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Cod in Divisions 2J+3KL - Estimates of Biomass and Age Composition
for the Portion of the Stock in the NAFO Regulatory Area.

by

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Introduction

The Fisheries Commission has annually requested information on "the stock separation in Div. 2J+3KL and the cod stock in Div. 3L in the NAFO Regulatory Area and a projection, if possible, of the proportion likely to be available in the Regulatory area in future years". Information is also requested on "the age composition of that portion of the stock in the Regulatory Area". This document updates information presented previously (Bishop et al., 1992) on the proportion of biomass occurring in the NAFO Regulatory Area (NRA) and the age composition of this biomass using data from the Canadian 1992 research surveys in the area. The issue of stock separation has been addressed in some detail by the Scientific Council in recent years (NAFO Scientific Council Reports, 1986) and the general conclusions recommending that the stock be managed as a single complex (2J+3KL) are still valid.

Results and Discussion

Survey coverage

The area of NAFO Div. 3L, in depths to 400 fathoms, is 42,265 sq. naut. miles, of which about 3700 or 9% occurs in the NRA (Table 1, Fig. 1). All areas within this depth zone in both Div. 2J and 3K are on the shoreward side of the Canadian 200-mile fishery zone. The total area in Div. 2J3KL to 400 fathoms is about 106,000 sq. naut. miles (Table 2); therefore, the area to this depth in the NRA in Div. 2J3KL is about 3.5% of the total.

Stratified-random research vessel surveys have been conducted by Canada in Div. 2J, 3K, and 3L during autumn since 1977, 1978, and 1981 respectively. Stratified-random surveys have also been conducted during spring since 1971 (excluding 1983-84) and during winter in 1985 and 1986. Surveys during spring for the 1971-76 period were incomplete with regard to strata coverage and have been excluded from analysis for this document.

Biomass estimates

For the spring surveys conducted during the 1977-90 period, the portion of total 3L biomass in the NRA has ranged from 0.4% to 6.0% with a mean of 2.9. In 1991, the percentage increased to 10.8% and further in 1992 to 16.1%, the highest in the time series (Table 3). Values for recent years may be underestimated as there has been evidence (winter hydroacoustic surveys and the commercial fisheries) to suggest that cod have moved to deeper waters and some may have been outside of the normal survey depth range (400 fathom). The February 1993 hydroacoustic survey located very few cod in Divisions 2J or 3K, and the only significant catch in 3L was 800 kg. caught in 930 meters in the NRA on the Nose of the Grand Bank.

Autumn survey results for the years 1981-92 indicated that from 0.5% to 7.7% of the 3L biomass occurred in the NRA with the 1992 value being about 1.2% (Table 4).

The 1985-86 winter survey results indicated that, in winter, about 25% of the 3L biomass occurred in the NRA. No stratified-random surveys have been conducted during winter since that time.

Surveys conducted during autumn for the years 1981-92 in Div 2J3KL indicated that only a small portion, less than 1%, of the total 2J3KL biomass occurs in the NRA at that time (Table 5). The average Divisional biomass from these surveys (Table 6) would suggest that, on average, less than 5% of the 2J3KL biomass occurs in the NRA throughout the year.

Age composition

The age compositions from spring and autumn research vessel surveys in Div. 3L since 1986 (Tables 7-8; Fig. 2-4) indicate for most years a higher proportion of younger cod in the NRA.

The 1985 and 1986 winter survey results, which indicated the highest seasonal proportion of 3L biomass in the NRA, also showed that the age compositions were similar in both areas.

Age compositions for the entire 2J3KL cod research vessel survey biomass (Table 9) were similar to those which occur in Div. 3L inside the 200-mile fishing zone.

Reference

Bishop, C.A. and E.F. Murphy, and J.W. Baird. 1992. Cod in Divisions 2J+3KL - Estimates of biomass and age composition for the portion of the stock in the NAFO Regulatory Area. NAFO SCR Doc. 92/68. Ser.No. N2122. 8 p.

