280.10	65.10	15.60	2.00	0.00	0.00
67	0.00	1.80	6.90	60.60	108.00	250.70	379.20	49.40	11.10	10.20	0.00
68	0.00	2.50	52.10	133.30	336.00	233.40	432.90	334.60	21.80	4.60	0.00
69	0.00	0.00	73.40	210.80	277.10	278.10	188.50	190.50	109.70	23.60	0.00
70	0.00	12.60	125.40	450.50	270.30	122.30	92.90	51.60	29.60	17.70	0.00
71	0.00	12.90	332.50	275.50	284.60	175.80	103.90	50.40	15.90	21.80	0.00
72	0.00	28.00	35.00	110.00	214.00	158.00	100.00	45.00	29.00	21.00	0.00
73	0.00	10.00	1026.00	266.00	64.00	33.00	23.00	12.00	3.00	5.00	0.00
74	0.00	1.90	39.90	608.90	68.60	12.90	6.10	3.50	2.10	0.00	0.00
75	0.00	1.40	11.30	76.80	503.00	34.60	12.50	6.20	4.20	0.10	0.00
76	0.00	0.50	7.50	6.60	18.60	140.80	5.10	2.30	1.20	0.30	0.00
77	0.00	0.02	0.30	6.90	1.20	0.20	1.90	0.04	0.05	0.01	0.00
78	0.00	0.10	3.65	2.33	4.23	0.52	0.27	1.19	0.01	0.01	0.00
79	0.00	0.00	5.07	2.07	0.41	0.37	0.01	0.03	0.01		

Table 3. STRATIFIED MEAN NUMBERS/HAUL OF 2-6+ YEAR OLD HERRING IN 1968-77 SPRING OFFSHORE SURVEYS.

