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The Inshore Herring Fisheries in the  
Southern Gulf of St. Lawrence

by

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Abstract

Catch statistics for inshore herring by fishery statistical district in the southern Gulf of St. Lawrence 1967 are compiled. In all major fisheries, catches have declined since the 1960's through 1972. For the Magdalens and Caraquet areas, the decreasing trends in their catches continued after 1972, but for Escuminac the trend was less obvious. Fishing effort and catch-per-unit-effort for the inshore fisheries in 1978 and 1979 were examined. CPUE varied widely between districts ranging between .860 and 4.024 mt/trip. On the average CPUE decreased from 2.349 mt/trip in 1978 to 1.540 mt/trip in 1979.

Linear regressions of inshore spring catches vs. stock biomass showed a good relationship between stock abundance and total catches for the entire inshore fisheries. Taken separately, however, the individual fisheries showed low regression coefficients with stock biomass. This indicates that estimates of stock biomass based on offshore purse seine catches may not reflect adequately the fluctuations in abundance of individual herring stocks which are being fished by the inshore herring fisheries in the southern Gulf of St. Lawrence.

Résumé

Nous avons compilé les prises de hareng de la pêche côtière par districts statistiques du sud du golfe du Saint-Laurent depuis 1967. Des années 1960 à 1972 inclusivement, les prises ont décliné dans toutes les principales régions. Dans les régions des Iles-de-la-Madeleine et de Caraquet ces tendances vers le bas continuèrent après 1972. Par contre, elles furent moins évidentes dans la région d'Escuminac. Nous avons analysé l'effort de pêche et les prises par unité d'effort des pêches côtières en 1978 et 1979. Les PUE varient largement entre districts de 0.860 à 4.024 tm/voyage. La PUE moyenne diminua de 1978 à 1979 passant de 2.349 tm/voyage à 1.540 tm/voyage.

Il y a une bonne corrélation entre l'abondance des stocks et les prises totales de toutes les pêches côtières de hareng, comme le démontrent des régressions linéaires des prises côtières de printemps vs la biomasse des stocks. Considérées séparément, cependant, les pêches individuelles ne montrent que de faibles coefficients de régression avec la biomasse des stocks. Ceci veut dire que les estimations de biomasse des stocks fondées sur les prises de sennes coulissantes en haute mer ne sont pas nécessairement de bons indicateurs des fluctuations d'abondance des stocks individuels de harengs pêchés par la flotte côtière dans le sud du le golfe du Saint-Laurent.

The recent decline in herring stocks in the Gulf of St. Lawrence accompanied by a shift in their spatial and temporal distribution, and a collapse of some of the traditional fisheries there, has caused much concern on the future of these fisheries. With the decline in herring catches, the mobile fleet have shifted their operations from offshore areas to near the spawning grounds where the inshore fisheries exist. Many local communities depend on herring as the mainstay of their economic livelihood, and the failure of these fisheries would have serious repercussions on these communities.

A departmental fishery management objective in the Gulf is the protection of the inshore fisheries and the herring spawning grounds. Management of these fisheries necessitates good catch statistics and catch-per-unit-effort data. Collection of CPUE data required re-analysis of purchase slip data for 1978 and 1979 since these were the only data available on computer tapes at present. An investigation of a representative inshore herring fishery in the Miramichi Bay, the largest spring fishery in the southern Gulf of St. Lawrence, was also conducted. This report summarizes results of these investigations.

### Catch statistics

Table 1 presents the inshore herring landings by fishery statistical district and province in the Gulf of St. Lawrence for the past 13 years (1967-1979). A map including Statistical Unit Areas and Fisheries Statistical Districts for the Maritimes region on the Gulf of St. Lawrence is shown in Figure 1. As can be seen in Table 1, the largest inshore landings in recent years were taken in the Escuminac area, New Brunswick (Districts #73 and 75) followed by those in Caraquet (Districts #65, 66 and 67) and the Magdalen Islands, Quebec (Districts 26, 27 and 28).

In all the three major fisheries, landings have declined since the 1960's through 1972. For the Magdalens and Caraquet, the decreasing trends continued after 1972, but for the Miramichi Bay (Escuminac) the trend was less obvious (Figure 2).

Table 2 shows the seasonality of the Miramichi Bay fishery. Monthly landings of herring for 1947-1978 are presented. Except for 1972 and 1973 which were exceptional, the fishery is mainly dependent on spring catches. Landings from the fall fishery were only 18%, 16% and 7% of the landings in the past three years respectively.

### Fishing effort and catch-per-unit-effort

Reliable data on fishing effort of any of the inshore herring fisheries in the Gulf of St. Lawrence are scarce. In 1979 a project was initiated to examine any available fishing effort data for the inshore fisheries. Some purchase slips for fish catches in the past 10 years or so were found in the Public Archives, Dartmouth, N.S. On each purchase slip data on catch by day, fishing gear and landing port are recorded. Examination of two years of data (1978 and 1979) and analysis of the results were completed. Results are presented in Tables 3-6.

Since purchase slips are only made out when fish are landed, fishing effort (E) shown in these tables represents the number of successful fishing trips. In most of these entries, one trip is made each day. No records of number of days spent in unsuccessful fishing trips can be obtained. Number of unsuccessful trips may not be significant, particularly, at the peak of the fishing season. However for slack periods, the exclusion of unsuccessful trips could result in underestimating the actual effort. Catch-per-unit-effort (CPUE) is the amount of herring (mt) landed and delivered to the buyer in a particular day as shown in the purchase slip records. For fish trade transactions made outside this system (e.g. fish kept for bait, etc.), these catches are not recorded, hence CPUE is not adjusted for this portion. Some advantages of CPUE data based on the inshore fisheries are firstly, there is no searching time spent on catching the fish, and secondly, the catch locality in almost all cases is in the general vicinity of the landing port since these fisheries are operated by small local vessels.

