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The Inshore Capelin Fishery in NAFO Div. 3L in 1988

.by

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**Abstract**

Data collected during the inshore capelin fishery in 1988 in NAFO Div. 3L were analyzed and are presented in this manuscript. Inshore landings were the highest in the series at 53,641 t. The fishery opened on June 1, however, fishing did not commence until June 11. Closing dates varied among areas and gear sectors. Discarding was considerably lower than observed in 1987. Low percentage of females was the dominant reason for discarding the catch for traps and for purse seines it was the presence of 'redfeed' in the fish. The catch rate for traps in 1988 was the second highest since 1981 and third highest for purse seines. Both catch rates in 1988 were lower than the ones estimated in 1987.

**Introduction**

Capelin landings of 53,641 t in NAFO Div. 3L were the highest reported for the inshore fishery (Table 1). Landings were substantially higher than in 1987 when the fishery operated for 7 days. In 1988 the fishery opened on June 1 for all areas (Fig. 1), however fishing did not commence until June 11 in St. Mary's Bay when roe content and redfeed levels were suitable. The purse seine fishery was closed on June 12 in St. Mary's Bay, reopened on June 16 to fish a reserve quota of 500 t, and closed on June 20. The fixed gear fishery was closed on June 30. On the Southern Shore the purse seine fishery was closed on June 27 and the fixed gear on June 30. In Conception Bay the purse seine fishery was closed on June 21, reopened on June 27, and closed on June 30. The fixed gear fishery was closed on June 28. For Trinity Bay the purse seine fishery was closed on June 29 and the fixed gear on June 25. In Bonavista Bay the purse seine fishery was closed on June 30 and the fixed gear on June 28. For all areas of NAFO Div. 3L, a fishery for small females was opened on July 6. The TAC for the Div. 3L inshore fishery in 1988 was 42,600 t.

**Materials and Methods**

Research logbooks were mailed to 34 purse seine and 95 fixed gear fishermen who fished in NAFO Div. 3L. Fishermen completed 26 purse seine and 70 fixed gear logbooks (Table 2). The proportion of fishermen who did not fish capelin in 1988 was low (Table 2). Seven purse seiners from Div. 3K who fished in Div. 3L were also included in the analysis.

Biological samples were collected from the commercial capelin fishery on the basis of two random samples per statistical section (Fig. 1) per gear type per week. From each sample 200 fish were measured for length, sex, and maturity stage (LSM). A stratified sample of 2 fish per sex per 1/2 cm length group was collected from each LSM sample for otoliths. The otoliths were used for age determinations.

Effort data for capelin traps were examined based on the fishery strategy employed. In 1988 34 fishermen who kept logbooks fished one trap, 31 fished two traps, and three crews fished up to three traps. Of the 34 who fished more than

one trap, 17 reported separate catch and effort data for each trap fished and 17 did not. Based upon interviews and examination of logbook data, we were able to determine that two fishermen fished both traps almost equally. To estimate effort for the two traps combined, an adjustment factor was derived from separated logbook data from 11 fishermen who used the same fishing strategy as the two who did not keep separate records for each trap. The analysis indicated that doubling the reported hauls and multiplying by 0.92 would estimate total fishing hauls for both traps and doubling the reported fishing days would estimate total fishing days for both traps. One fisherman's strategy who did not separate effort for the two traps was to focus on one trap and only fish the second trap when the main trap had insufficient capelin. To estimate effort for his data, an adjustment factor was derived from the records of six fishermen who fished in a similar manner. Total fishing hauls were calculated by doubling the reported hauls and multiplying by 0.77 and total fishing days for both traps by doubling the reported fishing days. It was not possible to determine the fishing strategy employed by the remaining 14 fishermen. For these, we developed an adjustment factor by combining the data for all 17 fishermen who kept separate records for each trap. Fishing effort for these 14 fishermen was estimated by doubling the fishing hauls and multiplying by 0.86 and doubling the number of fishing days. These adjustment factors are similar to ones derived in other years (eg. Nakashima and Harnum 1986, 1987, 1988).

