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Distribution and Abundance of Five Major Groundfish Species at the Continental Slope of
Divisions 3KLMN Based upon Canadian Deepwater Surveys in 1991, 1994 and 1995

by

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Introduction

Since about 1989, a deepwater fishery for Greenland halibut has developed at the continental slope of the NAFO Regulatory Area in Div. 3LM and more recently in Div. 3N in depths generally exceeding 1000 meters. In order to evaluate the distribution and abundance of Greenland halibut, in particular, deepwater trawl surveys were conducted in 1991, in Div. 3KLM and in Div. 3KLM and part of Div. 3N in 1994 and 1995. This paper describes the distribution and abundance of five other groundfish species caught during these surveys in addition to Greenland halibut. The five species are American plaice, witch flounder, redfish, roundnose grenadier and roughhead grenadier.

Materials and Methods

All three surveys were conducted by large offshore trawlers with the necessary capacity to fish depths beyond 1500 meters. All surveys were conducted using the same fishing gear i.e. an Engel 145' otter trawl with 18" rockhopper footgear and a 28 mm liner in the codend in order to retain the catch of small fish. To standardize sets within and among surveys, the fishing gear was equipped with electronic sensors which recorded when the net was on the bottom, the wing spread, headline height, towing speed and distance towed. This was done to dispel any concern related to the use of different vessels.

The first survey was carried out by the vessel Cape Adair during Sept. 4-30, 1991 in Div. 3KLM with most sets conducted within a depth range of 750-1500 meters. A total of 106 successful fishing sets were completed, 27 in Div. 3K, 42 in Div. 3L and 37 in Div. 3M. This survey used a line transect design which was later post-stratified according to the stratification scheme described in Bishop (1994).

The second survey was conducted by the vessel Zandvoort during Feb. 3-Mar. 13, 1994 in Div. 3KLMN using a stratified-random design with the stratification scheme discussed above, at depths ranging from 550-1500 meters depending upon the division. A total of 131 successful fishing sets were completed, 22 in Div. 3K, 47 in Div. 3L, 51 in Div. 3M and 11 in Div. 3N.

The 1995 survey was carried out during Mar. 16-April 21 by the Canadian research vessel Teleost in Div. 3KLMN using the same stratified-random design as in 1994 in depths of 500-1500 meters with more extensive coverage in Div. 3K than the previous two surveys. A total of 142 successful sets were conducted, 48 in Div. 3K, 48 in Div. 3L, 37 in Div. 3M and 9 in Div. 3N.

At the end of each fishing set the catch numbers and weights (kg) were collected for each species caught and where time was available, length frequencies were obtained for the major groundfish species encountered.

Results

American plaice

The distribution of American plaice as mean weight (kg) and mean number per set for each survey year are presented in figures 1 and 2, respectively. In the 1991 survey there were virtually no American plaice with the exception of several small catches on the northwest side of the Flemish Cap in relatively deep water (Fig. 1 and 2). In the 1994 survey, the catches were more frequent than in 1991 except for northern Div. 3K and in the deeper waters of the Flemish Pass. The area of highest density was along the northwest slope of Div. 3L inside the Canadian fishery zone and the southwest slope of the Flemish Pass in Div. 3L. Consistent catches were also taken on the northeast slope of Div. 3N although this area was not surveyed in 1991 for comparison. The distribution in 1995 was very similar to that of 1994. In 1995, however, survey coverage was extended to the 500-750 meter depth zone in Div. 3K. American plaice were caught consistently throughout this depth zone but were generally low compared to areas of highest density to the south.

Biomass and abundance indices separately by stratum and division are presented in tables 1 and 2, respectively. For the area surveyed in Div. 3K there were essentially no American plaice encountered in the 1991 and 1994 surveys. In 1995, on the other hand, the biomass was estimated to be about 1700 tons (Table 1) and the abundance, 8 million fish (Table 2). Most of the estimate is accounted for in the depth zone 500-750 meters. For commonly fished strata between in 1994 and 1995 still show virtually no fish. In Div. 3L there were no fish estimated for 1991 but in 1994 was estimated to be about 7400 tons and 27 million fish. This increased to 13000 tons and 52 million fish in the 1995 survey. For commonly fished strata in Div. 3L between 1994 and 1995 the estimates were much lower than the estimates for all strata fished, however, the ratio between the two years was about the same for both. The biomass and abundance estimates for Div. 3M increased from just 30 tons and 50 thousand fish in 1991 to 1400 tons and 1.7 million fish in 1994 and remaining much the same for 1995. For Div. 3N the estimates were about the same between 1994 and 1995 at around 1700 tons and 5 million fish.

The overall estimate of biomass and abundance in 1995 for the surveyed area of Div. 3KLMN was 18000 tons and 66 million fish respectively.

Age-length comparisons of American plaice

The presence of increasing numbers of American plaice in the very deep waters on both sides of the Flemish Pass was considered unusual in comparison to the typical distribution of American plaice in previous years. It is known that there is a considerable difference in the growth rates of this species between those of the Grand Bank and those of the Flemish Cap (Bowering and Brodie 1994). Age samples were therefore collected in 1994 from the west side (Div. 3L) of the Pass and the east side (Div. 3M) to determine the origin of the fish in the deepwater or the extent of any mixing. A plot of the mean length at age for the two samples by sex is presented in figure 3. A comparison of the Div. 3L sample with similar data from the regular groundfish survey on the northern Grand Bank is shown in figure 4.

The results presented in figure 3 indicate that the samples examined are from the respective stocks adjacent to where they were collected and do not appear to be confounded by mixing within the Flemish Pass area. This is further confirmed by the comparison in figure 4 where the mean sizes at age are virtually identical.

Witch flounder

The distribution of witch flounder as mean weight (kg) and mean number per set for each survey year are presented in figures 5 and 6, respectively. As with the American plaice, there were very few witch flounder caught in the 1991 survey except for a few sets with very low catches. In 1994, witch flounder were caught in more than half of the sets but at consistently low catches and widely dispersed throughout the survey area. In 1995, they were caught in most sets. Catch levels were generally in the range of the 1994 catches, although there were some localized areas of higher density in the southern Flemish Pass area.

Except for Div. 3N which showed some decline between 1994 and 1995, the biomass (Table 3) and abundance (Table 4) increased in all divisions from 1991 to 1995, although the overall estimates remained low. In 1995 the cumulative total was around 5000 tons of biomass and 12 million fish for Div. 3KLMN combined compared to 2400 tons and 4 million fish in 1994.

Redfish

The distribution of redfish as mean weight (kg) and mean number per set for each survey year are presented in figures 7 and 8, respectively. During the 1991 survey redfish were encountered in few areas being most prevalent on the nose of the Grand Bank in the area known as the Sackville Spur. Some catches were taken around the upper part of the Flemish Cap at relatively shallow depths. The largest catch was taken in the northernmost part of Div. 3K, however, there were few other catches in that division that had any redfish. In the 1994 survey, there were no redfish caught in Div. 3K and the northernmost part of Div. 3L. Although there were no catches taken in the deeper waters of Flemish Pass there were catches taken along the upper slopes on both sides of the Pass. The catches were most highly concentrated on the southwest end of the Flemish Cap in the area known as the Beothuck Knoll with several good catches taken on the northwestern side of the Cap in shallower waters.

Very little redfish was found in any year in either Div. 3K, 3L or Div. 3N (Tables 5 and 6). In Div. 3K in 1991 biomass was estimated to be over 4000 tons (Table 5) and 7 million fish (Table 6), however, this estimate was influenced by one large catch in the northern part of the division. The only area where significant amounts of redfish were encountered was in Div. 3M. In 1991 less than 200 tons of biomass was estimated but the biomass estimate for 1994 increased to nearly 8000 tons then declined to 4400 tons in 1995. In both years almost the entire biomass and abundance is accounted for by one or two strata as evident from the distribution plots.

Roundnose grenadier

Roundnose grenadier were widely distributed throughout the survey area in all three years (Fig. 9 and 10). The area of highest concentration encountered was in Div. 3K at the extreme north of the area surveyed in the deepest strata. This was the same for all three years. However, this area of concentration seemed to be less extensive in the 1995 survey than in each of the previous surveys. In 1994 and 1995 there were some larger catches on the north side of the Flemish Cap and at the southern tip of the Cap south of the Beothuck Knoll. In 1991 there was a significant number of large sets in the northern Flemish Pass area, however, this did not appear to be as much the case for 1994 and 1995.

The biomass and abundance of roundnose grenadier are presented by division and stratum in tables 7 and 8 respectively. The survey biomass index of roundnose grenadier has declined considerably between 1994 and 1995 in all divisions. The bulk of the biomass and abundance are found in Div. 3K and 3M which generally account for more than 50% and 25% of the total area estimates, respectively. The biomass in Div. 3K declined from about 20000 tons in 1991 and 1994 to less than 7000 tons in 1995 (Table 7). In Div. 3M the biomass estimates declined from about 12000 tons in 1991 to 8500 tons in 1994 and 4400 tons in 1995. The trends were the same for the entire survey area as well as the area of common strata fished. The abundance index for Div. 3K increased considerably between 1991 and 1994 compared to a stable index of biomass suggesting a preponderance of smaller fish in the 1994 survey compared to 1991. Otherwise the ratios of biomass and abundance was about the same in all other areas and years.