CPUE data were examined separately by set and drift gillnets, which represent most of the inshore catch. Driftnets are generally used in the summer and fall fishery while setnets are generally used to catch spring herring. The distinction between these gear types was found to be vague and discrepancies among fishery districts in using these gear codes interchangeably were found. For example, catches in district 73 during the spring were recorded for driftnets when only setnets were in use. For this reason data for the two gears were combined (Tables 3-6).

Slight differences may be noticed between the total landings presented in CPUE tables and those of the landing statistics (Table 1). These differences are due to the inclusion of small catches taken by miscellaneous gear in the tables of landing statistics.

Landing statistics and CPUE data are summarized into geographical areas based on information on stocks (Ware and Henriksen 1978; Messieh, unpublished data) and fishing practice (Fig. 3). Data presented in Table 6 show that the 5 selected fisheries made up 88% and 86% of the total inshore fisheries in the southern Gulf in 1978 and 1979 respectively. During these two years fishing effort increased by 43% which CPUE decreased by 34%.

Purchase slip records, source data of CPUE shown here, do not show the number of gillnets fished by each fisherman. In order to obtain an estimate of fishing effort in terms of number of gillnets, an interview with a sample of fishermen from the largest fishery in Escuminac, Miramichi Bay was made in spring of 1979. During these interviews, it was learned that the fishermen used different sizes of nets depending on their boat size, and condition of the fishery. Usually the nets fished are multiples of a standard net size measuring 15 fathoms in length and 40 meshes deep. Hence, all number of nets were adjusted to standard size as shown in Table 7. In this table, average fishing effort in terms of number of standard nets per fisherman are presented for 1975 through 1979. It can be seen that during this period number of nets per fisherman has increased from 65.8 in 1975 to 91.1 in 1979.

Table 8 presents the number of setnets per fisherman, as obtained from interviews with 44 fishermen in Escuminac area. This table, also, includes estimates of catch/fisherman/day, as obtained from purchase slip records at

the Escuminac Co-op, and estimates of catch/net/day based on these figures. Similar trends are evident for catch/fisherman/day and catch per purchase slip from Table 6. However, the latter values were slightly lower.

Lower values of catch/fisherman/day could be the result of two factors. Firstly, because of membership requirements, estimates based on Co-op data represent catches by fishermen who live in the area and are familiar with the fishing grounds. Secondly, multiple landings (=purchase slips) for a fisherman in one day were totalled and only this total value used. This tends to lower the number of purchase slips by which the total catch is divided, and thus, raise the catch/fisherman/day estimates.

In May, 1979 an aerial survey was carried out to record the number and distribution of herring gillnets fishing in the Miramichi Bay. Two flights were made on May 24 and 28. Pictures were taken in sequence along three transects near the southern shore from Point Escuminac westwards to Baie du Vin. Figure 4 shows the distribution and intensity of gillnets in these two days. Over 3,000 standard gillnets were located in a narrow stretch between Escuminac and Baie St. Anne. This number is much less than that fished during the peak fishing season. Based on the fishermen interview, number of fishermen and average number of nets per fisherman, an estimate of 10,000 standard nets were fishing in Escuminac area on May 7-9, 1979.

#### Estimates of stock biomass

The biomass of spring spawning herring populations in the Gulf of St. Lawrence was estimated from Winters and Moores (1979) using estimates of population numbers-at-age from cohort analysis and mean weight-at-age (Table 9). Recruitment to the fishery was assumed at 40% for age 3, 90% for age 4 and 100% for age 5.

These calculations indicate that total spring biomass declined from 415,000 mt in 1969 to 105,300 mt in 1976, then increased to 226,400 mt in 1978 (Fig. 5).

Linear regressions of inshore spring catches vs. stock biomass are shown in Figures 6 and 7. The high value of correlation coefficient ( $r=0.92$ ) between total inshore landings and estimated stock biomass indicates that the inshore landings adequately reflect the fluctuations in stock biomass. Taken separately, the landings from the three inshore fisheries showed lower values of correlation coefficient with stock biomass (0.71, 0.68 and 0.40 for Caraquet, Magdalen Islands and Escuminac, respectively).

This indicates that estimated stock biomass based on offshore purse seine catches may not reflect accurately the fluctuations in abundance of individual herring stocks in the Gulf, each of which support an inshore fishery in their spawning area. It should be noted, however, that the interpretation of regression of herring catch on estimated stock size should be looked at with caution, since fishing effort has changed considerably, and catch may over-estimate CPUE trends.

References

Ware, D.M. and B.L. Henriksen. 1978. On the dynamics and structure of the southern Gulf of St. Lawrence herring stocks. Fish. and Marine Serv. Tech. Rept. 800, 83 p.

Winters, G.H. and J.A. Moores. 1979. An evaluation of recent changes in the population dynamics of southern Gulf of St. Lawrence. CAFSAC Research Document 79/28, 34 p.

Table 1. Landings (metric tons) in the major inshore herring fisheries in the Gulf of St. Lawrence.

