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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 from Canadian Research Vessel Surveys

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 (Murphy and Bishop, 1994) on the proportion of biomass occurring in the NAFO Regulatory Area (NRA) and the age composition of this biomass using data from the Canadian 1994 research surveys in the area.

Results and Discussion

Stock separation

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 have been that the stock be managed as a single complex (2J+3KL). The general issue of stock definition is being addressed using a suite of recently developed genetic techniques (nuclear DNA gene probes). There is nothing to report to date from this work.

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

Winter surveys are not regularly conducted in Div. 3L. Results of surveys in the winters of 1985 and 1986 indicated that, in winter, about 25% of the 3L biomass occurred in the NRA (Murphy *et al.*, 1991). No stratified-random surveys have been conducted during winter since that time.

Spring surveys conducted during the 1977-90 period show the portion of total 3L biomass in the NRA has ranged from 0.4% to 6.0% with a mean of 2.9. Since 1991 this proportion has increased from highs of 10.8% to 63.% in 1994 (Table 3).

Autumn survey results for the years 1981-94 indicated that on average 3.5 % of the 3L biomass occurred in the NRA with the 1994 value being 9.7 % the highest observed (Table 4).

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. In 1993 this portion has increased to 5 % and is 4.4 % in 1994 (Table 5).

The average Divisional biomass from the autumn surveys (Table 6) has been variable in recent years. Biomass has declined substantially since 1990 and is currently (1994) at an extremely low level.

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

- Murphy, E.F, and C.A.Bishop. 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. 94/41. Ser.No. N2228 8 p.
- Murphy, E.F, C.A. Bishop, and J.W.Baird. 1991. Cod in Divisions 2J+3KL - Estimates of biomass and age composition for the portion of the stock beyond the Canadian 200-mile fishery zone. NAFO SCR Doc. 91/51. Ser.No. N1934. 12 p.

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

Depth fathoms	Depth meters	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 (mi . sq.) (0-750 m)	%
2J	27,633	26
3K	36,545	34
3L	42,262	40
Total	106,443	100

Table 7. Percent age compositions Divisions 3L inside and outside the 200 mile limit as derived from the 1986-93 spring RV surveys.

Age	1986 WT 48		1987 WT 59-63		1988 WT 70-71		1989 WT 83		1990 WT 96		1991 WT 106-107		1992 WT 119-122		1993 WT 137-138		1994 WT 152-154		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	
1																			
2		1	1	6		5	1	2	1	1	1	2	1	1	0	0	0	0	0
3	6	19	5	40	10	57	10	39	10	22	7	19	8	6	27	16	7	15	
4	24	42	11	30	9	20	20	43	29	36	24	46	34	17	25	40	36	35	
5	24	20	29	13	15	5	9	6	21	25	30	21	46	39	17	27	38	38	
6	19	10	27	5	33	6	9	2	8	6	18	8	9	24	20	10	12	8	
7	9	4	14	3	16	3	23	2	8	4	6	1	2	9	7	5	7	3	
8	7	3	5	1	8	2	17	2	11	3	5	1	0	1	4	2	1	0	
9	2	1	4	1	3	1	5	2	6	2	5	1	0	0	1	0	0	0	
10	1	1	1	1	2	1	2	1	3	1	2	0	0	1	0	0	0	0	
11	2	1	1	1	1	1	2	1	1	0	2	1	0	0	0	0	0	0	
12	1	1	1	1	1	1													

Table 8. Percent age compositions Divisions 3L inside and outside the 200 mile limit as derived from the 1986-93 autumn RV surveys.