Roughhead grenadier

As with the roundnose grenadier the roughhead grenadier was also widely distributed throughout the survey areas in all three surveys (Fig. 11 and 12). In 1991 there were no clear areas of high concentration. In both 1994 and 1995, however, there were areas of higher concentration especially in the Flemish Pass and along the northeast slope of Div. 3L and the eastern slope of Div. 3N. No apparent concentrations were observed in Div. 3K but catches seemed to be evenly distributed at similar levels in all three years.

All four of Div. 3KLM appear to have significant amounts of roughhead grenadier (Tables 9 and 10) although Div. 3L and 3M generally account for most of the stock biomass and abundance. The biomass and abundance increased systematically from 1991 to 1995 in all divisions. In 1991 the total estimated biomass for Div. 3KLM was 16000 tons (no survey conducted in Div. 3N in 1991) compared to 25000 tons in 1995 (about 6000 tons in Div. 3N). The abundance increased from about 27 million fish in 1991 in Div. 3KLM to 82 million fish in 1995 (10 million fish in Div. 3N in 1995).

References

Bishop, C.A. 1994. Revisions and additions to stratification schemes used during research vessel surveys in NAFO Subareas 2 and 3. NAFO SCR Doc. 94/43, Serial No. N2413, 23p.

Bowering, W.R. and W.B. Brodie. 1994. Distribution, Age and Growth, and Sexual Maturity of American Plaice (*Hippoglossoides platessoides* (Fabricius)) (NAFO Division 3M). J. Northw. Atl. Fish. Sci., Vol. 16:49-61.

Table 1. Estimated biomass (tons) per stratum of American Plaice from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
501-750	641	230	17	-	-	180
	642	418	31	-	-	404
	646	325	24	-	-	107
	651	359	27	-	-	306
Total					997	
751-1000	647	360	27	0	-	53
	652	516	39	0	-	586
Total			0	-	639	
1001-1250	643	733	55	0	0	0
	648	228	17	0	0	0
	653	531	40	0	46	37
Total			0	46	37	
1251-1500	644	474	36	0	0	0
	649	212	16	0	0	0
	654	479	36	0	10	3
Total			0	10	3	
Biomass(t)				0	56	1675
95% Lower				0	-89	830
95% Upper				0	-201	2521
Biomass common strata				0	56	40

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	730	170	13	-	21	-
	732	231	17	-	87	571
	734	228	17	0	14	347
	736	175	13	-	39	379
Total			0	161	1297	
732-914	737	227	17	0	182	706
	741	223	17	0	139	1422
	745	348	26	0	303	1121
	748	159	12	-	230	-
Total			0	854	3249	
915-1097	738	221	17	-	486	1722
	742	206	15	0	414	3123
	746	392	29	0	1283	337
	749	126	9	-	1036	855
Total			0	3199	6037	
1098-1280	739	254	19	-	589	1111
	743	211	16	0	2495	1286
	747	724	54	0	16	24
	750	556	42	0	53	40
	751	229	17	-	-	8
Total			0	3153	2469	
1281-1463	740	264	20	0	0	0
	744	280	21	0	-	0
Total			0	0	0	
Biomass(t)				0	7365	13051
95% Lower				0	-1102	6775
95% Upper				0	15832	19327
Biomass common strata				0	4879	8406

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
367-549	537	102	8	-	3	-
	Total				3	-
550-731	538	194	15	-	9	0
	Total				9	0
732-914	520	525	39	9	28	-
	524	253	19	-	67	-
	528	530	40	5	22	137
	533	98	7	-	-	10
	539	133	10	-	16	10
Total			14	131	157	
915-1097	521	517	39	0	17	-
	529	488	37	13	116	348
	532	238	18	0	0	5
	534	486	36	-	1086	503
Total			13	1219	858	
1098-1280	522	533	40	0	0	-
	530	1134	85	0	29	5
	535	92	7	-	2	171
Total			0	31	176	
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	0	0
Total			0	0	0	
Biomass(t)				27	1393	1190
95% Lower				-13	64	542
95% Upper				68	2722	1837
Biomass common strata				18	167	495

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	728	156	12	-	33	-
	Total				33	-
732-914	752	134	10	-	554	839
	Total				554	839
915-1097	753	138	10	-	658	875
	Total				658	875
1098-1280	754	180	14	-	245	0
	Total				245	0
1281-1463	755	385	29	-	118	0
	Total				118	0
Biomass(t)					1608	1714
95% Lower					-3474	-8247
95% Upper					6689	11874
Biomass common strata					1575	1714

Table 2. Estimated numbers (000) per stratum of American plaice from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
501-750	641	230	17	-	-	1183
	642	418	31	-	-	1710
	646	325	24	-	-	659
	651	359	27	-	-	1718
Total						5270
751-1000	647	360	27	0	-	162
	652	516	39	0	-	2099
Total				0	-	2261
1001-1250	643	733	55	0	0	0
	648	228	17	0	0	0
	653	531	40	0	133	112
Total				0	133	112
1251-1500	644	474	36	0	0	0
	649	212	16	0	0	0
	654	479	36	0	27	7
	Total			0	27	7
Abundance				0	160	7650
95% Lower				0	-268	4242
95% Upper				0	588	11057
Abun. for common strata				0	160	119

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	730	170	13	-	115	-
	732	231	17	-	329	2532
	734	228	17	0	60	3628
	736	175	13	-	296	2365
Total				0	800	8525
732-914	737	227	17	0	1210	3289
	741	223	17	0	1013	6520
	745	348	26	0	1054	4580
	748	159	12	-	865	-
Total				0	4142	14389
915-1097	738	221	17	-	2132	6030
	742	206	15	0	1894	11435
	746	392	29	0	3696	905
	749	126	9	-	2958	2161
Total				0	10678	20531
1098-1280	739	254	19	-	1964	3743
	743	211	16	0	8925	4324
	747	724	54	0	27	54
	750	556	42	0	100	46
Total				0	11016	8167
1281-1463	740	264	20	0	0	0
	744	280	21	0	-	0
	751	229	17	-	-	17
Total				0	0	17
Abundance				0	26635	51629
95% Lower				0	-1195	25018
95% Upper				0	54465	78240
Abun. for common strata				0	17979	34781

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
367-549	537	102	8	-	4	-
	Total				4	-
550-731	538	194	15	-	10	0
Total					10	0
732-914	520	525	39	21	30	-
	524	253	19	-	95	-
	528	530	40	12	60	191
	533	98	7	-	-	18
	539	133	10	-	20	15
Total				33	205	224
915-1097	521	517	39	0	26	-
	529	488	37	19	171	348
	532	238	18	0	0	9
	534	486	36	-	1255	660
Total				19	1452	1017
1098-1280	522	533	40	0	0	-
	530	1134	85	0	21	8
	535	92	7	-	3	190
Total				0	24	198
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	0	0
Total				0	0	0
Abundance				52	1695	1439
95% Lower				-7	247	607
95% Upper				111	3142	2272
Abun. for common strata				31	252	556

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	728	156	12	-	217	-
Total					217	-
732-914	752	134	10	-	2298	2319
Total					2298	2319
915-1097	753	138	10	-	1797	2315
Total					1797	2315
1098-1280	754	180	14	-	466	0
Total					466	0
1281-1463	755	385	29	-	275	0
Total					275	0
Abundance				-	5054	4634
95% Lower				-	-8984	-23550
95% Upper				-	19091	32817
Abun. for common strata					4836	4634

Table 3. Estimated biomass (tons) per stratum of Witch from the summer survey 1991 and the winter surveys in 1994 and 1995.
Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
501-750	641	230	17	-	-	24
	642	418	31	-	-	168
	646	325	24	-	-	28
	651	359	27	-	-	51
Total					271	
751-1000	647	360	27	0	-	154
	652	516	39	16	-	152
Total				16	-	306
1001-1250	643	733	55	0	176	291
	648	228	17	0	74	85
	653	531	40	0	277	273
Total				0	527	649
1251-1500	644	474	36	0	68	0
	649	212	16	0	0	0
	654	479	36	0	144	25
	Total				0	212
Biomass(t)				16	739	1250
95% Lower				-193	273	861
95% Upper				226	1204	1639
Biomass common strata				0	739	674

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	730	170	13	-	18	-
	732	231	17	-	21	46
	734	228	17	0	3	4
	736	175	13	-	1	11
Total				0	43	61
732-914	737	227	17	0	27	43
	741	223	17	0	0	73
	745	348	26	16	11	51
	748	159	12	-	14	-
Total				16	52	167
915-1097	738	221	17	-	26	41
	742	206	15	0	7	18
	746	392	29	0	101	921
	749	126	9	-	56	264
Total				0	190	1244
1098-1280	739	254	19	-	57	47
	743	211	16	0	11	430
	747	724	54	0	82	190
	750	556	42	0	124	224
	751	229	17	-	-	1
Total				0	274	892
1281-1463	740	264	20	0	96	118
	744	280	21	0	-	48
Total				0	96	166
Biomass(t)				16	655	2531
95% Lower				-28	384	1377
95% Upper				61	925	3685
Biomass common strata				16	462	2072

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
367-549	537	102	8	-	0	-
	Total				0	-
550-731	538	194	15	-	3	5
	Total				3	5
732-914	520	525	39	5	27	-
	524	253	19	-	83	-
	528	530	40	2	84	271
	533	98	7	-	-	61
	539	133	10	-	14	13
Total				7	208	345
915-1097	521	517	39	0	0	-
	529	488	37	0	33	236
	532	238	18	0	10	40
	534	486	36	-	316	644
Total				0	359	920
1098-1280	522	533	40	0	0	-
	530	1134	85	0	2	89
	535	92	7	-	0	547
Total				0	2	636
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	0	0
Total				0	0	0
Biomass(t)				7	572	1906
95% Lower				-10	113	-978
95% Upper				24	1032	4790
Biomass common strata				2	129	636