FISHERY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Magdalen Islands (26, 27, 28)	9711.9	784.5	6037.0	4701.5	7218.0	3476.4	-	2645.8	2785.1	890.9	1827.1	-	-
Caraquet (65, 66, 67)	7415.5	13803.0	9042.9	7917.8	8864.0	7028.7	5067.4	3312.6	2221.1	2142.9	2279.0	2620.8	1982.9
Escuminac (73, 75)	5490.8	5611.5	4199.2	2858.6	1897.3	2586.2	5425.0	2983.3	2682.8	3045.1	1482.0	3471.2	3399.6
Shediac (78, 80)	857.1	725.7	601.5	617.3	610.5	721.3	579.4	527.6	150.2	262.4	261.8	463.1	333.3
Pictou (11)	112.4	307.8	344.6	530.9	880.1	746.9	910.6	848.3	452.6	441.1	259.9	244.8	915.6
Northern P.E.I. (82, 92)	435.1	555.2	309.8	254.0	639.9	62.4	275.2	213.4	401.9	146.2	137.1	406.4	476.2
TOTAL (only these areas)	24022.8	21787.7	20535.0	16880.1	20109.8	14621.9	-	10531.0	8693.7	6928.6	6246.9	-	-

Table 2. Inshore Herring Landings (metric tons) in Miramichi Bay,  
Fisheries Statistical Districts Nos. 70-73 for 1947-1978

YEAR	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL* TOTAL
1947	-	886.9	-	-	-	-	-	-	-	886.9
48	-	1074.9	90.9	-	-	-	-	-	-	1165.5
49	-	1027.2	17.7	-	-	-	-	-	-	1036.3
1950	-	1240.8	-	-	-	-	-	-	-	1240.8
51	408.7	665.7	-	-	5.0	10.5	-	-	-	1089.9
52	-	1821.8	-	-	6.1	-	-	-	-	1828.0
53	205	588.0	-	-	16.1	-	-	-	-	809.0
54	13.9	843.7	-	-	46.2	10.7	-	-	-	914.5
55	31.7	867.4	11.3	-	4.5	30.1	-	-	-	945.2
56	38.1	610.00	14.1	-	9.3	5.7	-	-	-	677.1
57	14.0	558.0	57.6	45.9	63.3	57.1	-	36.9	16.9	849.9
58	182.8	204.6	214.8	3.5	254.5	15.1	84.5	-	-	959.8
59	0.1	573.4	284.0	-	15.2	110.4	4.6	-	-	987.7
1960	-	1227.6	1.8	633.0	-	26.9	39.4	-	-	1928.7
61	-	592.2	833.3	196.8	-	10.0	1.5	-	-	1633.8
62	22.8	4114.4	360.2	284.2	13.1	333.3	-	-	-	5128.0
63	-	1236.6	176.9	0.4	6.6	15.1	-	-	-	1462.6
64	25.7	1109.4	-	1.0	6.0	11.4	2.3	-	-	1155.8
65	37.1	1667.9	98.9	80.2	13.5	37.5	0.7	-	-	1935.8
66	147.6	1354.1	365.1	654.1	69.3	68.7	5.7	-	-	2664.6
67	-	3582.2	978.7	-	31.8	79.7	-	-	-	4672.4
68	31.3	3189.3	192.8	-	297.6	113.8	-	-	-	3824.8
69	91.4	3259.5	45.6	0.1	130.4	317.3	21.9	-	-	3866.2
1970	187.6	2047.1	0.9	2.2	33.1	341.3	8.2	-	-	2620.4
71	12.0	1193.0	35.4	0.5	110.3	356.2	-	-	-	1707.4
72	-	1151.3	309.5	2.4	425.6	674.3	36.1	-	-	2599.2
73	7.9	3132.5	73.0	3.3	1236.5	1243.5	-	-	-	5696.7
74	-	2138.5	244.0	0.3	203.8	472.7	-	-	-	3059.3
75	-	1356.8	332.8	-	243.9	746.8	3.0	-	-	2683.3
76	8.0	2488.0	49.5	-	16.4	529.2	-	-	-	3091.1
77	2.0	1128.0	120.2	-	56.9	173.4	-	-	-	1480.5
78	0.9	3107.2	211.4	1.4	41.0	212.6	1.4	-	-	3575.9

\*Annual total could be slightly different than sum of months shown.



Table 3. Catch per unit effort of herring gillnet fishery in the Nova Scotia side of of the Gulf of St. Lawrence, 1978-79.

Fisheries Statistical District	Year	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		ALL YEAR		Gillnet Landings
		C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	
02	1978			2.193	6	.842	12									1.292	18	23.3
	1979			8.165	5	3.175	6					.250	5			3.820	16	61.1
03	1978					1.151	9	.059	4			.067	6	.097	3	.513	22	11.3
	1979	1.130	178	4.780	13	1.032	8	.416	6							1.337	205	274.1
11	1978							.592	70	.997	138	1.187	51			.925	259	239.6
	1979							1.007	173	1.110	409	.830	345	.293	3	.984	930	915.6
12	1978									.272	6	1.980	98			1.881	104	195.6
	1979									.227	1	1.144	88	.127	28	.893	117	104.5
13	1978	.109	1					.826	41	.089	14	.574	13	.148	6	.581	75	43.6
	1979			1.241	14	.204	3	.137	32	.193	14	.253	32	.045	1	.346	96	33.2
46	1978	.045	1													.045	1	2.8
	1979			3.311	1											3.311	1	3.3

Table 4. Catch per unit-effort of herring gillnet fishery in the New Brunswick side of the Gulf of St. Lawrence, 1978-1979.