Table 1. Proportion of area (square nautical miles) outside the 200 mile fishery zone in NAFO Div. 3L by depth range.

Depth (fm)	Depth (m)	Area total	Area outside	% Outside
31-50	56-91	8,552	0	0
51-100	92-183	17,452	933	5
101-150	184-274	6,918	791	11
151-200	275-366	3,855	768	20
201-300	367-549	1,142	636	56
301-400	550-732	804	554	69
unstratified shoreward		3,542	0	0
total		42,265	3,682	9

Table 2. Area in square nautical miles in Div 2J, 3K and 3L.

Division	Survey area (ml. sq.) (0-750 m)	Percentage
2J	27,633	26
3K	36,545	34
3L	42,262	40
Total	106,443	100

Table 3. Estimates of cod biomass outside the 200 mile fishery zone in Division 3L by strata and depth zone from Canadian RV surveys conducted in the spring over the period 1977-92. The number of successful set are in parenthesis.

Strata	Depth zone outside (fath.) ml zone	% Area	ATC	ATC	ATC	ATC	ATC	ATC	WT	WT	WT	WT	WT	WT	WT	WT	
			(102)	(94)	(141)	(115)	(77)	(103)	(221)	(211)	(181)	(154)	(194)	(156)	(138)	(178)	
			1977	1978	1979	1980	1981	1982	1985	1986	1987	1988	1989	1990	1991	1992	
385	51-100	5	21	4	16	314	21	0	104	21	51	107	104	40	326	2	
390	-	56	278	437	1169	1639	276	119	144	223	277	0	109	36	202	20	
389	101-150	62	833	659	681	4292	296	1031	3825	558	401	429	382	318	140	39	
391	-	100	634	356	1048	2054	1212	96	429	826	201	41	96	621	283	0	
387	151-200	37	45	68	170	95	90	871	7952	2425	72	192	927	10667	3422	3005	
388	-	99	1169	179	346	107	188	1308	343	1556	10	177	121	1162	995	239	
392	-	100	30	66	189	0	128	256	2237	435	3	98	57		179	10	
729	201-300	100							35						170	562	
731	-	100	not surveyed beyond 200 fathoms						36	not surveyed beyond 200 fathoms						670	253
733	-	50							158						1290	384	
730	301-400	100							0						0	0	
732	-	100							0						0	0	
734	-	67							0						173	0	
biomass outside 200 ml. li			3010	1769	3659	8411	2210	3680	15263	6044	1017	1044	1845	12733	7849	4505	
total 3L biomass			70877	78118	129116	139030	218214	140578	267515	239857	257564	259080	2E+05	228865	72416	27919	
% outside			4.2%	2.3%	2.8%	6.0%	1.0%	2.6%	5.7%	2.5%	0.4%	0.4%	1.0%	5.6%	10.8%	16.1%	

Table 7. Percent age compositions Divisions 3L inside and outside the 200 mile limit as derived from the 1986-92 spring RV surveys.

Age	1986		1987		1988		1989		1990		1991		1992		
	WT48 Inside	Outside	WT 59-60 Inside	Outside	WT 70-71 Inside	Outside	WT 83 Inside	Outside	WT 96 Inside	Outside	WT 106-107 Inside	Outside	WT 119-122 Inside	Outside	
1									0	0	0	0			
2			1	1	6		5	1	2	1	1	1	2	1	1
3	6	19	5	40	10	57	10	39	10	22	7	19	8	6	
4	24	42	11	30	9	20	20	43	29	36	24	46	34	17	
5	24	20	29	13	15	5	9	6	21	25	30	21	46	39	
6	19	10	27	5	33	6	9	2	8	6	18	8	9	24	
7	9	4	14	3	16	3	23	2	8	4	6	1	2	9	
8	7	3	5	1	8	2	17	2	11	3	5	1	0	1	
9	2	1	4	1	3	1	5	2	6	2	5	1	0	0	
10	1		1	1	2	1	2	1	3	1	2	0	0	1	
11	2	1	1		1		2	1	1	0	2	1	0	0	
12	1		1	1	1										

Table 8. Percent age compositions Divisions 3L inside and outside the 200 mile limit as derived from the 1986-92 autumn RV surveys.

