Northwest Atlantic Fisheries Organization

Serial No. N1339

NAFO SCR Doc. 87/50

SCIENTIFIC COUNCIL MEETING - JUNE 1987

The 1986 Inshore Capelin Fishery in NAFO Div. 3L

by

Brian S. Nakashima and Robert W. Harnum

Science Branch, Department of Fisheries and Oceans
P. O. Box 5667, St. John's, Newfoundland A1C 5X1

Abstract

The logbook data from the 1986 inshore capelin fisnery in Div. 3L were analyzed and presented in tnis report. Discarding has declined considerably from 1985. Trends in tne catch/day index for traps and for purse seines were similar and implied high inshore abundance in 1986. The commercial catch in 1986 was dominated by the 1983 (62.2%) and the 1982 year-classes (34.4%). Provisional inshore landings were 47,946 t, tne highest ever observed.

Introduction

Tne nighest inshore landings ever (47,946 t) by tne inshore capelin fishery in NAFO Div. 3L was recorded in 1986 (Table 1). Landings from traps surpassed those from purse seines and beach seines. Tnese high landings resulted from a strong market demand for roe-bearing female capelin following tne very poor Norwegian capelin fishery in the Barents Sea in 1986. The season opened on June 1 and closed on August 31 in all areas except for two early closings. St. Mary's Bay (Fig. 1) was closed to purse seines on June 14 and Trinity Bay (Fig. 1) was closed to fixed gear (i.e. traps, beach seines) on June 28. There was an increase in the number of licences issued in 1986 to 150 purse seines from 133 in 1985 and to 732 fixed gear licences from 426 in 1985.

Materials and Methods

Research logbooks were given to 123 fishermen residing in Div. 3L. From these, 27 purse seine and 56 fixed gear fishermen returned their logbooks to us for analysis (Table 2). Seven purse seiners residing in Div. 3K fished part or all of their season in Div. 3L and pertinent data from their logbook records were included in tnis report. Purchase slips provided by Statistics Branch were examined to nominate new fishermen for the survey in 1987, however only the landings noted on purse seine purchase slips were compared to the logbook landings (Table 3). Unlike previous years, we did not compare purchase slip landings for fixed gear fishermen to those reported in their logbooks because we suspected some landings were spread out over the summer for Unemployment Insurance purposes. Also additional time would have been required to locate and record purchase slip data due to the increased landings in 1986 from earlier years. Otherwise, the analyses in this report corresponded to those in earlier studies (Nakashima and Harnum 1982, 1983, 1984, 1985, 1986).

Biological samples from the commercial capelin fishery were collected on the basis of two random samples per statistical section (Fig. 1) per gear type per week. Samples were obtained by fisnermen, collectors in fish plants, and other reliable individuals during the short but intensive fishing season. From each sample 200 fish were measured for length, sex, and maturity stage (LSM) and then they were stratified by sex and by ½ cm length group for otolith collections. Ages were read from otoliths.

Effort data for capelin traps especially when two or more traps were fished by a single crew were adjusted according to the fishing strategy followed. In 1986 23 fishermen fished only one trap and 27 fished two or more traps. Of these 27, nine maintained separate records for each of their two traps while the remaining 18 did not separate the information by trap. Consequently, for these 18 logbooks effort had to be estimated. For 6 fishermen, every haul was recorded regardless of the trap which was hauled. The fishing days were adjusted by doubling the time reported in these logbooks to correspond to the time both traps were fishing. Two fishermen hauled both traps every time they went out. Thus their effort was

estimated by doubling the number of hauls and the fishing days. One fishing crew fished three traps. In this instance, each haul was recorded and total fishing days for the three traps were estimated by tripling the days recorded in the logbook. Four fishermen had one trap in a prime location which they fished constantly and only went to the second trap if they required more capelin to make up the load or if the primary trap was empty. Their data were corrected by estimating an adjustment factor based on separated logbook data from three fishermen who fished in a similar manner in 1986. The results from the analysis suggested that doubling the hauls and multiplying by 0.75 would estimate fishing hauls for both traps and doubling the fishing days and multiplying by 0.94 would estimate total fishing days for both traps. For five fishermen there was no clear way to categorize their fishing activity into one of the previous ways described. Thus for these data we utilized the method employed in last year's analysis (Nakashima and Harnum 1986) to adjust effort utilizing only the 1986 logbook information. For all nine fishermen who had separated their trap records, we derived effort adjustment factors of 0.89 for hauls and 0.95 for fishing days. Consequently for these five unknown unseparated logbooks the reported hauls and fishing days were doubled and multiplied by the appropriate factor. The factors were comparable to the ones derived in last year's report (hauls: 0.87; days: 0.92) based on data combined from 1981-85 (Nakashima and Harnum 1986).