Fisheries Statistical District	Year	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		ALL YEAR		Gillnet Landings
		C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	
65	1978			3.696	105	8.155	14	3.631	19	7.668	74	2.456	15	1.384	3	5.214	231	1249.1
	1979	1.134	1	1.307	140	13.048	13	.710	30	.619	82	.397	79	2.293	36	1.416	381	539.7
66	1978			20.412	1			1.856	17	4.609	158	4.129	19	1.968	6	4.331	201	870.5
	1979			2.241	16	.527	26	.585	29	3.033	47	3.384	230	1.158	139	2.311	487	1125.4
67	1978			1.361	1			.433	18	2.462	169	1.805	4			2.253	192	432.5
	1979	1.247	4	1.074	7	.680	21	.169	6			33.026	4	2.922	6	3.697	48	177.5
68	1978	9.072	2	4.234	3	1.361	1	.028	4	.076	1	2.774	12	2.049	3	2.763	26	71.9
	1979	8.316	3	2.078	14	.632	19	.486	7	.602	8	.678	10	.036	3	1.224	64	78.4
70	1978			9.072	4											9.072	4	36.3
	1979			3.405	25	2.447	7									3.195	32	102.2
71	1978			13.713	7											13.713	7	96.0
	1979																	
73	1978	.907	1	2.600	1144	3.645	58	.118	12	2.048	20	5.447	39	1.361	1	2.701	1275	3443.4
	1979	2.050	6	1.631	1604	3.316	50	2.099	3	5.154	22	8.713	35			1.872	1720	3219.8
75	1978	.454	1	4.536	1	22.680	1									9.223	3	27.7
	1979			.438	3											.438	3	1.3
76	1978			2.050	18	.234	57	.277	98							.448	173	77.5
	1979			.816	3	.035	1					2.305	18			1.998	22	43.9
77	1978							.320	11	.057	2					.279	13	3.6
	1979					.031	2									.031	2	.1
78	1978	.588	4	.376	123	.754	7	1.185	52							.621	186	115.5
	1979	.461	4	.889	139	.115	7	2.548	18			.062	1			1.019	169	172.2
80	1978	.730	5	1.612	184	6.036	7									1.748	196	342.4
	1979	1.066	31	.438	262	.797	7									.511	300	153.4

Table 5. Catch per-unit-effort of herring gillnet fishery in the Prince Edward Island side of the Gulf of St. Lawrence 1978-1979.

Fisheries Statistical District	Year	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		ALL YEAR		Gillnet Landings
		C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	
82	1978	.816	2	1.542	157	.238	95	.262	26	.071	2	.688	6	1.915	6	.983	294	288.9
	1979	.250	5	.977	89	.532	34	.243	1	.296	2	.718	18			.806	149	120.0
83	1978			.563	116	.824	3									.569	119	67.8
	1979	2.644	13	1.456	125											1.568	138	216.4
86	1978			5.534	1											5.534	1	5.5
	1979	.363	1										1.452	2	1.089	3		3.3
87	1978									.454	1	.122	3			.205	4	.8
	1979	1.134	1	.454	2			4.209	1	1.921	27	1.094	73	.362	2	1.369	106	128.9
88	1978	.467	1	1.053	19	.070	9	3.935	1			.353	4			.778	34	26.5
	1979	3.719	3	1.571	4			.457	7	.230	10	.140	3			.753	27	20.3
92	1978	1.134	2	.910	93	.330	32	.183	14	.266	13	.426	8	.426	12	.646	174	112.4
	1979	3.326	3	2.506	103	.191	49	.103	21	.233	24	1.890	27	.317	1	1.488	228	339.4
93	1978									.034	2					.034	2	.1
	1979	2.314	1	2.419	9	.196	2	.045	1							1.886	13	24.5
95	1978			2.608	2											2.608	2	5.2
	1979	2.835	2	10.773	4											8.127	6	48.8
96	1978			4.876	4											4.876	4	19.5
	1979	2.782	3	14.833	2											7.602	5	38.0

Table 6. Gillnet catch per-unit-effort for the major inshore herring fisheries in the Southern Gulf of St. Lawrence.

	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		ALL YEAR		% change from 1978- 1979		% Total Inshore Landings *
	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	C/E	E	
Caraquet 1978 (65,66,67)	-	-	3.830	107	8.155	14	2.006	54	4.269	401	3.224	38	1.773	9	4.024	623	-	-	32%
1979	1.224	5	1.389	163	3.293	60	0.604	65	1.499	129	3.009	313	1.442	181	2.011	916	-50%	+47%	24%
Escuminac 1978 (73,75)	0.681	2	2.602	1145	3.970	59	0.118	12	2.048	20	5.447	39	1.361	1	2.990	1278			42%
1979	2.050	6	1.630	1607	3.316	50	2.099	3	5.154	22	8.713	35			1.870	1723	-37%	+36%	41%
Shediac 1978 (78,80)	0.667	9	1.116	307	3.395	14	1.185	52							1.184	382			6%
1979	0.997	35	0.594	401	0.527	14	2.548	18			0.062	1			0.700	469	-41%	+23%	4%
Pictou 1978 (11)							0.592	70	0.997	138	1.187	51			0.925	259			3%
1979							1.007	173	1.110	409	0.830	345	0.293	3	0.984	930	+ 6%	+259%	11%
Northern 1978 P.E.I. (82, 92)	0.975	4	1.310	250	0.261	127	0.230	40	0.240	15	0.538	14	0.922	18	0.810	498			5%
1979	1.404	8	1.797	192	0.331	83	0.109	22	0.238	26	1.423	45	0.317	1	1.180	377	+46%	-34%	6%
TOTALS 1978	0.751	15	2.240	1809	2.010	214	0.978	228	3.295	574	2.838	142	1.211	28	2.340	3010			88%
1979	1.200	54	1.450	2363	1.924	207	0.954	281	1.309	586	2.162	739	1.417	185	1.540	4415	-34%	+47%	86%

\* Quebec landings not included

C = Catch in metric tons

E = Effort in terms of number of successful fishing trips as shown from purchase slips.

Table 7. Number of gillnets/fisherman (adjusted to a standard size of 15 fathoms long and 40 mesnes deep) in Escuminac inshore spring herring fishery (District 73) as reported in interviews with 44 fishermen.