Age	1986		1987		1988		1989		1990		1991		1992	
	AN 72 Inside	Outside	WT 65 Inside	Outside	WT 78 Inside	Outside	WT 87 Inside	Outside	WT 101 Inside	Outside	WT 114-11 Inside	Outside	WT 129-130 Inside	Outside
1				17		4		1	0	1	0	2	0	0
2	3	4	7	62	5	37	3	20	1	4	5	19	2	7
3	6	4	6	18	16	36	22	40	13	18	10	18	18	33
4	27	20	13	2	8	6	21	15	30	31	29	26	29	22
5	23	23	31	3	18	2	11	3	21	12	30	20	28	15
6	24	26	23	1	22	2	15	2	12	4	17	10	17	15
7	7	8	11	1	16	3	15	3	8	3	3	2	5	5
8	6	6	4	1	8	3	6	2	7	5	2	1	0	1
9	2	3	3	2	4	2	4	4	4	7	2	1	0	0
10	1	1			2	1	1	3	1	4	1	1	0	1
11	1	2		1		1		2	1	3			0	0
12	1	1	1	1	1	1	1	1	3	3			0	0

Table 9. Mean numbers per tow of cod at age from autumn RV surveys in Divisions 2J3KL.

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.02	0.41	0.27	0.16	0.51	1.04	0.36	0.02	0.14	0.21	0.59	0.66	0.40	0.03	0.01
2	0.40	0.32	3.00	1.59	2.48	6.07	5.57	1.10	1.85	1.56	2.14	8.25	1.91	1.34	0.29
3	5.39	1.94	2.48	5.12	5.87	12.22	10.79	7.27	4.77	2.04	3.93	8.98	10.93	3.35	1.78
4	11.51	11.78	3.83	2.74	5.92	10.62	15.23	12.35	20.70	4.03	3.20	8.30	12.95	13.97	2.30
5	13.95	16.79	13.23	3.26	3.83	10.83	11.34	10.01	31.29	13.23	5.29	6.20	8.61	9.00	2.72
6	5.51	10.53	13.31	9.67	2.79	3.87	9.59	7.28	21.28	11.61	10.57	6.52	5.64	3.31	1.42
7	1.62	2.27	4.99	8.79	5.82	2.43	2.30	4.24	10.14	4.38	10.13	8.23	3.90	1.10	0.35
8	0.63	0.92	1.19	3.66	5.31	5.33	1.37	0.92	5.26	2.67	2.58	4.84	3.98	0.50	0.04
9	0.47	0.31	0.37	0.74	2.59	2.93	2.09	0.78	1.37	1.38	1.55	1.62	1.68	0.35	0.02
10	0.33	0.26	0.23	0.23	0.57	1.42	1.30	0.67	0.58	0.34	0.79	0.98	0.55	0.16	0.01
11	0.12	0.19	0.11	0.10	0.16	0.36	0.54	0.41	0.68	0.17	0.15	0.43	0.23	0.04	0.00
12	0.09	0.06	0.16	0.11	0.09	0.14	0.28	0.15	0.42	0.19	0.11	0.16	0.12	0.02	0.01
13	0.06	0.04	0.05	0.10	0.07	0.13	0.12	0.06	0.19	0.13	0.08	0.10	0.04	0.01	0.00
1+	40.10	45.82	43.22	36.27	36.01	57.39	60.88	45.26	98.67	41.94	41.11	55.27	50.94	33.18	8.95
2+	40.08	45.41	42.95	36.11	35.50	56.35	60.52	45.24	98.53	41.73	40.52	54.61	50.54	33.15	8.94
3+	39.68	45.09	39.95	34.52	33.02	50.28	54.95	44.14	96.68	40.17	38.38	46.36	48.63	31.81	8.65
4+	34.29	43.15	37.47	29.40	27.15	38.06	44.16	36.87	91.91	38.13	34.45	37.38	37.70	28.46	6.87
5+	22.78	31.37	33.64	26.66	21.23	27.44	28.93	24.52	71.21	34.10	31.25	29.08	24.75	14.49	4.57
6+	8.83	14.58	20.41	23.40	17.40	16.61	17.59	14.51	39.92	20.87	25.96	22.88	16.14	5.49	1.85