Results

Discarding

Discarding was generally lower in 1986 than in 1985 representing 32% for purse seines (Table 3), 43% for traps (Table 4), and 63% for beach seines (Table 5). Due to favorable market conditions discarding was not as prevalent a concern as experienced in 1985. All capelin caught but not landed for sale were considered as discards in this analysis with no breakdown between those released alive and those dumped (dead capelin). Capelin given to other fishermen were included in discarding estimates (Tables 3-5) but were excluded when the reasons for discarding were derived (Tables 6 and 12).

During 1986, 'redfeed' and low percentages of females in the catch were the principal reasons given for discarding fish. In traps 'redfeed' levels also included spawn in the stomachs which concerned the fishing industry. Unlike 1985, there were only a few problems related to selling capelin. Purse seiners in Bonavista and Trinity Bays discarded often due to low percentages of females in the catch, whereas purse seiners in Conception Bay experienced 'redfeed' problems (Table 6). Both 'redfeed' levels and low percentages of females were important in St. Mary's Bay. Capelin in traps in Bonavista Bay were discarded due to low percentages of females, 'redfeed' levels, and over ripe females in the miscellaneous column in Table 6. In Trinity and Conception Bays most of the capelin were discarded due to 'redfeed' problems. Sorting and dumping males were a major cause for discarding on the Southern Shore and in St. Mary's Bay low percentages of females and small females were of concern.

Catch/effort

Fishing effort for capelin traps from 1981-85 was revised last year (Nakashima and Harnum 1986) and in this study to account for the many crews which fished two traps in Div. 3L. As described earlier in this report, there were many ways to fish both traps and we have described in detail how we have interpreted these data.

Comprehensive information from 34 purse seiners (Table 3 and 8) and for 77 capelin traps (Tables 4 and 9) was analyzed to estimate catch/effort indices which reflected inshore mature biomass in 1986. On average purse seiners searched for 15.6 days and made 25.9 sets (Table 8) which were almost double the 1985 estimates. The high catch rates and concentration of vessels in St. Mary's Bay reflected the intensive purse seine fishery there when the season opened in 1986 (Table 8). For capelin traps fishing effort was higher in 1986 than in 1985 in all areas except in Bonavista Bay where it was similar in the two years (Table 7).

Catch rates for purse seiners (Table 8) and for capelin traps (Table 9) were similar among areas with some exceptions. The purse seine catch/day (C/D) in Trinity Bay was the lowest as in 1985 with C/D in Bonavista and Conception Bays similar, and in St. Mary's Bay it was the highest. The overall purse seine C/D for Div. 3L was 19.0 t per day. Catch/set (C/S) was more variable but in the same general increasing order as C/D. Catch rates for capelin traps (Table 9) were similar in all areas except St. Mary's Bay which was lower. The Div. 3L C/D was 4.6 t per day. The catch/haul (C/H) ranged from 3.0 in Bonavista Bay to 3.8 in Conception Bay with an overall value of 3.4 t per day in Div. 3L.

By-catch

The reported by-catch of cod was only 14.4 t for 77 traps in 1986 (Table 4) which was less than 0.5% of reported logbook landings. Herring by-catch in traps was much lower than

1985. For purse seines some of the miscellaneous reasons for discarding capelin were due to mixed sets of herring and capelin (Table 6), however the number of occurrences was low.

Age composition

Age composition of the commercial catch was determined from 175 samples composed of 21 beach seines, 103 capelin traps, and 51 purse seine (Table 10). These samples more than adequately represented the commercial landings among gear types per area (Table 1). Mean number of otolith pairs per sample was less than in 1985 and was comparable to earlier years.

Age compositions of catches from 1979-86 are given in Table 11. The 1985 age composition has been revised slightly using more recent landing statistics. The fishery in 1986 prosecuted the 1983 year-class which was projected to be strong (Anon. 1986). The 1982 year-class as age 4's represented 34.4% of the catch.