Interviews	Number of gillnets				
	1975	1976	1977	1978	1979
1	44	44	44	44	56
2	187	187	187	187	233
3	-	-	-	-	100
4	10	10	10	10	12
5	30	30	30	30	30
6	107	124	124	133	133
7	36	36	36	36	36
8	56	94	113	150	138
9	14	10	14	4	19
10	31	31	31	31	31
11	18	18	18	18	18
12	125	135	146	156	167
13	-	-	-	20	20
14	43	43	46	46	48
15	98	98	98	98	98
16	-	-	-	100	100
17	15	15	15	15	15
18	62	62	62	62	62
19	28	28	28	28	37
20	106	106	106	106	125
21	-	7	7	13	24
22	89	67	67	89	89
23	52	72	72	93	112
24	22	28	28	28	33
25	14	14	14	14	14
26	208	208	417	417	417
27	104	104	104	104	112
28	16	16	16	16	16
29	-	-	109	136	136
30	25	25	25	25	25
31	156	156	156	222	222
32	120	120	120	120	120
33	22	33	33	33	17
34	38	50	56	63	81
35	11	11	11	11	11
36	13	11	11	11	13
37	7	7	7	7	7
38	40	40	40	40	200
39	9	9	7	7	7
40	31	36	36	36	45
41	133	133	133	133	133
42	75	75	75	75	250
43	207	207	207	207	207
44	160	160	189	189	189
Average effort/fisherman	65.8	66.5	75.0	78.2	91.1

Table 8. Fishing effort from personal interviews and catch-per-unit-effort in the Miramichi herring fishery (Fishery Statistical District #73)

Year	Number of boats <sup>1</sup>	Number of set-nets per fisherman <sup>2</sup>	Catch/ fisherman/day <sup>3</sup>	Catch/net/day
			(kg)	(kg)
1976	200	66.5	2140	32.2
1977	-	75.0	2230	29.7
1978	-	78.2	2800	35.8
1979	380	91.1	2090	22.9

<sup>1</sup> Exact number of boats not available. Many boats unrecorded - move from other areas during the fishing season.

<sup>2</sup> Standard net 15 fathoms long and 40 meshes deep.

<sup>3</sup> Obtained from purchase slip data

Table 9. Spring spawning herring stock biomass as estimated from cohort analysis (Winters and Moores, 1979). Recruitment to the fishery was assumed as 40%, 90% and 100% for ages 3, 4 and 5+ respectively.

Age \ Year	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
3	100	44	307	32	35	56	159	8	612	63	91
4	404	221	96	652	76	85	125	350	173	1412	131
5	277	402	152	90	649	76	86	95	331	173	1399
6	416	239	363	114	72	517	71	76	72	298	157
7	414	274	158	283	81	40	366	14	57	52	234
8	147	286	142	110	233	57	23	259	11	48	41
9	586	101	137	75	80	177	37	13	192	8	38
10	1519	333	52	67	47	58	127	20	6	139	6
11+	291	992	560	251	217	179	181	218	139	71	123
-----											
Total	4154	2892	1967	1674	1490	1245	1175	1053	1593	2264	2220
(mt x 10 <sup>-2</sup> )											

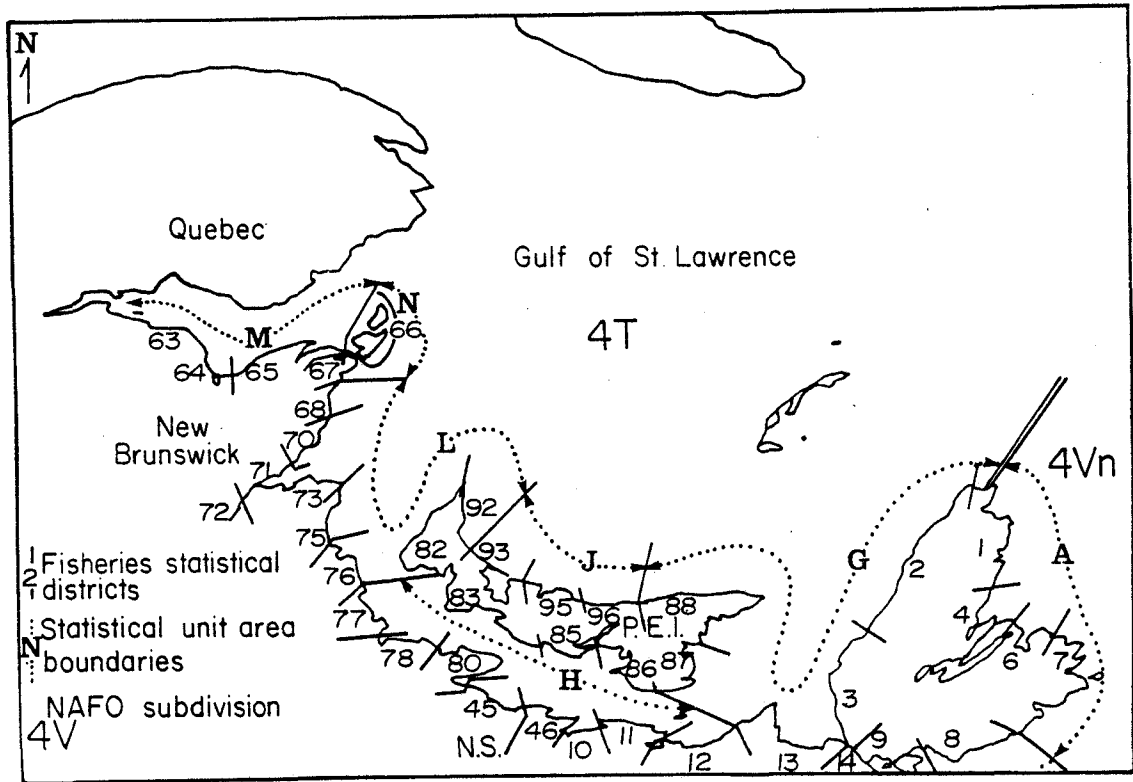


Figure 1. Gulf of St. Lawrence fisheries districts and NAFO Subdivisions.