Age	1986 AN 72		1987 WT 65		1988 WT 78		1989 WT 87		1990 WT 101		1991 WT 114-115		1992 WT 129-130		1993 WT 145-146		1994 WT 160-162		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	
1				17		4		1	0	1	0	2	0	0	0	0	0	0	0
2	3	4	7	62	5	37	3	20	1	4	5	19	2	7	9	5	6	6	
3	6	4	6	18	16	36	22	40	13	18	10	18	18	33	26	27	15	19	
4	27	20	13	2	8	6	21	15	30	31	29	26	29	22	38	44	54	35	
5	23	23	31	3	18	2	11	3	21	12	30	20	28	15	17	15	22	23	
6	24	26	23	1	22	2	15	2	12	4	17	10	17	15	8	7	3	11	
7	7	8	11	1	16	3	15	3	8	3	3	2	5	5	2	2	1	6	
8	6	6	4	1	8	3	6	2	7	5	2	1	0	1	0	0	0	0	
9	2	3	3	2	4	2	4	4	4	7	2	1	0	0	0	0	0	0	
10	1	1			2	1	1	3	1	4	1	1	0	1	0	0	0	0	
11	1	2		1		1		2	1	3			0	0	0	0	0	0	
12	1	1	1	1	1	1	1	1	3				0	0	0	0	0	0	

Table 9. MEAN NUMBERS OF COD PER TOW 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	1993	1994
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	0.00	0.01
2	0.40	0.32	3.00	1.59	2.49	6.09	5.57	1.10	1.85	1.56	2.14	8.25	1.91	1.34	0.29	0.37	0.05
3	5.39	1.94	2.48	5.11	5.88	12.31	10.79	7.27	4.77	2.04	3.93	8.98	10.93	3.35	1.78	0.60	0.16
4	11.51	11.78	3.83	2.74	5.93	10.65	15.23	12.35	20.70	4.03	3.20	8.30	12.95	13.97	2.30	0.83	0.13
5	13.95	16.79	13.23	3.26	3.83	10.88	11.34	10.01	31.29	13.23	5.29	6.20	8.61	9.00	2.72	0.34	0.08
6	5.51	10.53	13.31	9.67	2.79	3.88	9.59	7.28	21.29	11.81	10.57	6.52	5.64	3.31	1.42	0.22	0.02
7	1.62	2.27	4.99	6.78	5.82	2.44	2.30	4.24	10.14	4.38	10.13	8.23	3.90	1.10	0.35	0.04	0.02
8	0.63	0.92	1.19	3.66	5.31	5.35	1.37	0.92	5.28	2.67	2.58	4.84	3.98	0.50	0.04	0.01	0.01
9	0.47	0.31	0.37	0.74	2.59	2.94	2.09	0.78	1.37	1.38	1.55	1.62	1.68	0.35	0.02	0.00	0.00
10	0.33	0.28	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	0.00	0.00
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	0.00	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	0.00	0.00
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	0.00	0.00
1+	40.11	45.80	43.21	38.23	36.03	57.63	60.87	45.25	98.68	41.66	41.11	55.29	50.93	33.18	8.96	2.41	0.48
2+	40.09	45.39	42.94	36.08	35.52	56.58	60.51	45.23	98.54	41.74	40.53	54.62	50.53	33.15	8.94	2.41	0.47
3+	39.69	45.07	39.94	34.49	33.03	50.49	54.94	44.13	98.69	40.18	38.38	46.37	48.62	31.81	8.65	2.03	0.42
4+	34.30	43.13	37.47	29.38	27.16	38.18	44.15	36.98	91.92	38.14	34.46	37.39	37.70	28.46	6.87	1.43	0.26
5+	22.79	31.35	33.64	26.64	21.23	27.53	23.93	24.52	71.22	34.11	31.26	29.09	24.75	14.49	4.57	0.61	0.13
6+	8.84	14.57	20.41	23.38	17.40	16.68	17.59	14.50	39.93	20.88	25.97	22.89	16.14	5.49	1.65	0.27	0.05