## Results

### Discards

Discarding rate for purse seines was 14% (Table 3) and 17% for traps (Table 4) which were considerably lower than the 35% and 74% respectively observed in 1987 (Nakashima and Harnum 1988). Capelin caught but not landed for sale was considered as discards in this analysis with no distinction between those released alive and those dumped (dead capelin). Capelin given to other fishermen were included in the estimates of discarding (Tables 3 and 4) but were excluded in the reasons for discarding (Tables 5 and 11).

In 1988, the primary reasons for discarding capelin varied among areas (Table 3). In Bonavista Bay, Conception Bay, and St. Mary's Bay, a low percentage of females was the main reason for discarding the catch in capelin traps. In Trinity Bay and the Southern Shore, most of the discards were males picked from the catch in traps to enhance the percentage of females. For purse seines in Bonavista Bay, discarding was predominantly due to low percentages of females while 'redfeed' was the dominant factor reported in Trinity Bay, Conception Bay, and St. Mary's Bay. For traps in 1988, 'redfeed' was not a significant factor causing fishermen to discard their catches.

### Catch/effort

The extensive data collected from 32 purse seines (Tables 3 and 7) and from 105 capelin traps (Tables 4 and 8) were examined to estimate catch/effort indices. For capelin traps and purse seines, fishing effort was higher in 1988 than in 1987 in all areas. Days fished and number of hauls in 1988 were not as high as estimated in years prior to 1987 (Table 6). Purse seiners fished for 10.3 days and made 20.9 sets on average in 1988 (Table 7).

Catch rates for purse seiners and capelin traps varied among areas (Tables 7 and 8). The lowest catch/day (C/D) for purse seines was in Trinity Bay with similar C/D in Bonavista Bay and Conception Bay, and the highest C/D in St. Mary's Bay. This pattern was similar to past years when St. Mary's Bay had the highest C/D and Trinity Bay had the lowest (Nakashima and Harnum 1986, 1987) and different from the 1987 fishery (Nakashima and Harnum 1988). The average C/D for a purse seiner in NAFO Div. 3L in 1988 was 20.7 t per day. The catch/set amongst all four areas varied between 8.6 and 13.9 t and averaged 12.1 t per set overall. As in 1987, catch rates for capelin traps among areas were variable (Table 8). The lowest C/D for traps was 1.0 t which was observed in St. Mary's Bay the next lowest was 4.5 t per day in Conception Bay. Capelin traps in Trinity Bay and Bonavista Bay had similar C/D and the highest C/D of 9.7 t was observed on Southern Shore. The catch/haul (C/H) followed a similar pattern as the C/D. The average C/D for a trap in Div. 3L was 6.2 t per day and the average C/H was 3.4 t per day.

### By-catch

The total reported by-catch of cod was 26.5 t for 105 traps fished in 1988 which represented 0.5% of reported logbook landings of capelin (Table 4).

Herring by-catch in traps was negligible (Table 4). No by-catch was reported for the purse seine fishery.

#### Age Composition

The age composition of the commercial catch was estimated from 117 samples based on 41 purse seine, 66 capelin trap, and 10 beach seine samples (Table 9). The mean number of otolith pairs read per sample in 1988 varied from 43 for beach seines to 45 for capelin traps (Table 9). This was approximately 10 more per sample than was collected in 1987 (Nakashima and Harnum 1988).

Age compositions of the inshore catch from 1979 to 1988 are presented in Table 10. In 1988, the 1985 year-class as three-year-olds dominated the catch (Table 10). With respect to age composition of the total catch, the 1984 year-class as four-year-olds and the 1983 year-class as five-year-olds were similar in numbers. However, considering only females the 1983 year-class comprised 21.5% of the catch and the 1984 year-class was 11.5%. The 1987 fishery was projected to be dominated by the 1985 year-class representing 86% of the mature biomass (Anon. 1987).