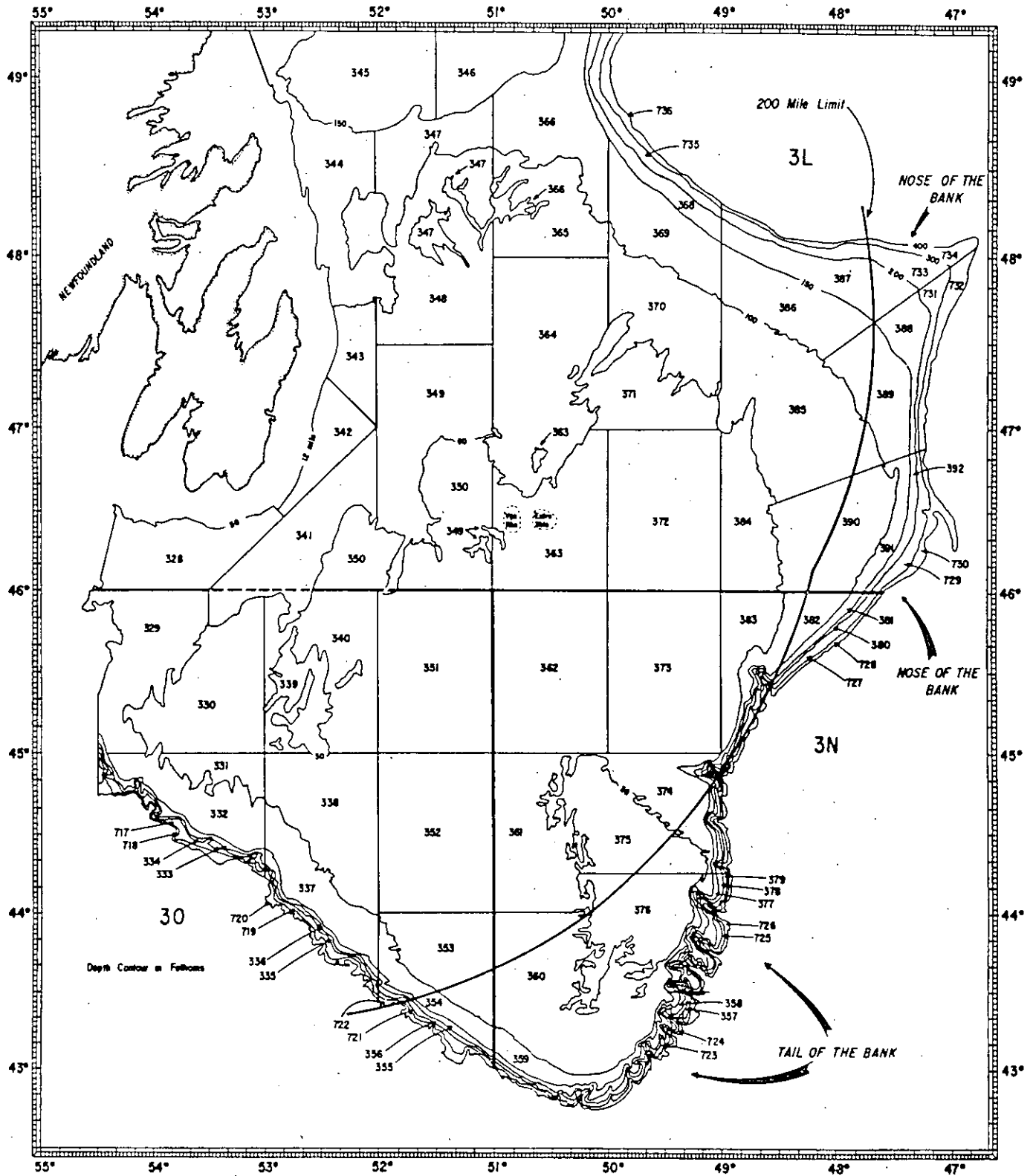


Figure 1. Stratification scheme for NAFO Divisions 3LNO showing the Canadian 200-mile limit.