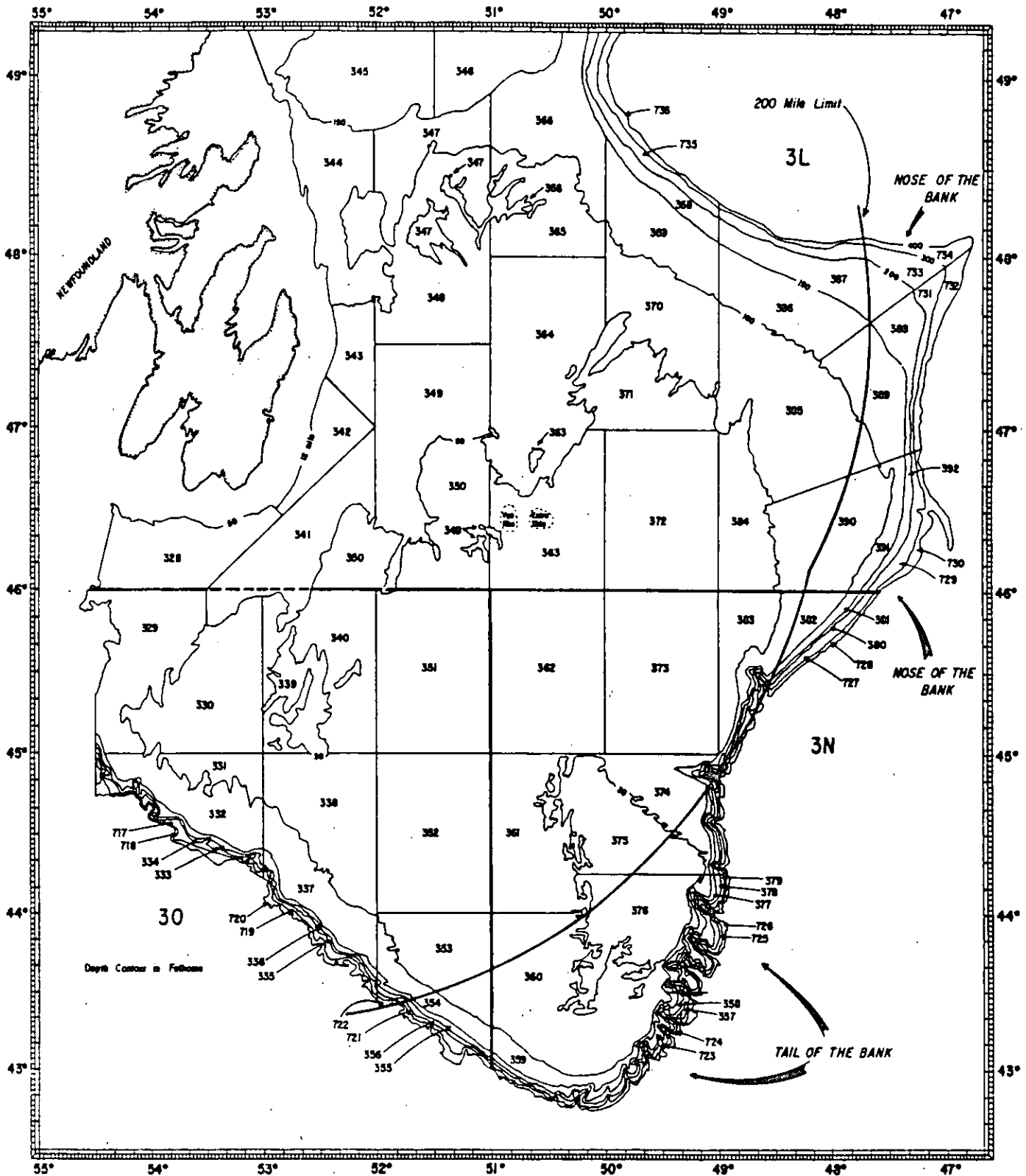


Figure 1. Stratification scheme for NAFO Divisions 3LNO showing the Canadian 200-mile limit.