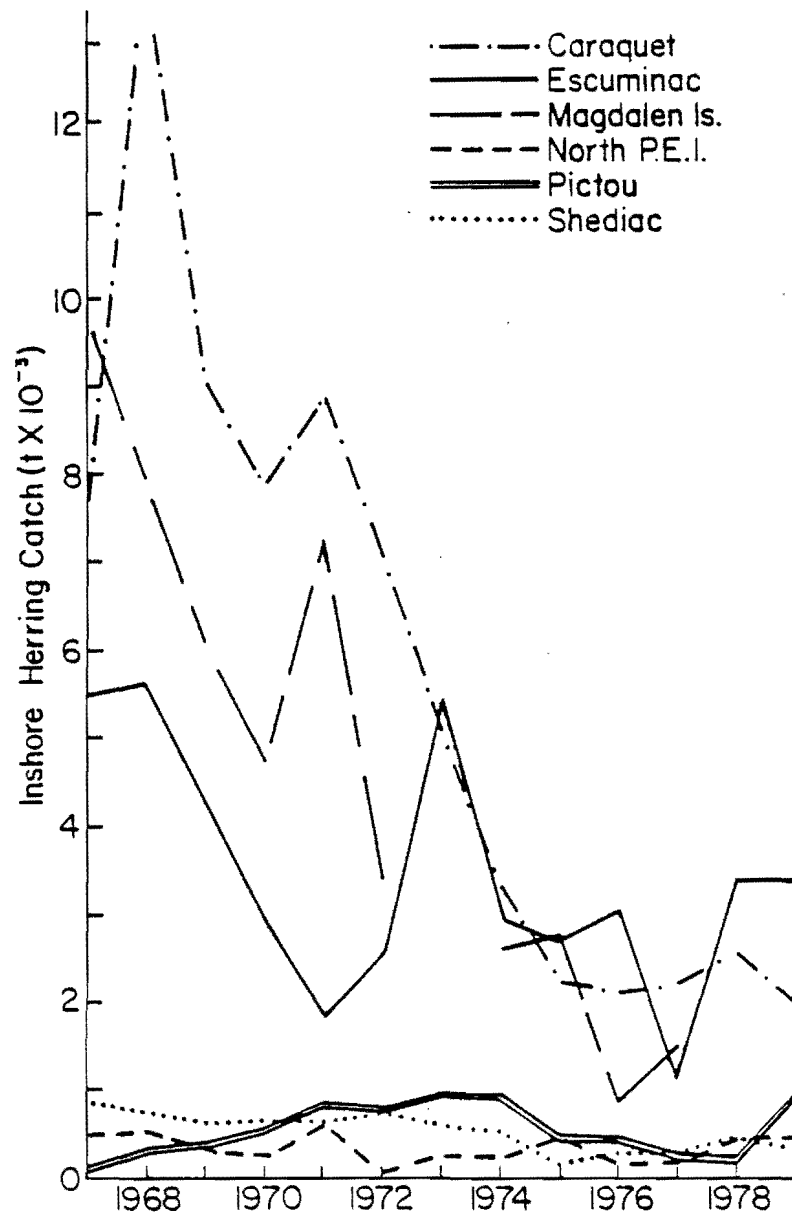


Figure 2. Herring catches in the major inshore fisheries in the Gulf of St. Lawrence 1967-79.