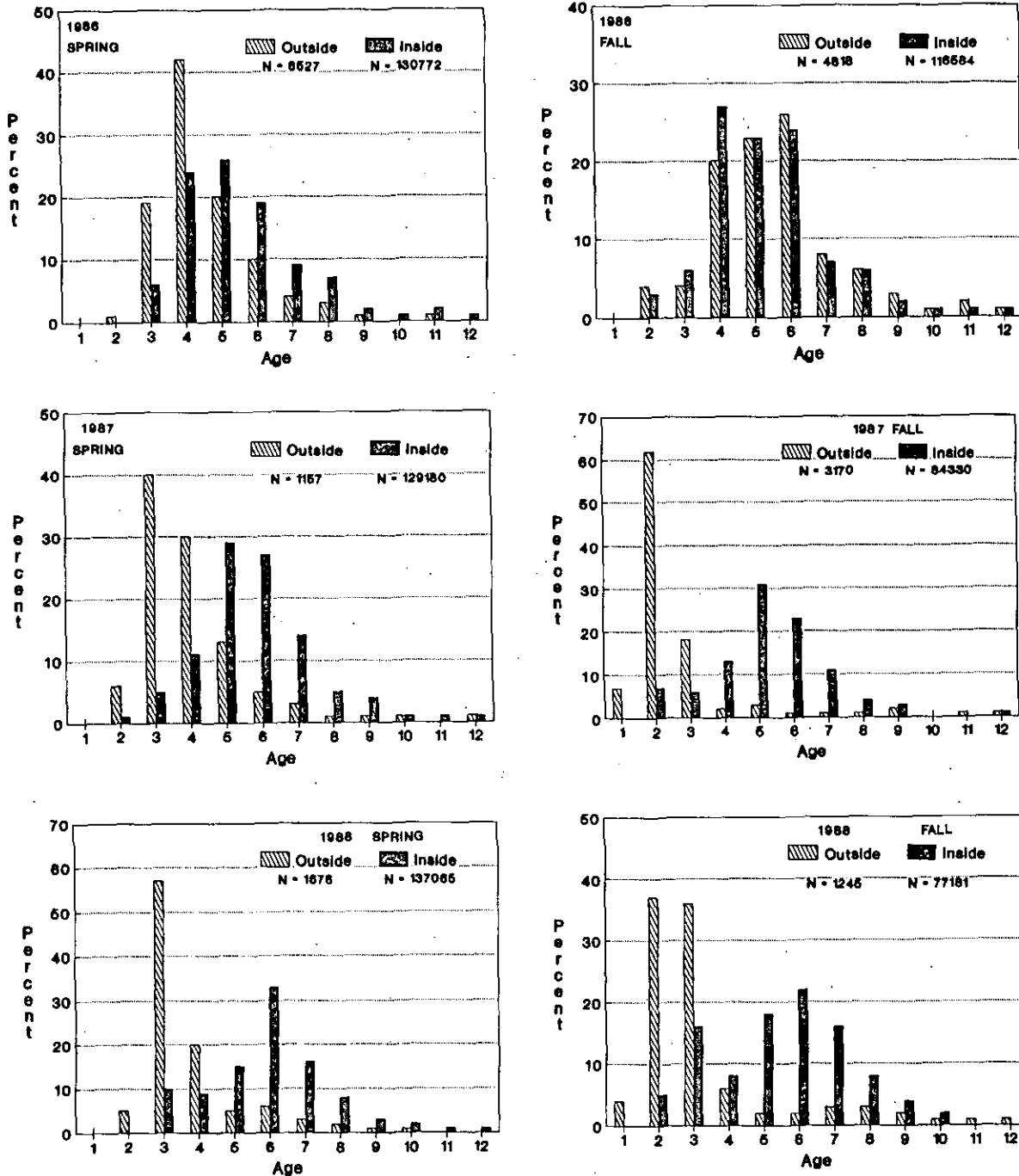


Fig 2. Percent age composition for Division 3L inside and outside the 200-mile limit derived from 1986-88 spring and autumn Canadian RV surveys.