#### Discussion

Discarding was considerably lower in 1988 than observed in 1987 for both traps and purse seines. When discarding was reported, the major reasons were low percentage of females in the catch and discarded males when females were separated from the catch (Table 11). The presence of 'redfeed' in females was given as the major reason for discarding fish by purse seiners (Table 11).

Four catch rate indices were estimated for capelin traps and for purse seines based on logbook data (Tables 12 and 13). Catch/day (C/D) is the preferred index because it combines both landings and discards to estimate catch. If the discards were in the same proportion to landings in all years then landings could be utilized in place of the catch. However, the level of discarding varies among years. We assume that catch/set (C/S) and catch/haul (C/H) more likely reflect school size and may not necessarily indicate changes in biomass. The C/D per capelin trap in 1988 was 6.2 t which was the second highest in the series since 1981 (Table 12). The C/D per purse seiner was 20.7 t which was the highest estimate since 1981 (Table 13). Both indices indicated that biomass in 1988 was high.

Nakashima and Harnum (1988) suggested that catch rates derived from the 1987 fishery may have been biased due to the late start and reduced fishing time. They noted that many purse seiners missed the initial appearance of capelin which generally constituted the major part of their fishery. This was especially true in St. Mary's Bay and Conception Bay and may have resulted in overall lower catch rates there compared to 1986. Capelin traps in Div. 3L experienced a high catch rate which was influenced to some extent by the late start. In previous years the first few days of the catch were variable. However, in 1987 catch rates were very high from the first day until the last day of the fishery. No trap fishery took place in St. Mary's Bay in 1987 because the fishery began too late for this area to participate in the capelin roe fishery. The catch rate may have been biased upwards due to the fishery opening during high abundance inshore. If we discount the 1987 catch rates, then the 1988 inshore catch rates for both gear types were the highest in their respective series, implying a high inshore biomass was available to the commercial fishery.

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Table 1. Inshore capelin landings (t) by fishing gear (vessels <21 m in length) by area (Bonavista Bay = BB, Trinity Bay = TB, Conception Bay = CB, Southern Shore = SS, St. Mary's and Trepassey Bays = SMB) in Div. 3L. The mobile fleet was issued ringnet licences until 1982 and purse seine licences from 1983 to the present.

Year	Area	Ringnet and purse seine (<21 m)	Beach seine	Capelin trap	Total
1977	BB	-	126	-	126
	TB	-	1145	287	1432
	CB	1703	1275	722	3700
	SS	-	7	-	7
	SMB	-	4	-	4
	3L	1703	2557	1009	5269
1978	BB	-	341	12	353
	TB	429	1756	284	2469
	CB	487	1687	1298	3472
	SS	-	82	38	120
	SMB	-	6	-	6
	3L	916	3872	1632	6420
1979	BB	45	680	45	770
	TB	1144	991	1163	3298
	CB	2087	1727	4250	8064
	SS	15	70	93	178
	SMB	4	2	-	6
	3L	3295	3470	5551	12316
1980	BB	1388	205	124	1717
	TB	2541	603	1612	4756
	CB	3226	457	3591	7274
	SS	-	80	239	319
	SMB	284	-	95	379
	3L	7439	1345	5661	14445
1981	BB	3714	89	62	3865
	TB	6006	1006	2267	9279
	CB	4670	202	5537	10409
	SS	-	14	51	65
	SMB	820	3	-	823
	3L	15210	1314	7917	24441
1982	BB	3429	169	133	3731
	TB	7687	463	2445	10595
	CB	5511	174	5944	11629
	SS	9	33	314	356
	SMB	1056	58	9	1123
	3L	17692	897	8845	27434
1983	BB	2580	96	527	3203
	TB	3801	603	4445	8849
	CB	6349	166	5500	12015
	SS	-	3	3	6
	SMB	983	6	12	1001
	3L	13713	874	10487	25074
1984	BB	3805	49	2037	5891
	TB	4928	799	5531	11258
	CB	6628	89	6806	13523
	SS	-	17	672	689
	SMB	1714	28	159	1901
	3L	17075	982	15205	33262

Table 1. Continued.