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	728	156	12	-	0	-
	Total				0	-
732-914	752	134	10	-	34	22
	Total				34	22
915-1097	753	138	10	-	270	59
	Total				270	59
1098-1280	754	180	14	-	162	12
	Total				162	12
1281-1463	755	385	29	-	15	0
	Total				15	0
Biomass(t)					482	94
95% Lower					-3226	-245
95% Upper					4190	433
Biomass common strata					481	93

Table 4. Estimated numbers (ooo) per stratum of Witch from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
501-750	641	230	17	-	-	78
	642	418	31	-	-	494
	646	325	24	-	-	122
	651	359	27	-	-	141
Total						835
751-1000	647	360	27	0	-	608
	652	516	39	19	-	411
Total				19	-	1019
1001-1250	643	733	55	0	468	816
	648	228	17	0	171	217
	653	531	40	0	598	630
Total				0	1237	1663
1251-1500	644	474	36	0	178	0
	649	212	16	0	0	0
	654	479	36	0	261	50
Total				0	439	50
Abundance				19	1675	3567
95% Lower				-227	921	2309
95% Upper				265	2430	4825
Abun. for common strata				0	1676	1713

Div. 3L						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	730	170	13	-	19	-
	732	231	17	-	26	165
	734	228	17	0	9	111
	736	175	13	-	13	79
Total				0	67	355
732-914	737	227	17	0	34	85
	741	223	17	0	0	134
	745	348	26	22	26	87
	748	159	12	-	18	-
Total				22	78	306
915-1097	738	221	17	-	41	66
	742	206	15	0	23	62
	746	392	29	0	112	1552
	749	126	9	-	85	393
Total				0	261	2073
1098-1280	739	254	19	-	140	95
	743	211	16	0	24	736
	747	724	54	0	127	317
	750	556	42	0	200	459
Total				0	491	1607
1281-1463	740	264	20	0	205	264
	744	280	21	0	-	84
	751	229	17	-	-	9
Total				0	205	357
Abundance				22	1102	4699
95% Lower				-39	697	2927
95% Upper				84	1508	6471
Abun. for common strata				22	760	3807

Div. 3M						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
367-549	537	102	8	-	0	-
	Total				0	0
550-731	538	194	15	-	7	15
	Total				7	15
732-914	520	525	39	21	59	-
	524	253	19	-	152	-
	528	530	40	18	169	581
	533	98	7	-	-	107
	539	133	10	-	15	35
Total				39	395	723
915-1097	521	517	39	0	0	-
	529	488	37	0	61	540
	532	238	18	0	36	71
	534	486	36	-	613	1273
Total				0	710	1884
1098-1280	522	533	40	0	0	-
	530	1134	85	0	11	217
	535	92	7	-	0	1001
Total				0	11	1218
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	0	0
Total				0	0	0
Abundance				39	1123	3840
95% Lower				-24	252	-1605
95% Upper				101	1993	9285
Abun. for common strata				18	277	1409

Div. 3N						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	728	156	12	-	0	-
	Total				0	0
732-914	752	134	10	-	45	45
	Total				45	45
915-1097	753	138	10	-	409	109
	Total				409	109
1098-1280	754	180	14	-	203	14
	Total				203	14
1281-1463	755	385	29	-	24	0
	Total				24	0
Abundance					681	168
95% Lower					-4804	-452
95% Upper					6167	787
Abun. for common strata					681	168

Table 5. Estimated biomass (tons) per stratum of redfish from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
501-750	641	230	17	-	-	398
	642	418	31	-	-	44
	646	325	24	-	-	834
	651	359	27	-	-	220
Total					1496	
751-1000	647	360	27	4313	-	65
	652	516	39	0	-	137
Total				4313	-	202
1001-1250	643	733	56	13	0	0
	648	228	17	0	0	0
	653	531	40	0	0	0
Total				13	0	0
1251-1500	644	474	36	4	0	0
	649	212	16	0	0	0
	654	479	36	3	0	0
Total				7	0	0
Biomass(t)				4332	0	1698
95% Lower				-14060	0	1
95% Upper				22725	0	3395
Biomass common strata				20	0	0

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	730	170	13	-	107	-
	732	231	17	-	98	384
	734	228	17	381	43	340
	736	175	13	-	101	196
Total				381	349	920
732-914	737	227	17	36	58	42
	741	223	17	151	7	212
	745	348	26	21	79	282
	748	159	12	-	398	-
Total				208	542	536
915-1097	738	221	17	-	0	0
	742	206	15	0	21	3
	746	392	29	0	4	4
	749	126	9	-	28	0
Total				0	53	7
1098-1280	739	254	19	-	0	0
	743	211	16	0	0	0
	747	724	54	0	11	0
	750	556	42	0	8	2
	751	229	17	-	-	0
Total				0	19	2
1281-1463	740	264	20	0	6	0
	744	280	21	0	-	0
Total				0	6	0
Biomass(t)				589	970	1465
95% Lower				118	-2417	845
95% Upper				1060	4356	2085
Biomass common strata				589	237	885

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
367-549	537	102	8	-	1476	-
	Total				1476	-
550-731	538	194	15	-	840	2664
	Total				840	2664
732-914	520	525	39	37	586	-
	524	253	19	-	141	-
	528	530	40	39	3880	472
	533	98	7	-	-	204
	539	133	10	-	713	938
Total				76	5320	1614
915-1097	521	517	39	15	39	-
	529	488	37	6	6	7
	532	238	18	0	8	7
	534	486	36	-	22	81
Total				21	75	95
1098-1280	522	533	40	32	0	-
	530	1134	85	14	0	9
	535	92	7	-	0	1
Total				46	0	10
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	3	16
Total				0	3	16
Biomass(t)				142	7714	4399
95% Lower				3	-1030	-24072
95% Upper				282	16458	32869
Biomass common strata				59	3894	495

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	728	156	12	-	178	-
	Total				178	-
732-914	752	134	10	-	25	18
	Total				25	18
915-1097	753	138	10	-	2	0
	Total				2	0
1098-1280	754	180	14	-	0	0
	Total				0	0
1281-1463	755	385	29	-	0	0
	Total				0	0
Biomass(t)					205	18
95% Lower					-1019	-212
95% Upper					1430	248
Biomass common strata					27	18

Table 6. Estimated numbers (000) per stratum of Redfish from the summer survey 1991 and the winter surveys in 1994 and 1995.
Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
501-750	641	230	17	-	-	2167
	642	418	31	-	-	173
	646	325	24	-	-	4814
	651	359	27	-	-	1260
Total						8414
751-1000	647	360	27	6666	-	209
	652	516	39	0	-	705
Total				6666	-	914
1001-1250	643	733	55	18	0	0
	648	228	17	0	0	0
	653	531	40	0	0	0
Total				18	0	0
1251-1500	644	474	36	9	0	0
	649	212	16	0	0	0
	654	479	36	5	0	0
	Total			14	0	0
Abundance 95% Lower				6698	0	9328
95% Upper				-21748	0	16
Abun. for common strata				35144	0	18639
Abun. for common strata				32	0	0

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	730	170	13	-	408	-
	732	231	17	-	520	1933
	734	228	17	521	103	1172
	736	175	13	-	447	782
Total				521	1478	3887
732-914	737	227	17	45	256	119
	741	223	17	238	33	586
	745	348	26	22	366	871
	748	159	12	-	1301	-
Total				303	1956	1576
915-1097	738	221	17	-	0	0
	742	206	15	0	46	8
	746	392	29	0	24	15
	749	126	9	-	85	0
Total				0	155	23
1098-1280	739	254	19	-	0	0
	743	211	16	0	0	0
	747	724	54	0	27	0
	750	556	42	0	17	8
Total				0	44	8
1281-1463	740	264	20	0	20	0
	744	280	21	0	-	0
	751	229	17	-	-	0
Total				0	20	0
Abundance 95% Lower				825	3652	5494
95% Upper				257	-7704	-6819
Abun. for common strata				1392	15009	17807
Abun. for common strata				824	892	2779

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
367-549						
	537	102	8	-	2515	-
Total					2515	-
550-731						
	538	194	15	-	1665	5133
Total					1665	5133
732-914	520	525	39	63	1586	-
	524	253	19	-	392	-
	528	530	40	90	11219	2117
	533	98	7	-	-	706
	539	133	10	-	1517	2037
Total				153	14714	4860
915-1097	521	517	39	27	78	-
	529	488	37	19	12	9
	532	238	18	0	27	18
	534	486	36	-	88	175
Total				46	205	202
1098-1280	522	533	40	42	0	-
	530	1134	85	16	0	15
	535	92	7	-	0	3
Total				58	0	18
1281-1463	523	284	21	-	0	-
	527	171	13	-	0	-
	531	203	15	0	-	-
	536	112	8	-	13	38
Total				0	13	38
Abundance 95% Lower				258	19112	10252
95% Upper				79	-6901	-52052
Abun. for common strata				438	45126	72555
Abun. for common strata				125	11258	2159

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731						
	728	156	12	-	1066	-
Total					1066	-
732-914						
	752	134	10	-	70	50
Total					70	50
915-1097						
	753	138	10	-	5	0
Total					5	0
1098-1280						
	754	180	14	-	0	0
Total					0	0
1281-1463						
	755	385	29	-	0	0
Total					0	0
Abundance 95% Lower				-	1141	50
95% Upper				-	-4436	-589
Abun. for common strata					6718	689
Abun. for common strata					75	50