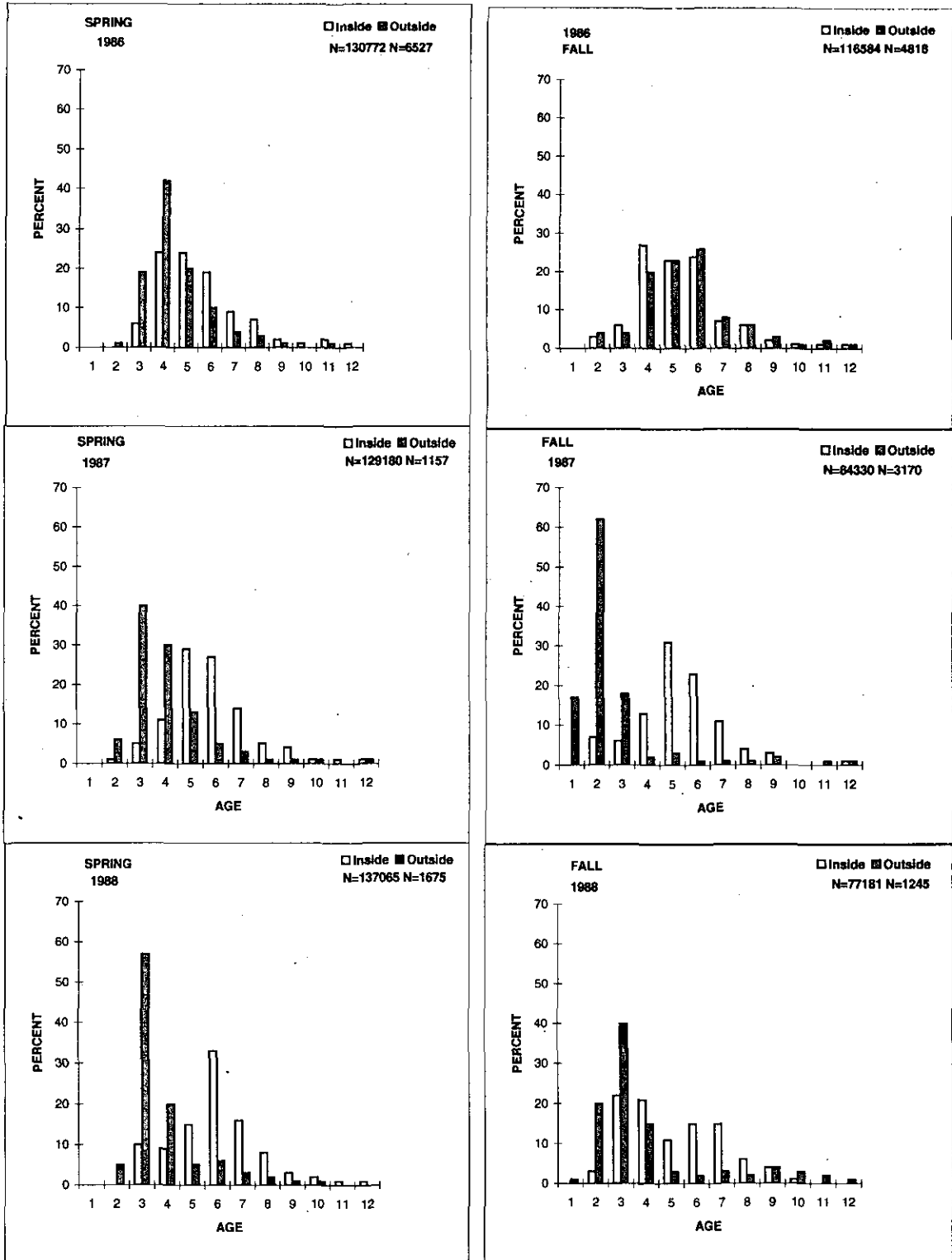


Fig 2. Percent age composition for Division 3L Inside and outside the 200-mile limit derived from 1986-1988 spring and autumn Canadian RV surveys.