Year	Area	Ringnet and purse seine (<21 m)	Beach seine	Capelin trap	Total
1985	BB	2286	115	1593	3994
	TB	1624	545	6816	8985
	CB	3649	211	6804	10664
	SS	33	9	348	390
	SMB	1284	12	121	1417
	3L	8876	892	15682	25450
1986*	BB	3323	199	3197	6719
	TB	4005	648	12142	16795
	CB	7454	133	9589	17176
	SS	37	52	1362	1451
	SMB	5685	34	337	6056
	3L	20504	1066	26627	48197
1987*	BB	2140	76	2139	4355
	TB	1644	193	6780	8617
	CB	1317	120	3084	4521
	SS	106	32	633	771
	SMB	712	0	0	712
	3L	5919	421	12636	18976
1988*	BB	3978	157	3960	8095
	TB	4164	169	15393	19726
	CB	6996	88	10793	17877
	SS	220	33	3201	3454
	SMB	3634	228	627	4489
	3L	18992	675	33974	53641

\* provisional

Table 2. Responses from a logbook survey conducted in Div. 3L, 1981-88.

Year	No. contacted	No. logbooks returned	Did not fish capelin	Logbooks not returned
<u>Purse seine</u>				
1981	70 (7)*	37 (44)	11	22
1982	91 (7)*	54 (61)	10	27
1983	75 (9)*	37 (46)	7	31
1984	63 (3)*	39 (42)	3	21
1985	45 (3)*	30 (33)	2	13
1986	36 (7)*	27 (34)	0	9
1987	37	23	4	10
1988	34 (7)*	26 (33)	3	5
<u>Fixed gear</u>				
1981	119	74	13	32
1982	136	81	36	19
1983	131	66	38	27
1984	142	91	20	31
1985	93	61	8	24
1986	87	56	5	26
1987	93	62	14	17
1988	95	70	8	17

\* fishermen who reside in Div. 3K but fished in Div. 3L. These are added to the 'No. logbooks returned' column in parentheses.

Table 3. Total purse seine landings (t) compiled from logbooks in 1988.

Area	Landings by logbook	Discards by logbook*	No. of fishermen
Bonavista Bay	1163.7	122.7	8
Trinity Bay	1098.8	172.8	14
Conception Bay	2233.1	354.7	18
St. Mary's Bay	1486.8	189.1	19
Div. 3L	5982.4	839.3	32

\* includes capelin given to other fishermen

Table 4. Total capelin trap landings (t) compiled from logbooks in 1988.

Area	Landings by logbook	Discards by logbook*	By-catch		No. of fishermen	No. of traps
			Cod	Herring		
Bonavista Bay	747.7	103.9	7.0	+	15	16
Trinity Bay	2849.3	284.5	10.1	0.2	28	44
Conception Bay	1517.3	399.0	8.3	+	19	34
Southern Shore	676.7	179.5	1.1	+	5	10
St. Mary's Bay	9.6	1.0	0	0	1	1
Div. 3L	5800.6	967.9	26.5	0.2	68	105

\* includes capelin given to other fishermen

Table 5. Percent contribution by weight of reasons for discarding capelin in 1988. (This excludes capelin given to other fishermen.)

Area	Redfeed	Low % females	Small females	Females picked out	Females spawned out	No market/ quota filled	Misc.	Not given
<u>Traps</u>								
Bonavista Bay	1	39	-	-	-	25	29	5
Trinity Bay	9	29	-	45	-	7	4	6
Conception Bay	2	31	12	7	7	7	27	7
Southern Shore	-	6	6	64	16	-	8	-
St. Mary's Bay	-	100	-	-	-	-	-	-
<u>Purse Seine</u>								
Bonavista Bay	21	50	13	-	-	6	10	-
Trinity Bay	77	-	-	-	-	15	8	-
Conception Bay	58	15	7	-	17	3	+	-
St. Mary's Bay	62	38	-	-	-	-	-	-

Table 6. Average fishing days (d) and average number of trap hauls (H) per capelin trap per area in Div. 3L from 1981-88. (Number of traps given in parentheses.)