Table 7. Estimated biomass (tons) per stratum of roundnose grenadier from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
501-750	641	230	17	-	-	1
	642	418	31	-	-	119
	646	325	24	-	-	9
	651	359	27	-	-	1
Total					130	
751-1000	647	360	27	46	-	110
	652	516	39	240	-	11
Total				286	-	121
1001-1250	643	733	55	9418	9447	457
	648	228	17	1965	695	1284
	653	531	40	185	83	46
	Total			11568	10205	1787
1251-1500	644	474	36	5506	5665	1218
	649	212	16	1321	4619	3121
	654	479	38	1140	909	254
	Total			7967	11193	4593
Biomass(t)			19822	21397	6630	
95% Lower			-11566	8709	-34712	
95% Upper			51209	34085	47972	
Biomass common strata			19535	21398	6380	

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	730	170	13	-	2	-
	732	231	17	-	0	1
	734	228	17	1	0	5
	736	175	13	-	0	6
Total			1	2	12	
732-914	737	227	17	32	1	0
	741	223	17	16	8	12
	745	348	26	54	8	11
	748	159	12	-	3	-
Total			102	20	23	
915-1097	738	221	17	-	14	0
	742	206	15	83	8	11
	746	392	29	219	93	77
	749	126	9	-	94	21
Total			302	209	109	
1098-1280	739	254	19	-	33	17
	743	211	16	210	12	43
	747	724	54	1853	846	110
	750	556	42	597	228	123
	751	229	17	-	-	121
Total			2660	1119	414	
1281-1463	740	264	20	734	195	23
	744	280	21	595	-	307
Total			1329	195	330	
Biomass(t)			4394	1546	888	
95% Lower			1335	545	231	
95% Upper			7453	2548	1546	
Biomass common strata			3799	1399	415	

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
367-549	537	102	8	-	0	-
	Total				0	-
550-731	538	194	15	-	0	5
Total					0	5
732-914	520	525	39	23	2	-
	524	253	19	-	13	-
	528	530	40	35	40	63
	533	98	7	-	-	11
	539	133	10	-	4	44
Total				58	59	118
915-1097	521	517	39	280	82	-
	529	488	37	1811	122	131
	532	238	18	880	340	96
	534	486	36	-	268	236
Total				2951	812	463
1098-1280	522	533	40	3770	545	-
	530	1134	85	3683	3866	2332
	535	92	7	-	158	181
Total				7453	4569	2513
1281-1463	523	284	21	-	1916	-
	527	171	13	-	574	-
	531	203	15	1113	-	-
	536	112	8	-	545	1317
Total				1113	3035	1317
Biomass(t)				11576	8475	4415
95% Lower				-38176	4410	1047
95% Upper				61327	12540	7783
Biomass common strata				6409	4368	2622

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	728	156	12	-	1	-
Total					1	-
732-914	752	134	10	-	25	20
Total					25	20
915-1097	753	138	10	-	10	53
Total					10	53
1098-1280	754	180	14	-	126	156
Total					126	156
1281-1463	755	385	29	-	356	250
Total					356	250
Biomass(t)					516	479
95% Lower					-377	86
95% Upper					1409	871
Biomass common strata					517	479

Table 8. Estimated numbers (000) per stratum of Roundnose granadier from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
501-750	641	230	17	-	-	52
	642	418	31	-	-	1812
	646	325	24	-	-	57
	651	359	27	-	-	13
Total						1934
751-1000	647	360	27	1153	-	1459
	652	516	39	1569	-	248
Total				2722	-	1707
1001-1250	643	733	55	24925	45265	4209
	648	228	17	3976	2020	7873
	653	531	40	781	651	351
	Total			29682	47936	12433
1251-1500	644	474	36	11750	12446	6027
	649	212	16	1766	8156	10034
	654	479	36	2332	2014	676
	Total			15848	22616	16737
Abundance 95% Lower				48253	70551	32811
95% Upper				-23171	22540	-2951
Abun. for common strata				45530	70552	29170

Div. 3L						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	730	170	13	-	19	-
	732	231	17	-	0	35
	734	228	17	8	0	188
	736	175	13	-	0	144
Total				8	19	367
732-914	737	227	17	577	60	0
	741	223	17	455	243	368
	745	348	26	636	44	122
	748	159	12	-	54	-
Total				1668	401	490
915-1097	738	221	17	-	133	0
	742	206	15	761	139	77
	746	392	29	1752	689	1008
	749	126	9	-	440	189
Total				2513	1401	1274
1098-1280	739	254	19	-	172	51
	743	211	16	579	79	150
	747	724	54	6951	5009	897
	750	556	42	3204	1027	922
Total				10734	6287	2020
1281-1463	740	264	20	1186	390	73
	744	280	21	957	-	687
	751	229	17	-	-	541
Total				2143	390	1301
Abundance 95% Lower				17066	8495	5453
95% Upper				4445	1966	3643
Abun. for common strata				29687	15024	7263
Abun. for common strata				16109	7680	3805

Div. 3M						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
367-549	537	102	8	-	0	-
	Total				0	-
550-731	538	194	15	-	0	73
Total					0	73
732-914	520	525	39	522	30	-
	524	253	19	-	63	-
	528	530	40	578	865	1011
	533	98	7	-	-	331
	539	133	10	-	45	804
Total				1100	1003	2146
915-1097	521	517	39	1274	310	-
	529	488	37	9755	1319	1236
	532	238	18	5360	2260	616
	534	486	36	-	2152	2200
Total				16389	6041	4052
1098-1280	522	533	40	9214	1760	-
	530	1134	85	10340	17386	11801
	535	92	7	-	580	697
	Total				19554	19726
1281-1463	523	284	21	-	3411	-
	527	171	13	-	1483	-
	531	203	15	1613	-	-
	536	112	8	-	1366	3170
Total				1613	6260	3170
Abundance 95% Lower				38655	33031	21939
95% Upper				-88953	16549	11475
Abun. for common strata				166263	49513	32402
Abun. for common strata				26033	21830	14664

Div. 3N						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	728	156	12	-	23	-
Total					23	-
732-914	752	134	10	-	226	287
Total					226	287
915-1097	753	138	10	-	83	326
Total					83	326
1098-1280	754	180	14	-	709	588
Total					709	588
1281-1463	755	385	29	-	1169	742
Total					1169	742
Abundance 95% Lower					2212	1942
95% Upper					-1022	753
Abun. for common strata					5445	3132
Abun. for common strata					2187	1943

Table 9. Estimated biomass (tons) per stratum of Roughhead Grenadier from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
501-750	641	230	17	-	-	31
	642	418	31	-	-	337
	646	325	24	-	-	61
	651	359	27	-	-	27
Total					456	
751-1000	647	360	27	500	-	413
	652	516	39	736	-	189
Total				1236	-	602
1001-1250	643	733	55	761	616	995
	648	228	17	188	404	484
	653	531	40	645	404	613
Total				1594	1424	2092
1251-1500	644	474	36	476	961	941
	649	212	16	191	863	439
	654	479	36	776	889	1128
Total				1443	2713	2508
Biomass(t)				4273	4137	5659
95% Lower				2762	3226	4475
95% Upper				5784	5047	6844
Biomass common strata				3037	4137	4600

Div. 3L

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	730	170	13	-	18	-
	732	231	17	-	2	10
	734	228	17	960	7	15
	736	175	13	-	7	20
Total				960	34	45
732-914	737	227	17	253	11	12
	741	223	17	139	49	56
	745	348	26	490	20	160
	748	159	12	-	790	-
Total				882	870	228
915-1097	738	221	17	-	98	143
	742	206	15	273	75	260
	746	392	29	502	360	737
	749	126	9	-	628	1785
Total				775	1161	2925
1098-1280	739	254	19	-	180	380
	743	211	16	465	194	1257
	747	724	54	1458	2367	4510
	750	556	42	1215	3714	4821
	751	229	17	-	-	3110
Total				3138	6455	14078
1281-1463	740	264	20	253	438	1029
	744	280	21	347	-	3870
Total				600	438	4899
Biomass(t)				6354	8960	22176
95% Lower				5342	1566	15813
95% Upper				7366	16353	28539
Biomass common strata				6008	7235	12857

Div. 3M

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
367-549	537	102	8	-	5	-
	Total				5	-
550-731	538	194	15	-	26	27
	Total				26	27
732-914	520	525	39	694	210	-
	524	253	19	-	129	-
	528	530	40	847	108	243
	533	98	7	-	-	38
	539	133	10	-	220	212
Total				1541	667	493
915-1097	521	517	39	794	1292	-
	529	488	37	1343	1141	885
	532	238	18	312	186	429
	534	486	36	-	546	1593
Total				2449	3165	2907
1098-1280	522	533	40	371	2860	-
	530	1134	85	1107	2925	7573
	535	92	7	-	144	381
Total				1478	5929	7954
1281-1463	523	284	21	-	397	-
	527	171	13	-	181	-
	531	203	15	119	-	-
	536	112	8	-	93	147
Total				119	671	147
Biomass(t)				5588	10465	11528
95% Lower				4587	-16315	7495
95% Upper				6588	37245	15561
Biomass common strata				3609	4360	9130

Div. 3N

Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Biomass 1991	Biomass 1994	Biomass 1995
550-731	728	156	12	-	2	-
	Total				2	-
732-914	752	134	10	-	203	18
	Total				203	18
915-1097	753	138	10	-	827	605
	Total				827	605
1098-1280	754	180	14	-	886	2600
	Total				886	2600
1281-1463	755	385	29	-	1110	2900
	Total				1110	2900
Biomass(t)					3028	6122
95% Lower					-6297	3358
95% Upper					12353	8886
Biomass common strata					3026	6123

Table 10. Estimated numbers (ooo) per stratum of Roughhead grenadier from the summer survey 1991 and the winter surveys in 1994 and 1995. Based on the new stratification system.