AL. IV ¹	Block	Year	Age 2		Age 3		Age 4		Age 5		Age 6+		Σ		No. of tows
			No./Tow	%	No./tow	%	No./tow	%	No./tow	%	No./tow	%	No./tow	%	
	Block 1	1968	1.91	68.21	0.89	31.79	0	-	0	-	0	-	2.80	100	21
	Block 1	1969	0	-	0.61	81.33	0.14	18.67	0	-	0	-	0.75	100	22
	Block 1	1970	3.14	74.94	0.88	21.02	0.06	1.43	0.03	.72	0.08	1.91	4.19	100	28
	Block 1	1971	1.16	12.42	0.32	3.42	1.09	11.67	1.02	10.92	5.75	61.56	9.34	100	38
	Block 1	1972	8.11	100.00	0	-	0	-	0	-	0	-	8.11	100	35
	Block 1	1973	0.83	9.43	5.36	60.91	0.81	9.21	0.48	5.46	1.32	1.32	8.80	100	33
	Block 1	1974	2.67	68.46	0.33	8.46	0.78	20.00	0.04	1.03	0.08	2.05	3.90	100	29
	Block 1	1975	0.53	53.00	0.04	4.00	0.03	3.00	0.24	24.00	0.16	16.00	1.00	100	12
	Block 1	1976	0.10	3.60	2.19	79.06	0.23	8.30	0.08	2.89	0.17	6.14	2.77	100	20
	Block 1	1977	0.24	10.25	0.54	23.08	1.08	46.15	0.21	8.97	0.27	11.54	2.34	100	9 ²
	Block 1	1978	0	-	0.04	50.00	0.01	12.50	0.02	25.00	0.01	12.50	0.08	100	38 ²
	Block 1	1979	0	-	2.14	99.07	0.02	0.93	0	-	0	-	2.16	100	11 ²
	Block 2	1968	3.60	70.73	1.24	24.36	0.19	3.73	0	-	0.06	1.18	5.09	100	67
	Block 2	1969	0.03	4.62	0.53	81.54	0.03	4.62	0	-	0.06	9.23	0.65	100	66
	Block 2	1970	1.18	60.20	0.58	29.59	0.02	1.02	0.02	1.02	0.16	8.16	1.96	100	73
	Block 2	1971	0.79	75.24	0.23	21.91	0	-	0	-	0.03	2.85	1.05	100	77
	Block 2	1972	2.19	9.163	0.03	1.26	0.03	1.26	0.03	1.26	0.11	4.60	2.59	100	76
	Block 2	1973	0.21	3.54	0.72	12.12	0.50	8.42	0.84	14.14	3.67	61.79	5.94	100	68
	Block 2	1974	0.28	32.56	0	0	0.47	54.65	0.05	5.81	0.06	6.98	0.86	100	71
	Block 2	1975	0.12	4.53	0.45	16.98	0.26	9.81	1.71	64.53	0.11	4.15	2.65	100	65
	Block 2	1976	2.33	77.67	0.20	6.67	0.02	0.67	0.03	1.00	0.42	14.00	3.00	100	80
	Block 2	1977	0.44	74.56	0.04	6.77	0.04	6.77	0.01	1.69	0.06	10.18	0.59	100	77
	Block 2	1978	0.27	54.00	0.04	8.00	0.01	2.00	0.03	6.00	0.15	30.00	0.50	100	93
	Block 2	1979	11.47	85.85	1.18	8.83	0.53	3.97	0.10	0.75	0.08	0.60	13.36	100	98
	Block 3	1968	0.43	58.11	0.06	8.11	0.08	10.81	0.06	8.11	0.11	14.37	0.74	100	59
	Block 3	1969	0	-	0	-	0	-	0	-	0.06	100.0	0.06	100	64
	Block 3	1970	2.78	51.96	1.68	31.40	0.36	6.73	0.06	1.12	0.47	8.79	5.35	100	59
	Block 3	1971	0.06	5.31	0.62	54.37	0.42	37.17	0.03	2.66	0	-	1.13	100	62
	Block 3	1972	3.56	26.97	8.58	68.86	0.30	2.41	0.19	1.53	0.03	0.24	12.46	100	65
	Block 3	1973	0	-	7.31	83.73	0.75	8.59	0.33	3.78	0.10	1.15	3.73	100	61
	Block 3	1974	0	-	0.02	0.23	5.62	65.20	1.41	16.36	1.57	18.21	3.62	100	57
	Block 3	1975	0.13	4.26	0.08	2.62	2.75	90.16	0.09	2.96	0	-	3.05	100	53
	Block 3	1976	0	-	0.53	31.18	0.03	1.77	0.02	1.18	1.12	65.88	1.70	100	60
	Block 3	1977	0.02	4.87	0.18	43.90	0.12	29.26	0.05	12.20	0.04	9.77	0.41	100	61
	Block 3	1978	0.01	1.56	0.41	64.06	0.03	4.69	0.02	3.12	0.17	26.56	0.64	100	66
	Block 3	1979	0	-	0.12	15.00	0.44	55.00	0.15	18.75	0.09	11.25	0.80	100	108
	Block 4	1968	18.18	7.50	96.42	39.76	21.45	8.85	42.41	17.49	64.05	26.41	242.51	100	37
	Block 4	1969	3.13	7.05	10.50	23.67	2.84	6.40	17.84	40.21	10.06	22.67	44.37	100	62
	Block 4	1970	38.19	48.21	17.49	22.08	8.44	10.66	8.99	11.35	6.10	7.70	79.21	100	74
	Block 4	1971	1.36	14.67	5.39	58.15	1.07	11.54	0.72	7.77	0.73	7.88	9.27	100	68
	Block 4	1972	0.66	5.11	7.37	57.04	2.42	18.73	1.73	13.39	0.74	5.73	12.92	100	70
	Block 4	1973	0.10	0.61	14.00	84.69	0.85	5.14	0.53	3.21	1.05	6.35	16.53	100	94
	Block 4	1974	0.02	0.17	0.14	1.19	10.90	92.37	0.50	4.24	0.24	2.03	11.30	100	58
	Block 4	1975	0.02	6.45	0.03	9.68	0.02	6.45	0.18	58.07	0.06	19.36	0.31	100	63
	Block 4	1976	0.13	7.65	0.42	24.71	0.03	1.77	0.11	6.47	1.01	59.41	1.70	100	64
	Block 4	1977	0.03	1.12	0.30	11.19	1.29	48.13	0.34	12.69	0.72	26.87	2.68	100	65
	Block 4	1978	0.25	2.45	7.66	75.10	1.07	10.49	0.90	8.82	0.32	3.14	10.20	100	66
	Block 4	1979	0.10	0.63	1.52	9.58	4.29	27.03	2.78	17.52	7.18	45.24	15.87	100	79
	Block 5	1968	0.11	0.23	8.80	18.71	3.52	7.49	13.31	28.30	21.99	45.27	47.03	100	58
	Block 5	1969	0.08	0.45	3.97	22.42	1.98	11.18	3.58	20.22	8.08	45.62	17.71	100	52
	Block 5	1970	0	-	0.25	7.36	0.16	5.03	0.88	27.67	1.89	59.43	3.18	100	55
	Block 5	1971	0	-	2.81	29.86	1.26	13.59	1.84	19.55	3.60	38.26	9.41	100	53
	Block 5	1972	0	-	0.08	1.25	2.75	43.10	2.06	32.39	1.49	23.35	6.38	100	54
	Block 5	1973	0	-	9.45	65.40	1.95	13.50	1.15	7.96	1.90	13.15	14.45	100	55
	Block 5	1974	0.04	1.75	0.06	2.62	1.85	80.79	0.17	7.42	0.15	6.55	2.29	100	38
	Block 5	1975	0	-	0	-	0	-	0	-	t	t	-	100	34
	Block 5	1976	0	-	0	-	0	-	0.01	1.27	0.78	98.73	0.79	100	50
	Block 5	1977	0	-	0	-	0.03	11.54	0.02	7.69	0.21	30.77	0.26	100	31
	Block 5	1978	0	-	0	-	0.02	1.87	0.60	0.56	0.45	42.06	1.07	100	53
	Block 5	1979	0	-	0	-	0.01	9.09	0.01	9.09	0.09	81.82	0.11	100	52

¹ ALBATROSS IV data 1968-72 increased by a factor of 2.75 to account for the ration between the #41 and #56 trawls.

² ALBATROSS IV did not fish in the survey stata 41-42.