Year	Measure of effort	Areas in Div. 3L				
		Bonavista	Trinity	Conception	Southern Shore	St. Mary's
1981	D	-	10.4 (15)	16.8 (21)	13.6 (5)	-
	H	-	12.1	21.1	11.8	-
1982	D	-	14.6 (23)	24.2 (48)	13.0 (10)	-
	H	-	18.0	30.3	12.5	-
1983	D	14.0 (1)	17.2 (25)	19.8 (40)	-	-
	H	12.0	21.9	21.3	-	-
1984	D	13.7 (7)	19.5 (36)	18.2 (31)	19.0 (8)	19.0 (1)
	H	26.0	30.9	26.4	22.4	47.0
1985	D	11.4 (16)	13.3 (23)	16.8 (24)	10.5 (8)	-
	H	19.8	18.4	23.8	9.4	-
1986	D	11.8 (14)	15.3 (33)	24.9 (22)	17.7 (6)	6.3 (2)
	H	17.7	24.4	28.8	20.8	2.5
1987	D	6.3 (15)	7.7 (31)	7.3 (25)	5.0 (7)	-
	H	13.9	14.3	11.2	6.9	-
1988	D	9.0 (16)	11.6 (44)	12.6 (34)	8.8 (10)	11.1 (1)
	H	16.4	22.5	17.0	14.7	17.0

Table 7. Catch/effort data for purse seiners from the 1988 logbook survey.

Area	No. days fished	No. sets made	Landings per logbook (t)	Landings and discards per logbook (t)	No. of purse seiners
Bonavista Bay	65	127	17.9/day 9.2/set	19.8/day 10.1/set	8
Trinity Bay	86	121	12.8/day 9.1/set	14.8/day 10.5/set	15
Conception Bay	125	301	17.9/day 7.4/set	20.7/day 8.6/set	18
St. Mary's Bay	54	121	27.5/day 12.3/set	31.0/day 13.9/set	19
Div. 3L	330	670	18.1/day 8.9/set	20.7/day 10.2/set	32

Table 8. Catch/effort data for capelin traps from the 1988 logbook survey.

Area	No. days fished	No. hauls made	Landings per logbook (t)	Landings and discards per logbook (t)	No. of traps
Bonavista Bay	143.3	263	5.2/day 2.8/haul	5.9/day 3.2/haul	16
Trinity Bay	512.3	998	5.6/day 2.9/haul	6.1/day 3.2/haul	44
Conception Bay	428.1	577	3.5/day 2.6/haul	4.5/day 3.3/haul	34
Southern Shore	88.2	147	7.7/day 4.6/haul	9.7/day 5.8/haul	10
St. Mary's Bay	11.1	17	0.9/day 0.6/haul	1.0/day 0.6/haul	1
Div. 3L	1094.8	1992	5.3/day 2.9/haul	6.2/day 3.4/haul	105

Table 9. Summary of the commercial samples collected from the inshore capelin fishery in 1988 in Div. 3L.

Gear type	No. of LSM/stratified samples	No. of otoliths aged	Mean number of otoliths aged per sample $\pm$ SD
Purse seine	41	1781	43.4 $\pm$ 4.7
Capelin trap	66	2959	44.8 $\pm$ 5.1
Beach seine	10	432	43.2 $\pm$ 1.4
TOTAL	117	5172	



Table 10. Age compositions (%) from the inshore commercial capelin fishery in Div. 3L, 1979-88.