Discussion

Discarding was much lower in 1986 than in 1985 primarily due to the high expectations for selling roe-bearing capelin to the Japanese market. It was estimated that market problems represented only 5% of the discards for trap fishermen which was considerably lower than in previous years (Table 12). 'Redfeed' which encompassed redfeed and spawn in the stomachs remained a significant factor in discarding fish for traps and purse seines in 1986 (Table 12). The levels of 'redfeed' tolerated by buyers varied from plant to plant and from day to day. Despite the good market conditions, trap fishermen discarded capelin 45% of the time due to the presence of 'redfeed' in the stomachs. The levels were variable among areas (Table 6). A low percentage of females was the second most important reason for discarding for both gear types.

For traps and purse seines we have provided four catch rate indices since the logbook survey was initiated in 1981 (Table 13 and 14). Catch/day (C/D) has been the preferred index since it is assumed that this reflects abundance, moreso than catch/haul (C/H) or catch/set (C/S). The catch includes landings and discards which should reflect abundance better than landings alone especially since the discard rate varies annually (eg. Nakashima and Harnum 1984, 1985, 1986). For the time period 1981-86, the C/D indices for traps and for purse seines were similar taking into consideration that the 1985 C/D of 4.6 for traps was probably an overestimate as a result of the late opening of the 1985 fishery (Nakashima and Harnum 1986). Both indices supported the notion of high abundance inshore in 1986 although the magnitude of the difference between the 1985 and 1986 catch rates was not as great as projected (Anon. 1985).

Acknowledgments

The logbook data were diligently collected by inshore capelin fishermen. P. J. Williams organized the commercial sampling program and P. Eustace aged the capelin. The technical staff of the Pelagic Section processed the samples in the laboratory. M. Y. Hynes assisted in the preparation of the manuscript.

References

Anon. 1985. NAFO Scientific Council Reports. p. 74-77.

1986. NAFO Scientific Council Reports. p. 74-77.

Nakashima, B. S., and R. W. Harnum. 1982. Summary of a logbook survey of the 1981 inshore capelin fishery in Divisions 3KL. NAFO SCR Doc. 82/18, Ser. No. N506. 6 p.

1983. Summary of a logbook survey of the 1982 inshore capelin fishery in Division 3KL. NAFO SCR Doc. 83/47, Ser. No. N705. 9 p.

1984. The 1983 inshore capelin fishery in Div. 3L. NAFO SCR Doc. 84/54, Ser. No. N841. 7p.

1985. The 1984 inshore capelin fishery in Div. 3L. NAFO SCR Doc. 85/76, Ser. No. N1034. 11 p.

1986. The 1985 inshore capelin fishery in Div. 3L. NAFO SCR Doc. 86/15, Ser. No. N1127. 12 p.

Table 1. Inshore capelin landings (t) by fishing gear (vessels <21 m in lengtn) 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 ring net licences until 1982 and purse seine licences from 1983 to the present.

Year	Area	Ringnet and purse seine (<21 m)	Beach seine	Capelin trap	Misc.	Total
1974	BB	-	65	5	-	70
	TB	-	2890	20	-	2910
	CB	-	705	110	97	912
	SS	-	178	592	-	770
	SMB	-	22	-	-	22
	3L	-	3860	727	97	4684
1975	BB	-	38	-	-	38
	TB	-	894	159	6	1059
	CB	16	461	6	1	484
	SS	-	19	627	-	646
	SMB	-	2	-	6	8
	3L	16	1414	792	13	2235
1976	BB	-	65	30	-	95
	TB	-	399	263	-	662
	CB	-	1101	20	-	1121
	SS	-	4	641	-	645
	SMB	-	46	-	-	46
	3L	-	1615	954	-	2569
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

Table 1. Continued.

Year	Area	Ringnet and purse seine (<21 m)	Beach seine	Capelin trap	Misc.	Total
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
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	3283	199	3197	-	6679
	TB	4055	523	12005	-	16583
	CB	7478	133	9617		17228
	SS	37	52	1362	-	1451
	SMB	5628	34	343	-	6005
	3L	20481	941	26524	-	47946

* provisional

Table 2. Responses from a logbook survey conducted in Div. 3L, 1981-86.

Year	No. contacted	No. logbooks returned	Did not fish capelin	Logbooks not returned
Purse seine				
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
Fixed gear				
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

* 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 and from purchase slips in 1986.