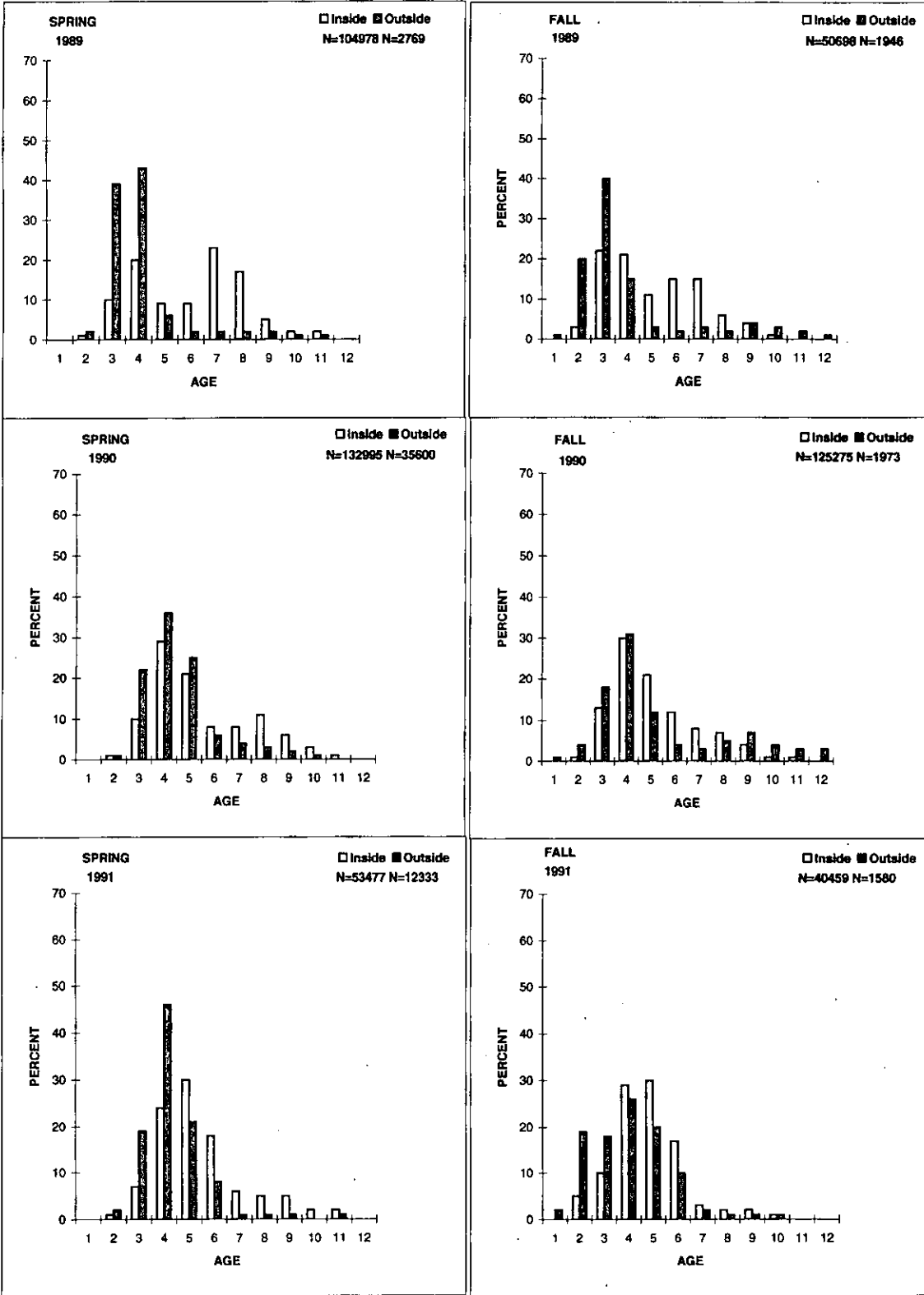


Fig 3. Percent age composition for Division 3L inside and outside the 200-mile limit derived from 1986 -1988 spring and autumn Canadian RV surveys.