	Age					
	1	2	3	4	5	6
<b>Males</b>						
1979	-	-	47.6	36.3	15.1	0.9
1980	-	0.2	53.4	43.4	2.9	0.1
1981	9.0	1.9	29.7	37.7	20.6	1.2
1982	0.1	0.5	88.8	10.0	0.6	-
1983	-	2.3	62.9	34.0	0.9	-
1984	-	0.4	37.5	61.5	0.7	-
1985	-	5.8	66.3	26.4	1.5	0.1
1986	-	0.3	56.0	43.1	0.5	-
1987	-	0.3	12.7	85.4	1.6	-
1988	-	5.4	72.3	19.6	2.7	-
<b>Females</b>						
1979	-	0.8	59.1	25.4	11.3	3.4
1980	0.1	3.3	64.6	31.1	0.4	0.6
1981	5.8	5.6	54.0	20.1	14.0	0.6
1982	0.2	2.4	76.4	13.0	6.4	1.6
1983	-	6.4	59.1	32.1	2.3	0.2
1984	-	2.8	41.5	47.1	8.3	0.3
1985	-	16.7	58.0	16.0	8.7	0.6
1986	-	0.2	66.1	28.9	3.7	1.1
1987	-	6.6	21.7	63.6	7.7	0.3
1988	-	14.9	50.7	11.5	21.5	1.4
<b>Sexes combined</b>						
1979	-	0.2	50.3	33.8	14.2	1.5
1980	-	1.7	58.9	37.3	1.7	0.4
1981	7.4	3.2	42.7	28.7	17.2	0.9
1982	0.1	1.4	83.1	11.4	3.2	0.7
1983	-	4.6	60.7	32.9	1.7	0.1
1984	-	1.7	39.6	53.7	4.8	0.2
1985	-	12.4	61.3	20.2	5.8	0.4
1986	-	0.3	62.3	34.2	2.5	0.7
1987	-	4.0	18.0	72.5	5.2	0.2
1988	-	11.2	59.0	14.6	14.3	0.8

Table 11. Percent contribution to weight of reasons for discarding capelin in Div. 3L, 1981-88. (This analysis excludes capelin given to other fishermen.)

Area	Redfeed	Low % females	Small females	Females picked out	Females spawned out	No market/ quota filled	Misc.	Not given
<u>Traps</u>								
1981	13	43	1	10	+	22	3	8
1982	4	57	+	19	1	4	13	2
1983	17	37	+	3	+	18	13	12
1984	1	31	-	35	6	15	11	1
1985	30	26	4	5	3	22	4	5
1986	45	28	+	10	+	5	10	2
1987	59	22	1	+	2	9	7	+
1988	4	27	6	28	6	8	17	5
<u>Purse seine</u>								
1981	32	35	14	8*	+	8	+	3
1982	45	41	3	-	+	+	10	1
1983	70	17	1	-	+	5	3	4
1984	18	78	+	-	+	3	2	-
1985	61	15	9	1	3	4	5	2
1986	52	35	1	+	1	3	8	1
1987	73	4	2	-	1	2	11	7
1988	58	21	5	-	8	5	3	-

\* use of separators at sea

Table 12. Catch/effort of capelin traps in Div. 3L utilizing research logbook data.

Year	L = Logbook landings (t)		C = Logbook landings and discards (t)	
	L/day	L/haul	C/day	C/haul
1981	2.2	1.9	2.9	2.5
1982	2.7	2.2	3.1	2.5
1983	2.4	2.1	3.4	3.0
1984	2.6	1.7	2.9	1.9
1985	2.9	2.0	4.6	3.2
1986	3.2	2.4	4.6	3.4
1987	5.1	2.9	8.8	5.0
1988	5.3	2.9	6.2	3.4

Table 13. Catch/effort of purse seines in Div. 3L utilizing research logbook data.

Year	L = Logbook landings (t)		C = Logbook landings and discards (t)	
	L/day	L/set	C/day	C/set
1981	6.9	3.4	9.4	5.3
1982	13.5	6.7	16.4	8.1
1983	10.4	5.4	18.8	9.7
1984	12.3	6.2	14.3	7.2
1985	10.5	5.5	16.4	8.6
1986	14.4	8.6	19.0	11.4
1987	13.4	9.0	18.1	12.1
1988	18.1	8.9	20.7	10.2