Div. 3K						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
501-750	641	230	17	-	-	164
	642	418	31	-	-	1114
	646	325	24	-	-	716
	651	359	27	-	-	162
Total						2156
751-1000	647	350	27	711	-	1412
	652	516	39	1026	-	821
Total				1737	-	2233
1001-1250	643	733	55	1761	1467	2714
	648	228	17	348	941	844
	653	531	40	1136	943	1778
Total				3245	3351	5336
1251-1500	644	474	36	809	1651	1921
	649	212	16	318	931	684
	654	479	36	873	1555	1913
Total				2000	4137	4518
Abundance 95% Lower				6984	7489	14243
95% Upper				5728	5900	12112
Abun. for common strata				8239	9078	16375
				5245	7488	9854

Div. 3L						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	730	170	13	-	45	-
	732	231	17	-	26	165
	734	228	17	1097	103	308
	736	175	13	-	33	348
Total				1097	207	821
732-914	737	227	17	433	145	170
	741	223	17	437	92	628
	745	348	26	951	139	287
	748	159	12	-	686	-
Total				1821	1062	1095
915-1097	738	221	17	-	232	456
	742	206	15	594	340	804
	746	392	29	917	830	2317
	749	126	9	-	1286	2587
Total				1511	2688	6164
1098-1280	739	254	19	-	362	890
	743	211	16	679	475	2225
	747	724	54	2578	3460	6830
	750	556	42	2386	5267	7905
Total				5643	9564	17850
1281-1463	740	264	20	325	826	1856
	744	280	21	757	-	7139
	751	229	17	-	-	3326
Total				1082	826	12321
Abundance 95% Lower				11154	14347	38242
95% Upper				8528	4438	31490
Abun. for common strata				13781	24257	44993
				10397	11677	23330

Div. 3M						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
367-549	537	102	8	-	11	-
	Total				11	-
550-731	538	194	15	-	67	87
Total					67	87
732-914	520	525	39	1033	424	-
	524	253	19	-	500	-
	528	530	40	1438	348	748
	533	98	7	-	-	151
	539	133	10	-	324	474
Total				2471	1596	1373
915-1097	521	517	39	1178	2316	-
	529	488	37	1570	2332	1877
	532	238	18	504	554	929
	534	486	36	-	1080	3447
Total				3252	6282	6253
1098-1280	522	533	40	657	3381	-
	530	1134	85	2073	5075	10648
	535	92	7	-	252	445
Total				2730	8708	11093
1281-1463	523	284	21	-	650	-
	527	171	13	-	327	-
	531	203	15	202	-	-
	536	112	8	-	172	198
Total				202	1149	198
Abundance 95% Lower				8655	17814	19005
95% Upper				7253	-14548	14205
Abun. for common strata				10058	50176	23805
				5585	8309	14202

Div. 3N						
Depth range (m)	Stratum	Area (sq. nm)	Trawlable Units(000)	Abundance 1991	Abundance 1994	Abundance 1995
550-731	728	156	12	-	53	-
Total					53	-
732-914	752	134	10	-	402	171
Total					402	171
915-1097	753	138	10	-	1228	1228
Total					1228	1228
1098-1280	754	180	14	-	1338	3790
Total					1338	3790
1281-1463	755	385	29	-	1829	4768
Total					1829	4768
Abundance 95% Lower				-	4849	9957
95% Upper				-	-7786	-2488
Abun. for common strata				-	17484	22402
					4797	9957

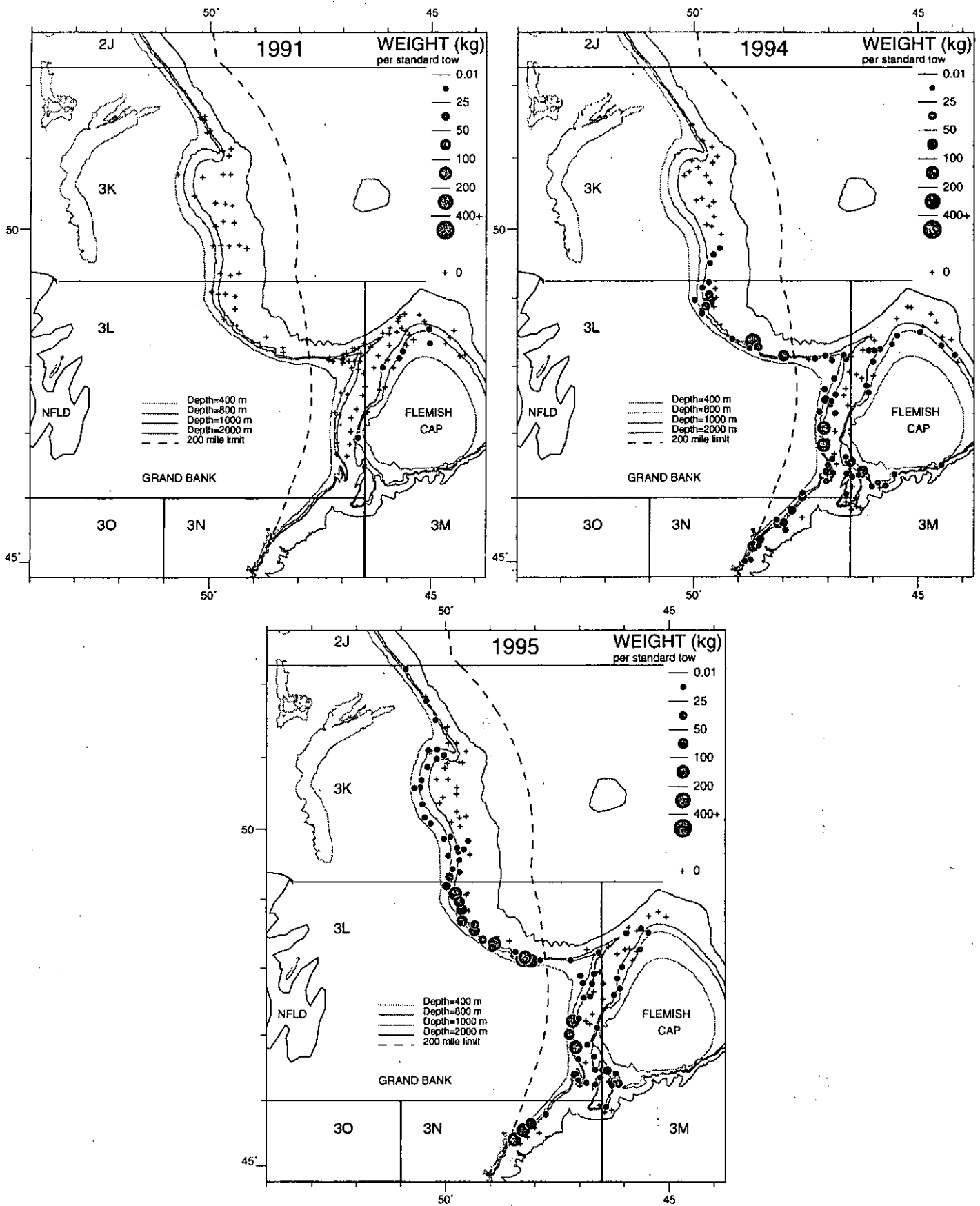


Fig. 1. Distribution of American plaice catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch weight (kg) per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