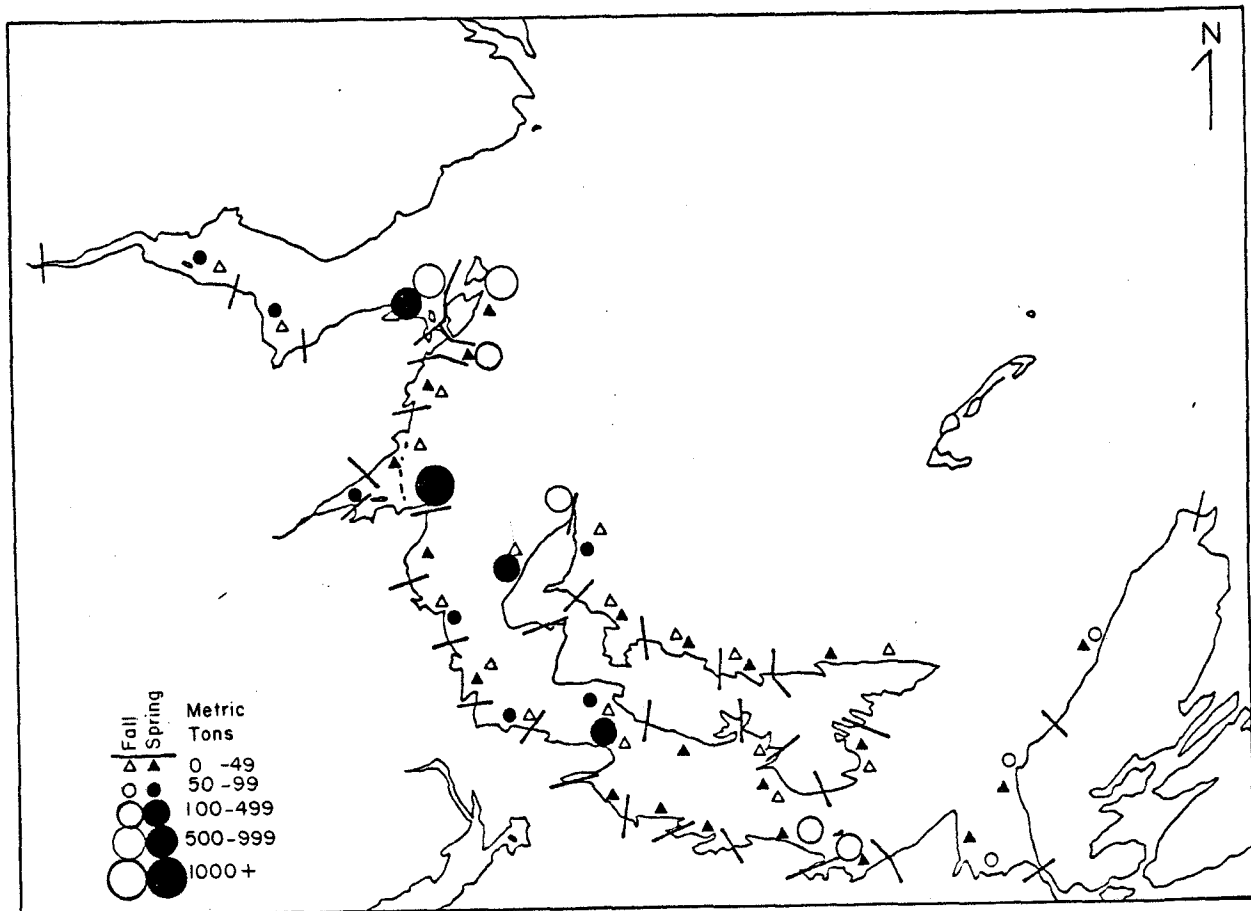


Figure 3. Map of southern Gulf of St. Lawrence showing relative importance of inshore herring catches in spring and fall fisheries.

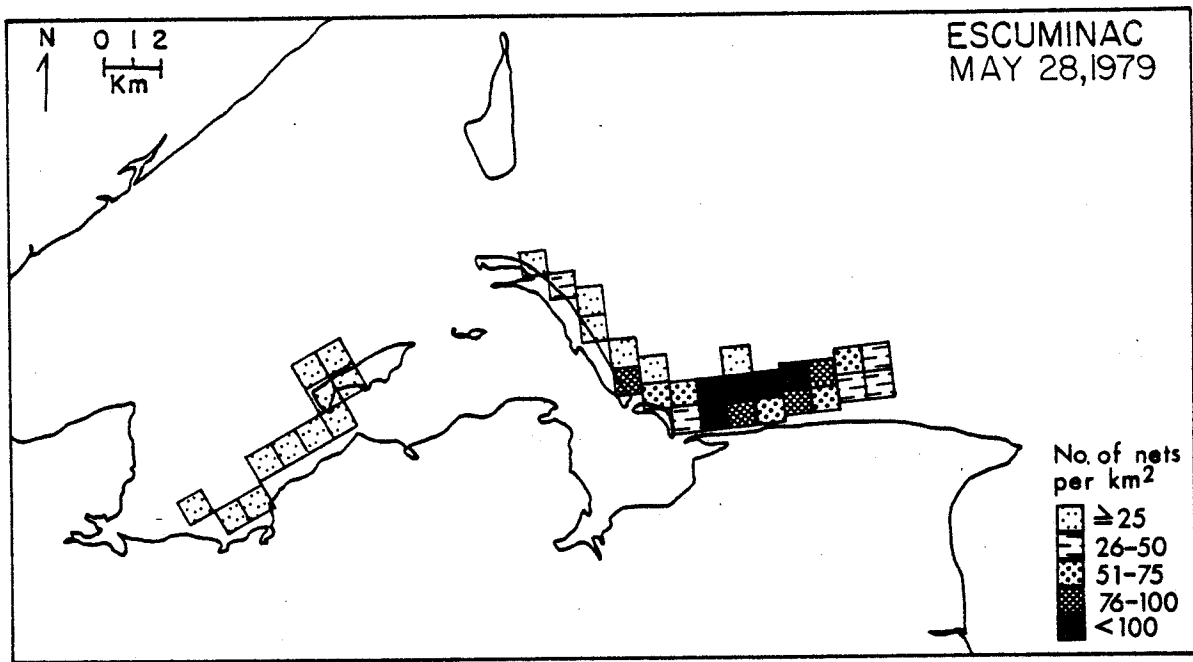


Figure 4. Distribution of herring gillnets in the Miramichi Bay fishery as determined from aerial photos.



Figure 5. Trend in recruited spring herring stock biomass, 1969-79.