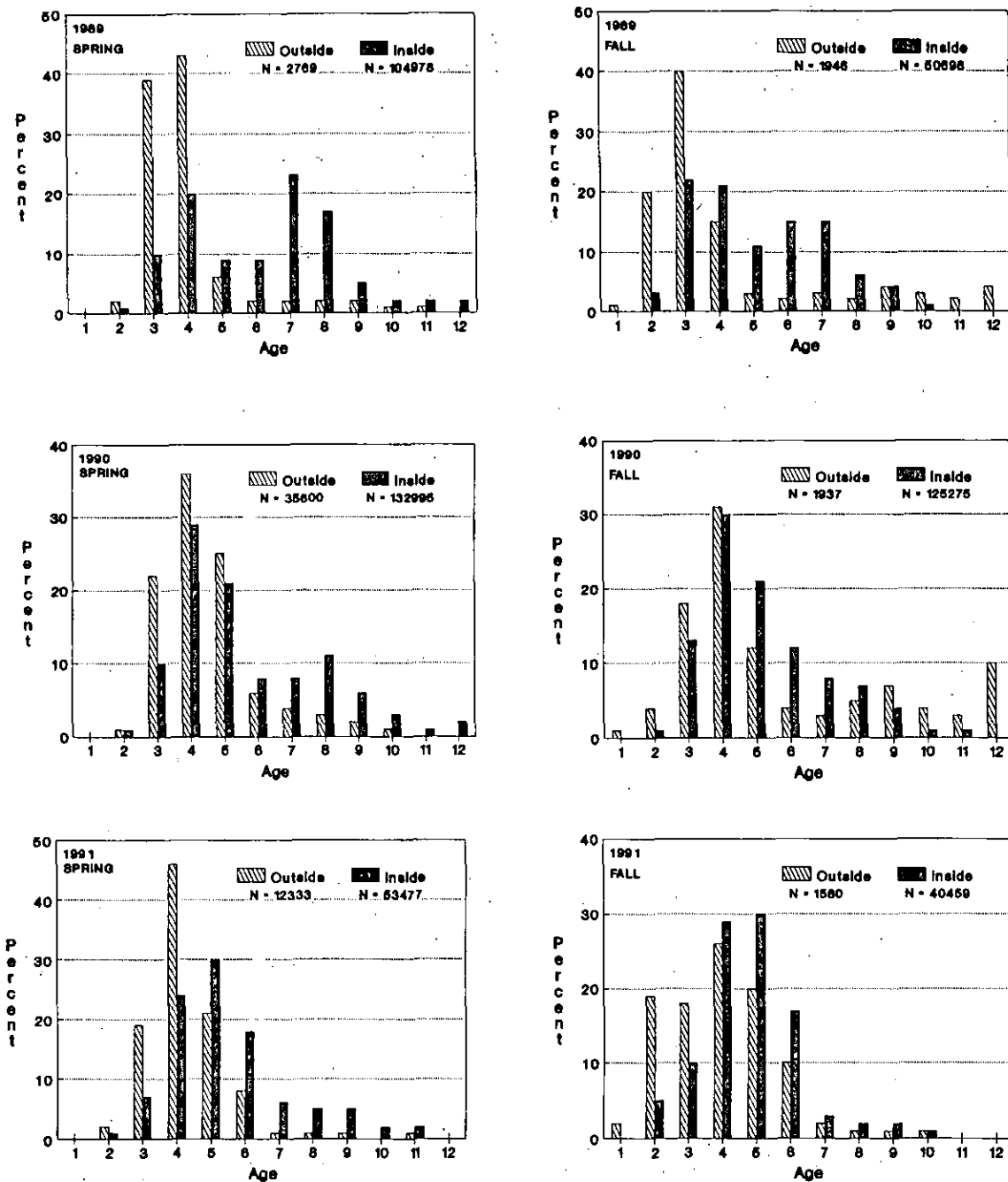


Fig 3. Percent age composition for Division 3L inside and outside the 200-mile limit derived from 1989-1991 spring and autumn Canadian RV surveys.