Area	Landings by logbook	Discards by logbook*	Landings by purchase slips	No. of fishermen
Bonavista Bay	895.1	256.6	907.1	11
Trinity Bay	738.1	227.3	1187.3	14
Conception Bay	3263.4	1548.5	2353.2	25
St. Mary's Bay	2704.0	402.8	1961.9	17
Div. 3L	7600.6	2435.2	6409.5	34

* includes capelin given to other fishermen

Table 4. Total capelin trap landings (t) compiled from logbooks in 1986.

Area	Landings by logbook	Discards by logbook	By-catch		No. of fishermen	No. of traps
			Cod	Herring		
Bonavista Bay	571.4	168.6	6.0	0	10	14
Trinity Bay	1972.2	537.3	2.5	0.4	21	33
Conception Bay	1509.1	925.4	5.2	+	14	22
Southern Shore	246.1	212.3	0.5	+	4	6
St. Mary's Bay	0	16.9	0.2	0	1	2
Div. 3L	4298.8	1860.5	14.4	0.4+	50	77

* includes capelin given to other fishermen

Table 5. Total beach seine landings (t) compiled from logbooks in 1986.

Area	Landings by logbook	Discards by logbook	No. of fishermen
Bonavista Bay	3.8	12.3	1
Trinity Bay	187.4	128.1	6
Conception Bay	32.7	0	1
Div. 3L	223.9	140.4	8

Table 6. Percent contribution by weight of reasons for discarding capelin in 1986. (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
Traps								
Bonavista Bay	23	31	-	-	+	6	37	2
Trinity Bay	52	21	-	8	2	9	7	1
Conception Bay	52	31	-	2	+	3	9	3
Southern Shore	20	21	1	56	-	-	-	1
St. Mary's Bay	-	67	33	-	-	-	-	-
Purse seine								
Bonavista Bay	15	69	-	-	-	8	8	+
Trinity Bay	15	59	-	5	2	4	15	-
Conception Bay	63	25	-	-	1	2	10	+
St. Mary's Bay	50	40	4	-	-	2	-	3

Table 7. Average fishing days (D) and average number of trap hauls (H) per capelin trap per area in Div. 3L from 1981-86. (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

Table 8. Catch/effort data for purse seiners from the 1986 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	61	117	14.7/day 7.7/set	18.9/day 9.8/set	12
Trinity Bay	86	119	8.9/day 6.2/set	11.2/day 8.1/set	14
Conception Bay	272	420	12.0/day 7.8/set	17.7/day 11.5/set	25
St. Mary's Bay	110	225	24.6/day 12.0/set	28.2/day 13.8/set	17
Div. 3L	529	881	14.4/day 8.6/set	19.0/day 11.4/set	34

Table 9. Catch/effort data for capelin traps from the 1986 logbook survey.

Area	No. days fished	No. hauls made	Landings per logbook (t)	Landings and discards per logbook (t)	No. of traps
Bonavista Bay	165.7	248	3.5/day 2.3/haul	4.5/day 3.0/haul	14
Trinity Bay	506.3	805	3.9/day 2.5/haul	5.0/day 3.1/haul	33
Conception Bay	547.1	634	2.8/day 2.4/haul	4.5/day 3.8/haul	22
Southern Shore	106.1	125	2.3/day 2.0/haul	4.3/day 3.7/haul	6
St. Mary's Bay	12.6	5	0.0/day 0.0/haul	1.3/day 3.4/haul	2
Div. 3L	1337.8	1817	3.2/day 2.4/haul	4.6/day 3.4/haul	77

Table 10. Summary of the commercial samples collected from the inshore capelin fisnery in 1986 in Div. 3L.

Gear type	No. of LSM/stratified samples	No. of otoliths aged	Mean number of otoliths aged per sample ± SD
Purse seine	51	1788	35.1 ± 3.0
Capelin trap	103	3580	34.8 ± 4.5
Beach seine	21	714	34.0 ± 6.7
TOTAL	175	6082	

Table 11. Age-compositions (%) from the inshore commercial capelin fishery in Div. 3L, 1979-86.

	Age					
	1	2	3	4	5	6
Males						
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	-	0.4	56.1	43.0	0.5	-
Females						
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	65.8	29.3	3.7	1.1
Sexes combined						
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	62.2	34.4	2.5	0.7

Table 12. Percent contribution by weight of reasons for discarding capelin in Div. 3L, 1981-86. (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
Traps								
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
Purse seine								
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

* use of separators at sea

Table 13. Catch/effort of capelin traps in Div. 3L utilizing research logbook data.