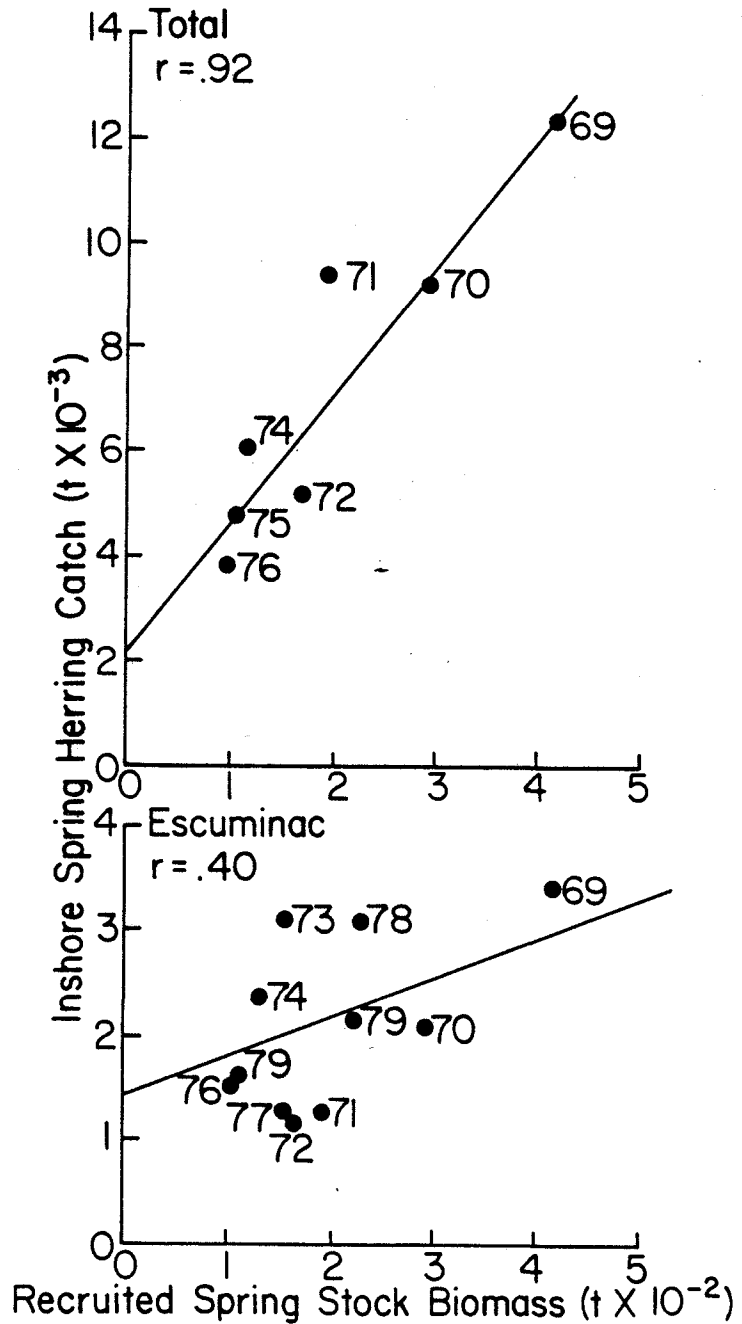


Figure 6. Regression of total inshore spring herring catch (upper figure) and inshore spring catch in Escuminac (lower figure) on recruited spring stock biomass as estimated from cohort analysis.

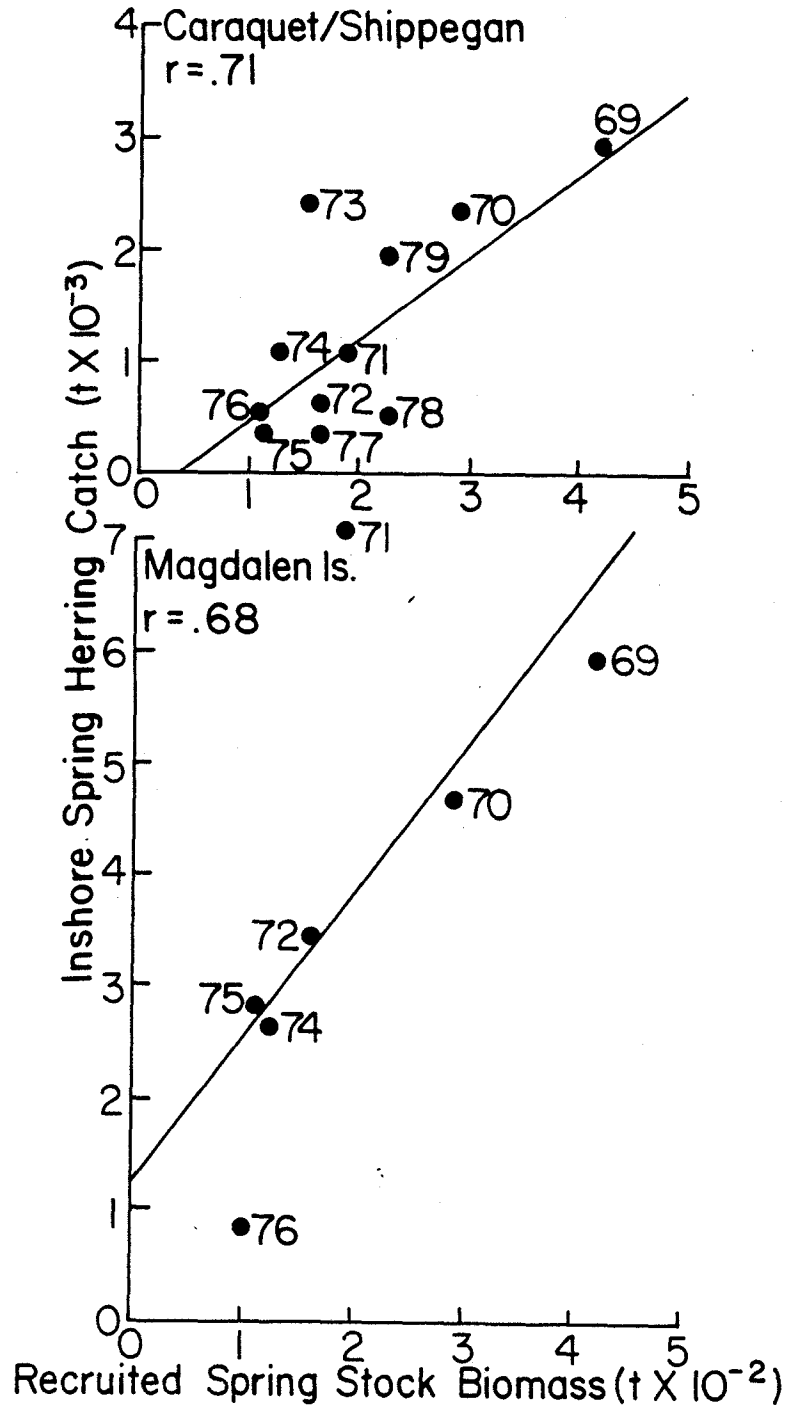


Figure 7. Regression of inshore spring herring catch in Caraquet (upper figure) and inshore spring catch in Magdalen Is. (lower figure) on recruited spring stock biomass as estimated from cohort analysis.