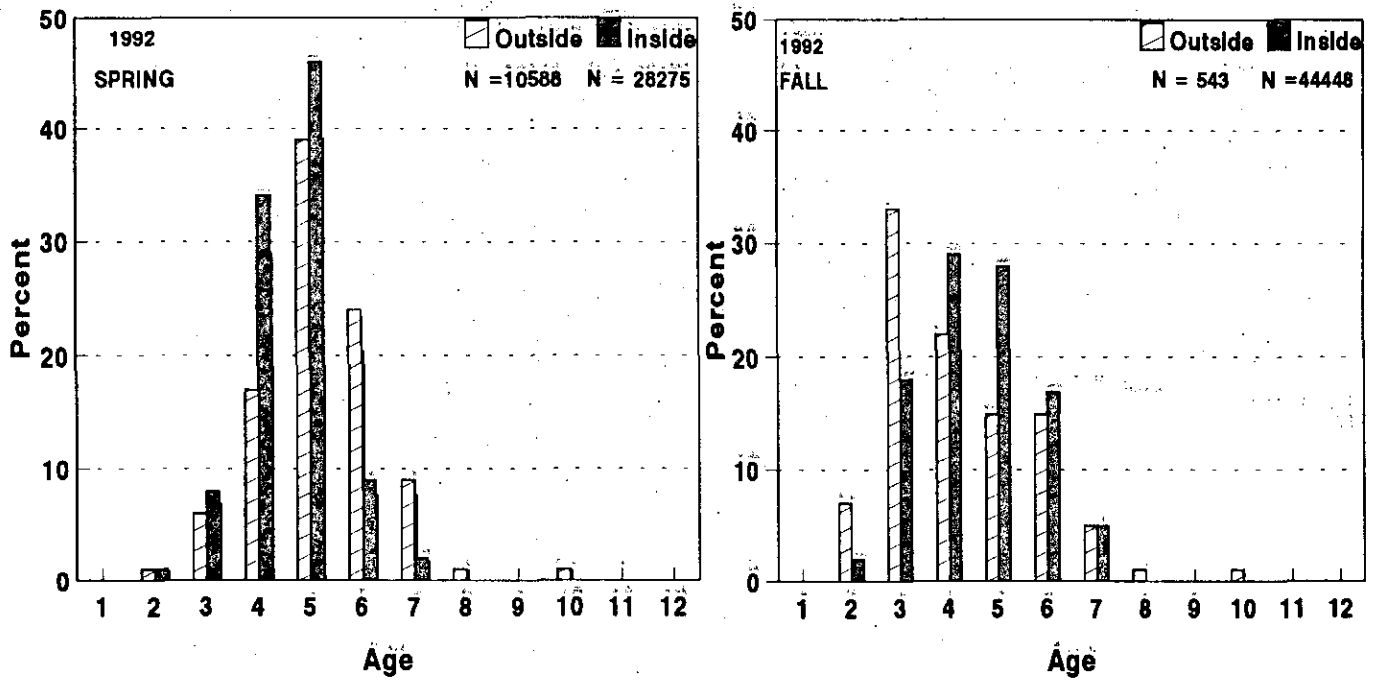


Fig. 4. Percent age composition for Division 3L inside and outside the 200 mile limit as derived from the 1992 spring and autumn Canadian RV surveys.