	L = Logbook landings (t)		C = Logbook landings and discards (t)	
Year	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

Table 14. Catch/effort of purse seines in Div. 3L utilizing research logbook data.

	L = Logbook landings (t)		C = Logbook landings and discards (t)	
Year	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

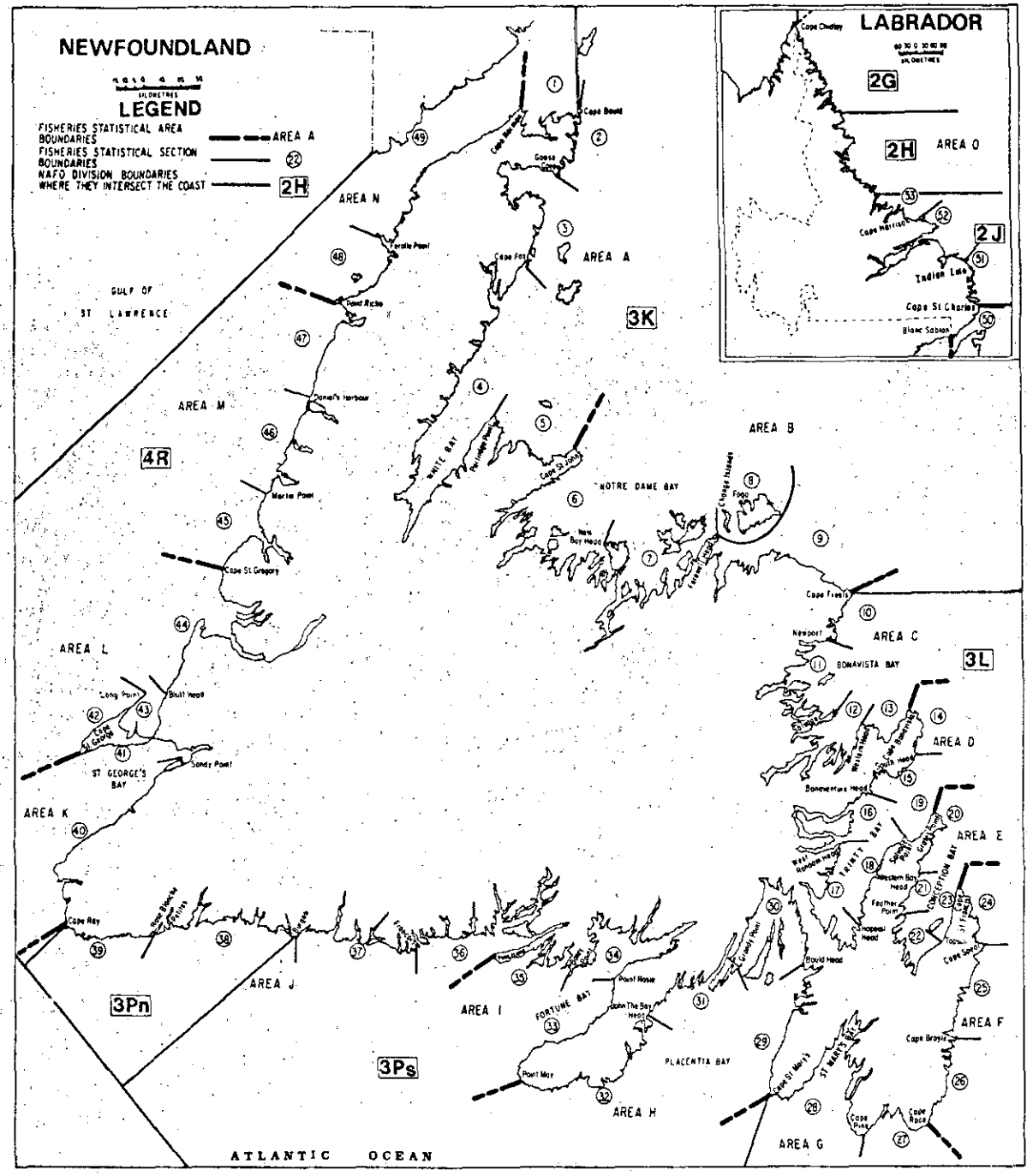

Fig. 1. Statistical areas (C = Bonavista Bay; D = Trinity Bay; E = Conception Bay; F = Southern Shore; G = Trepassey and St. Mary's Bay) and sections (numeric) in Div. 3L along the coast of Newfoundland.