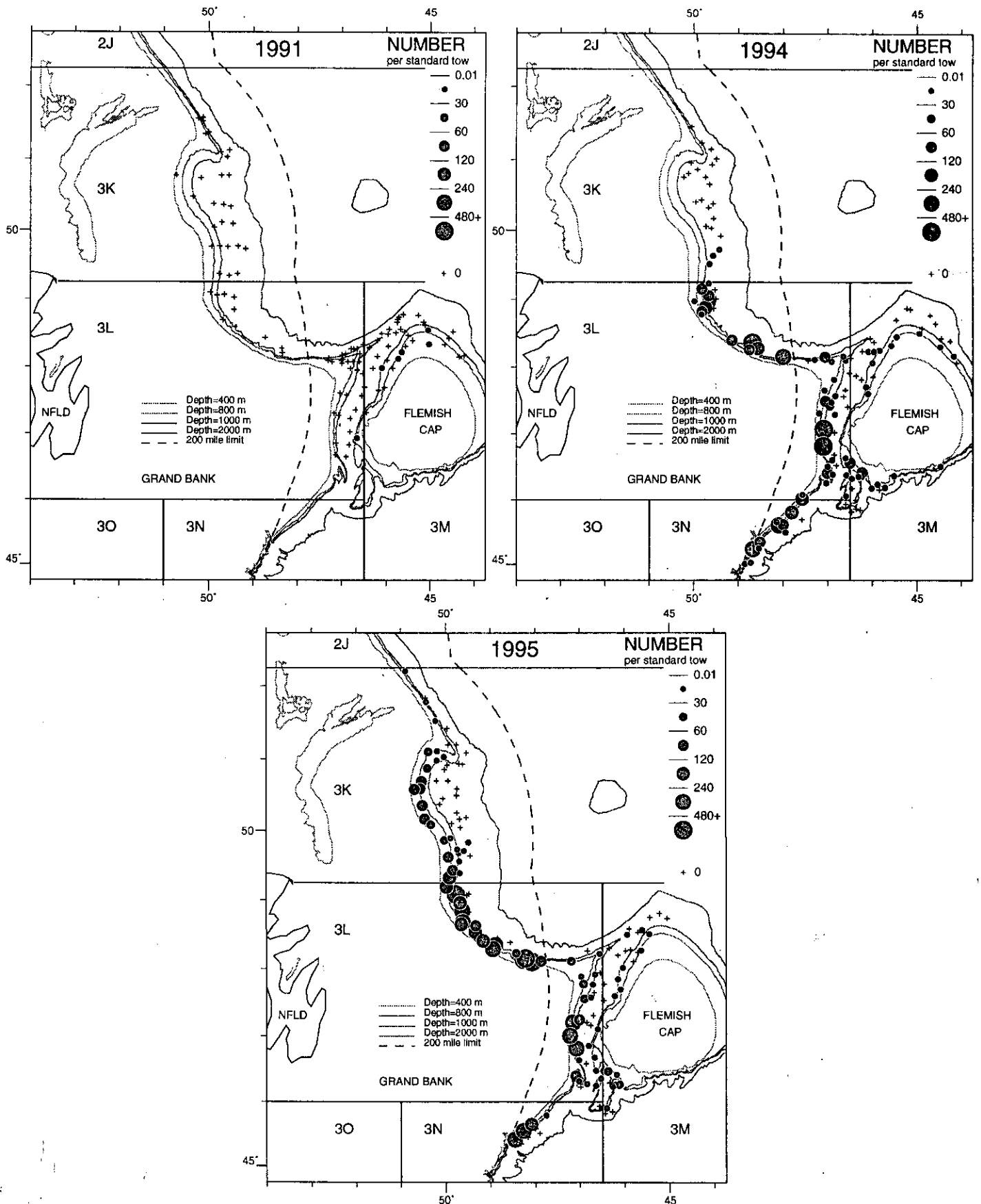
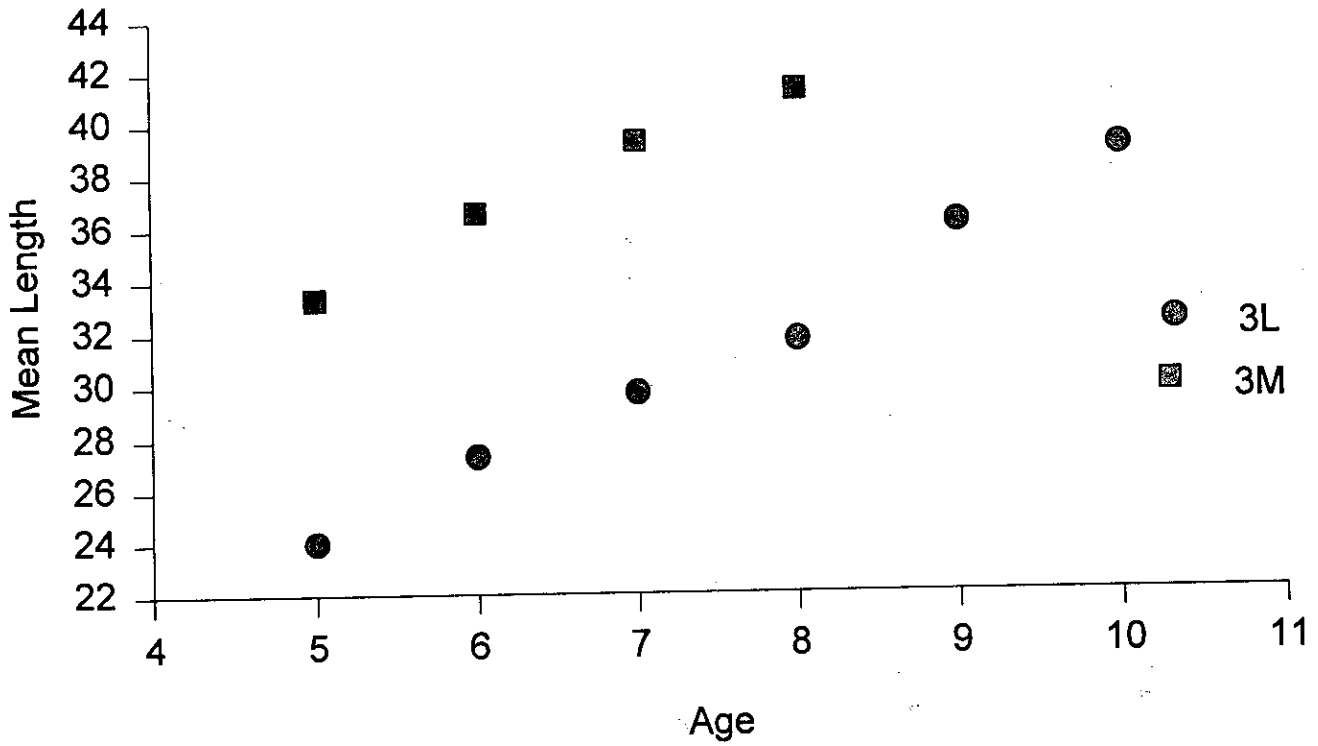


Fig. 2. Distribution of American plaice catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch number per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

Males



Females

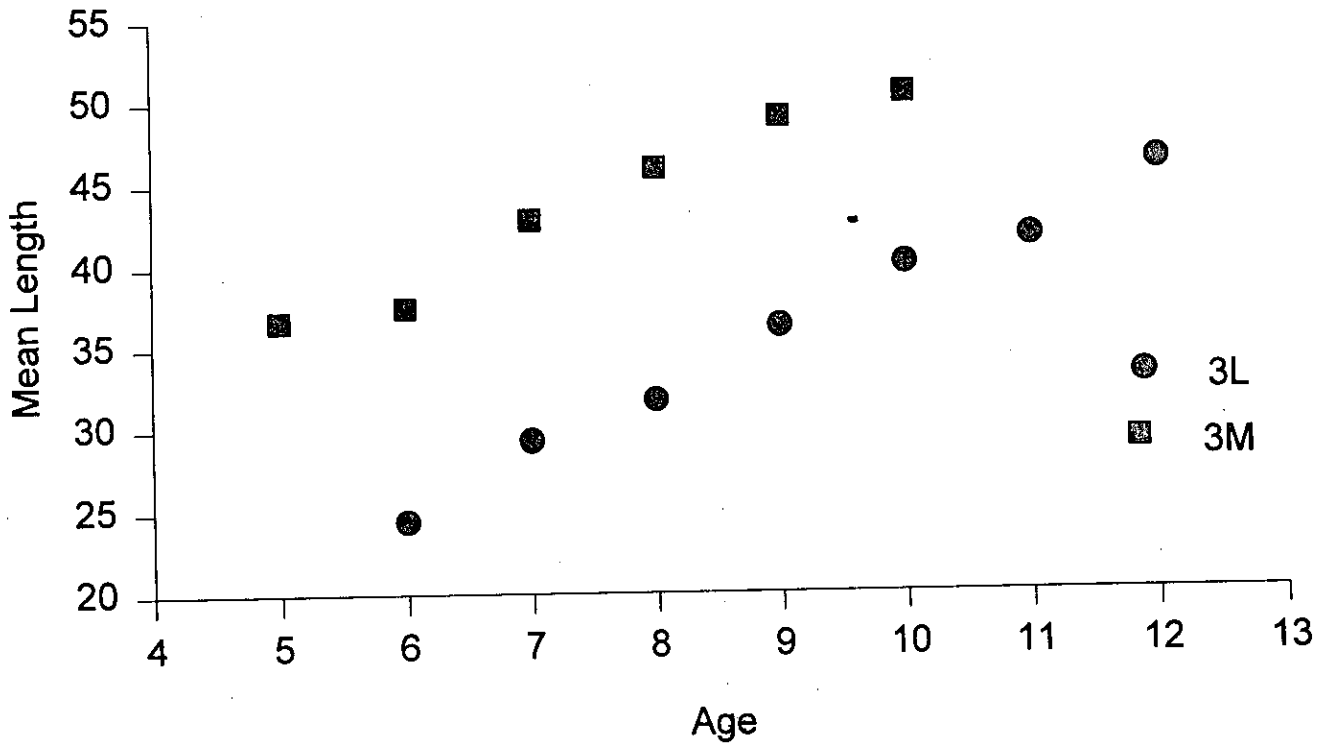


Figure 3. Mean length at age for American plaice collected on the east (3M) west (3L) sides of the Flemish Pass.