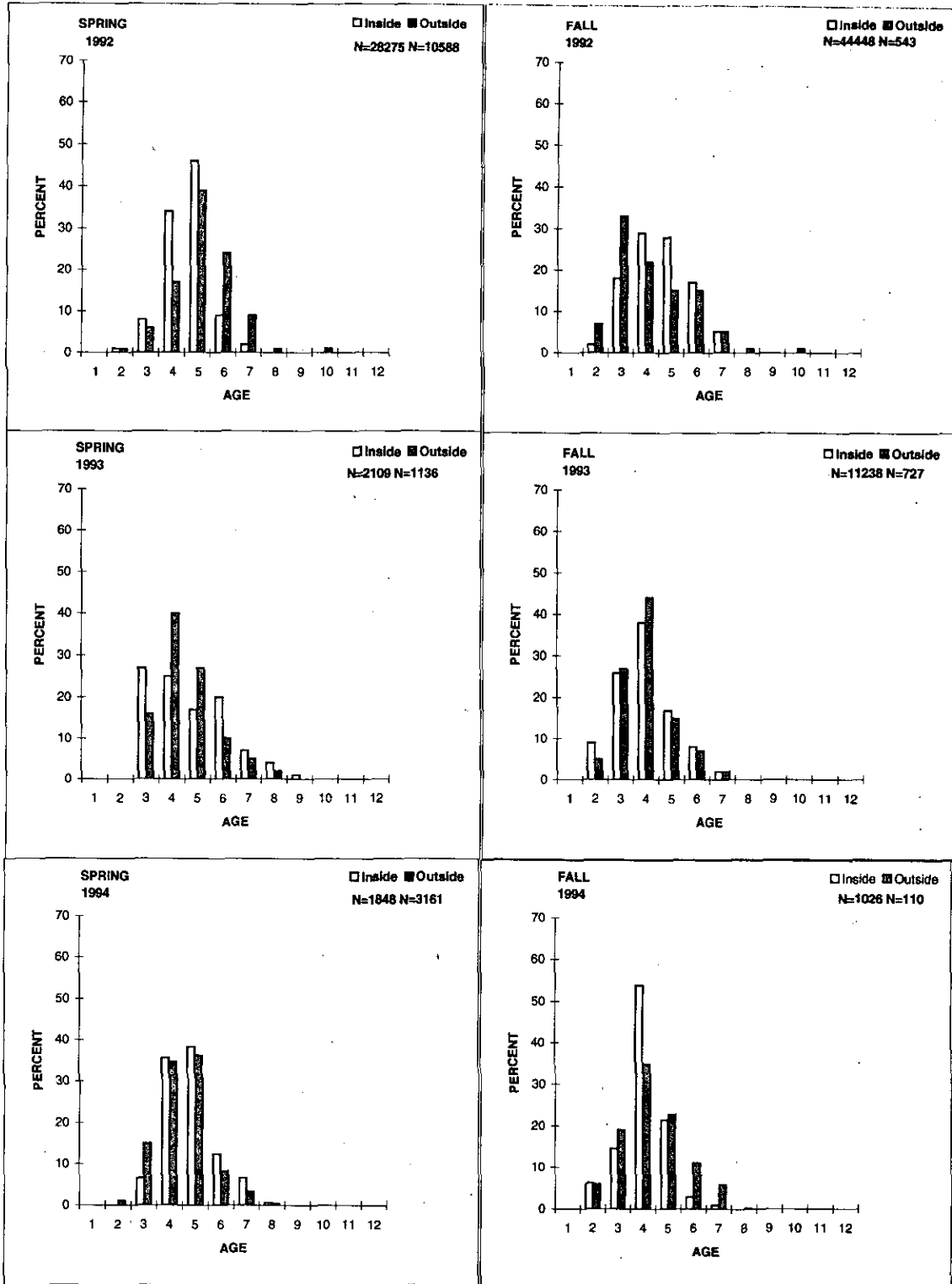


Fig 4. Percent age composition for Division 3L inside and outside the 200-mile limit derived from 1986 -1988 spring and autumn Canadian RV surveys.