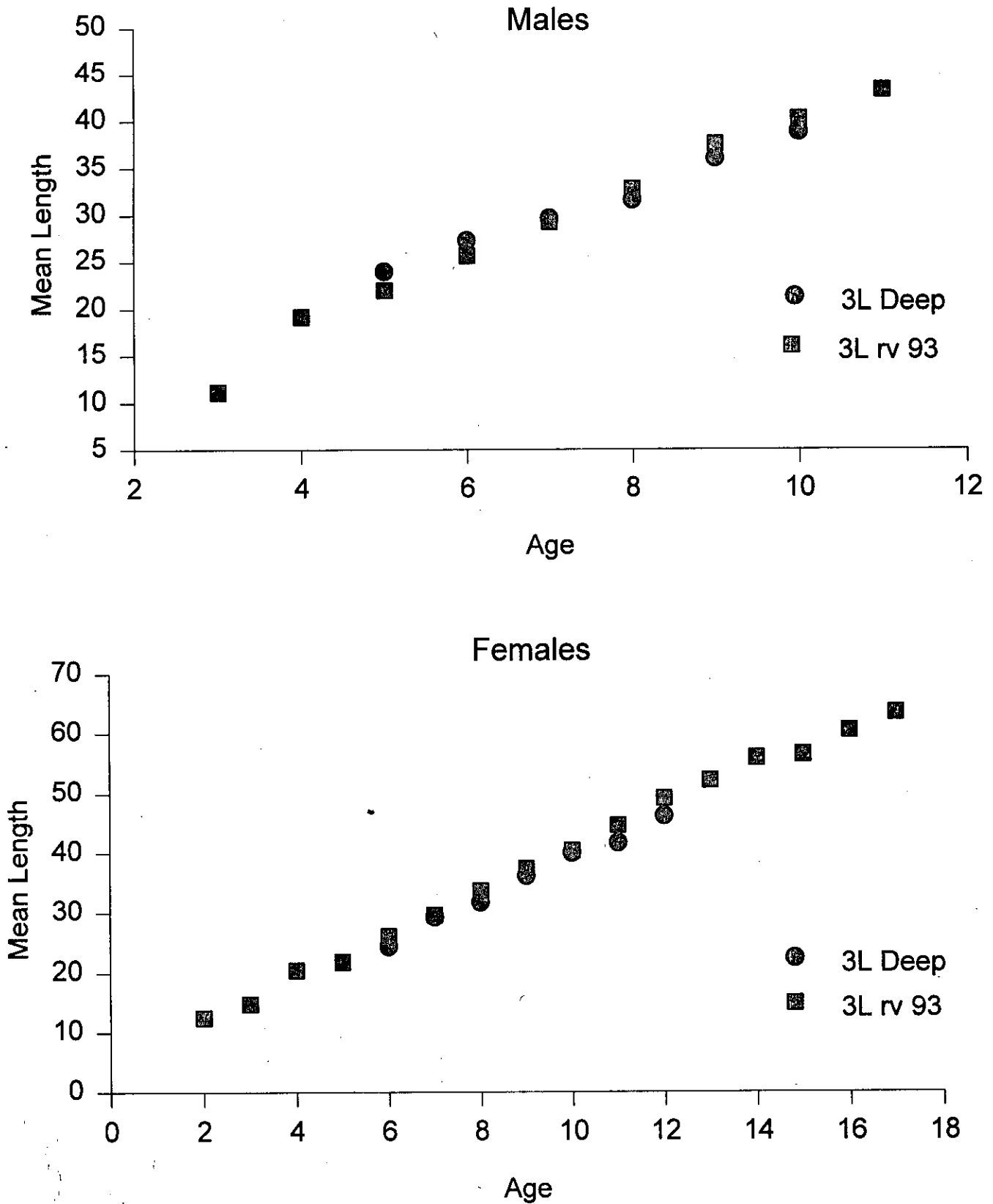


Figure 4. Mean length at age of American plaice collected from the west side of the Flemish Pass (3L deep) and from the Canadian spring research vessel survey in 3L in 1993 (3L rv 93).

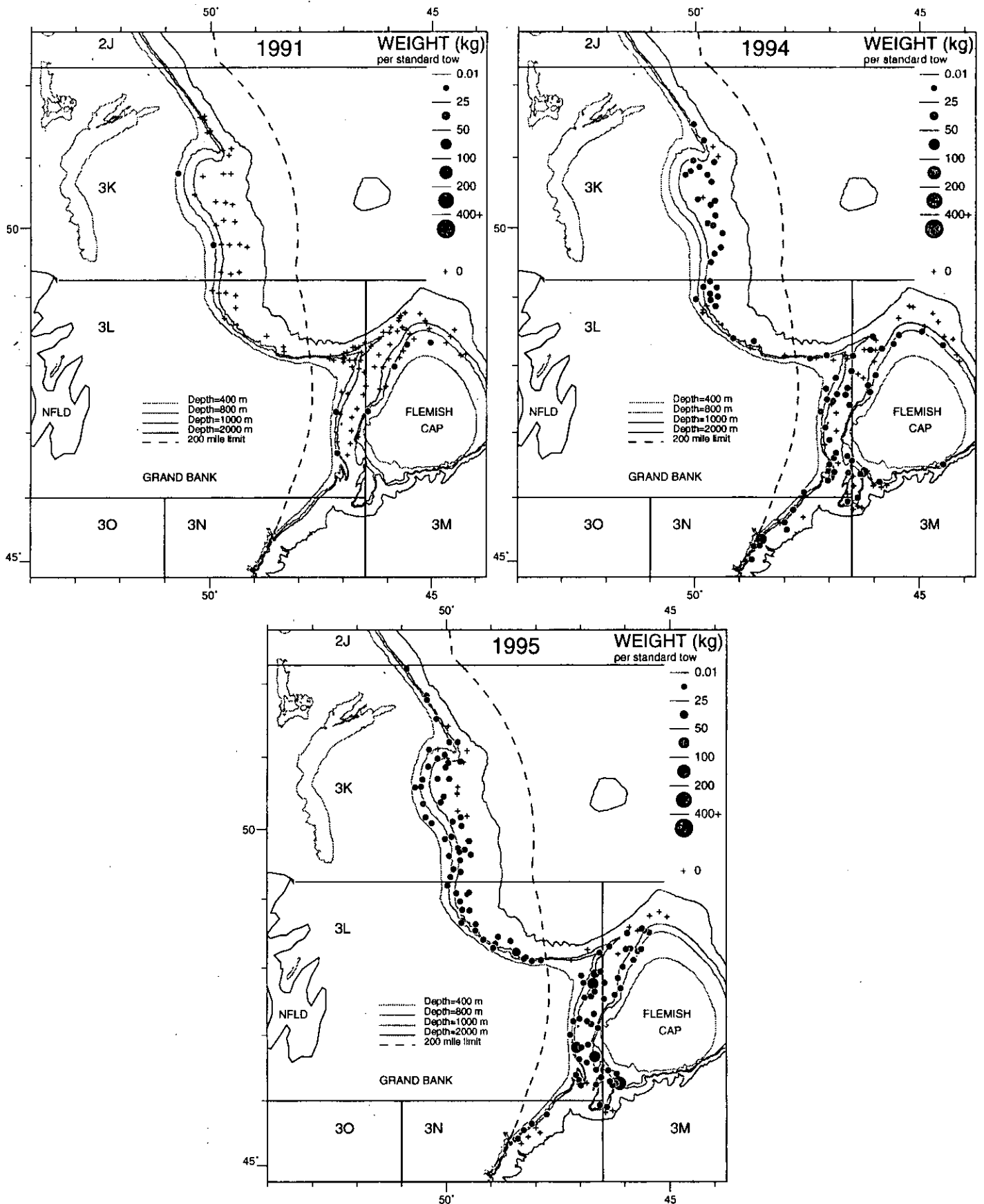


Fig. 5. Distribution of witch flounder catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch weight (kg) per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

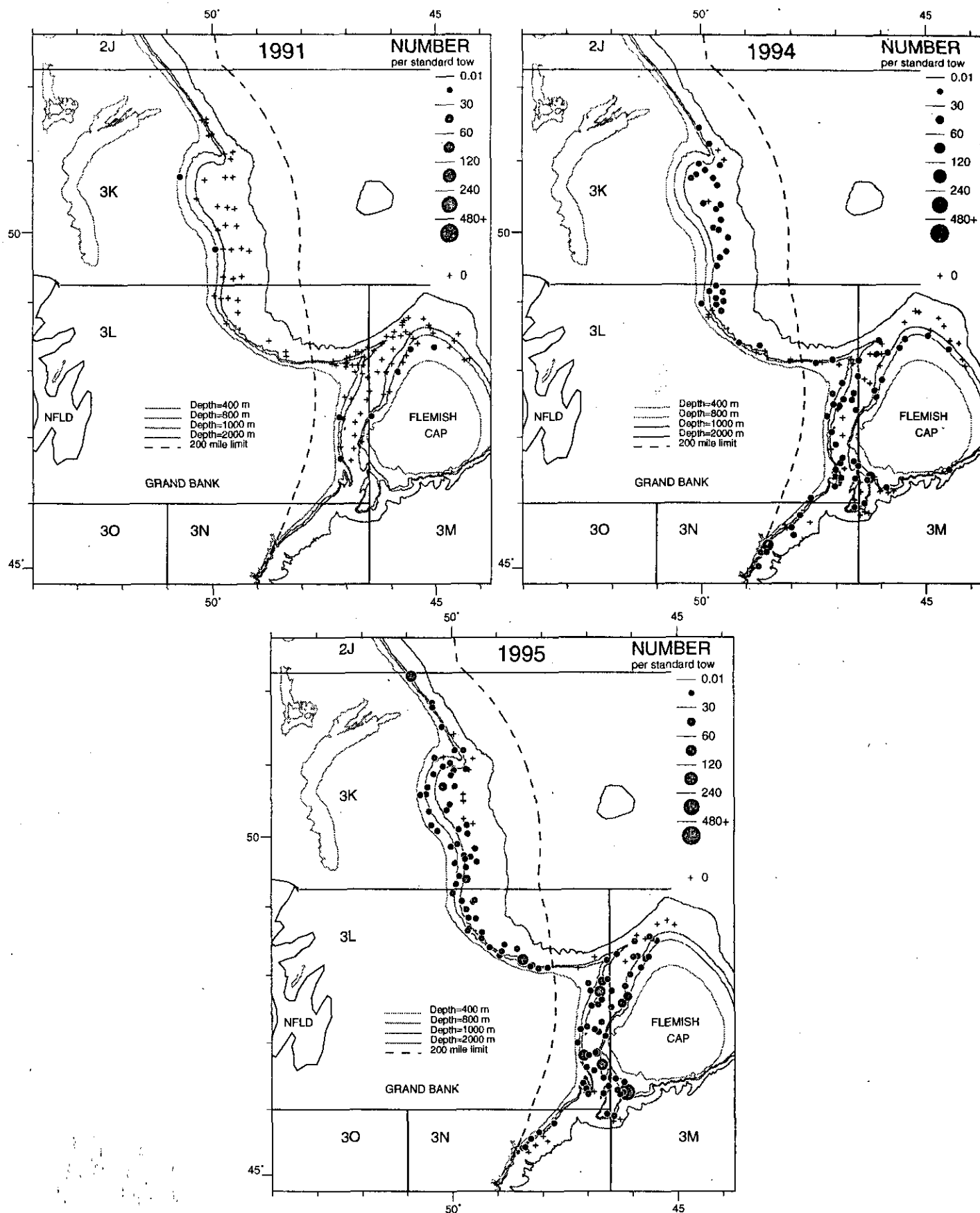


Fig. 6. Distribution of witch flounder catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch number per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

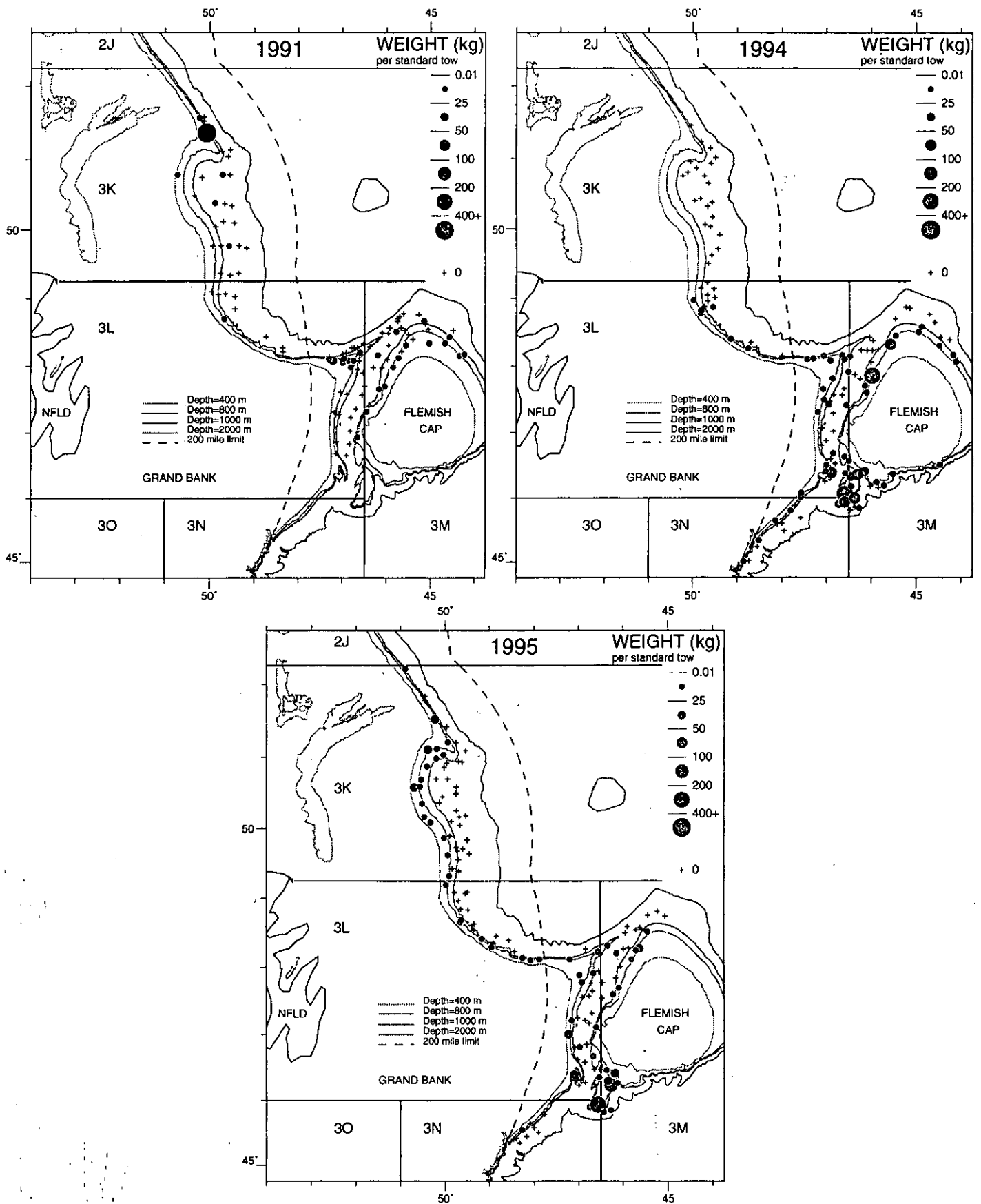


Fig. 7. Distribution of redfish catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch weight (kg) per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

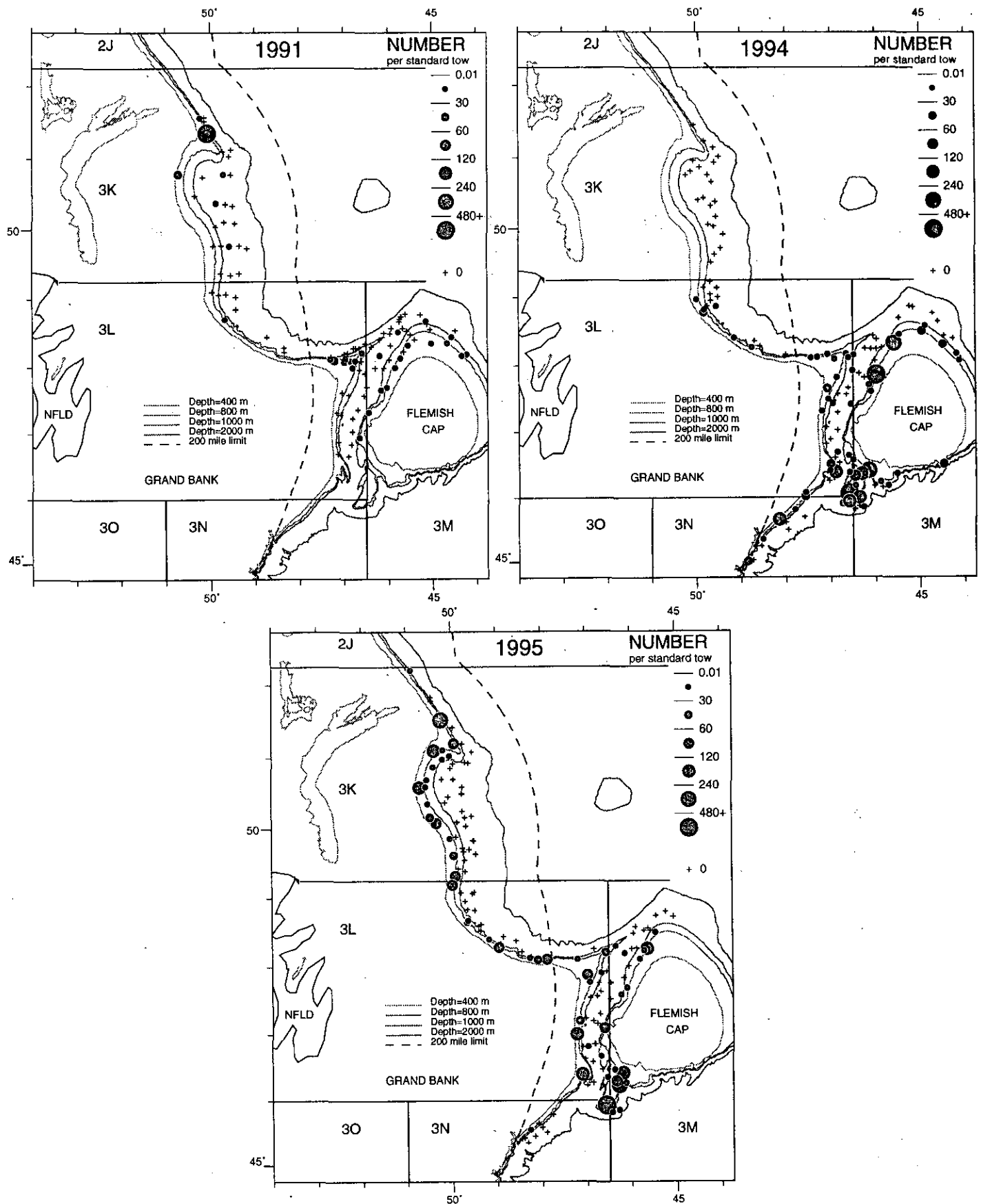


Fig. 8. Distribution of redfish catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch number per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

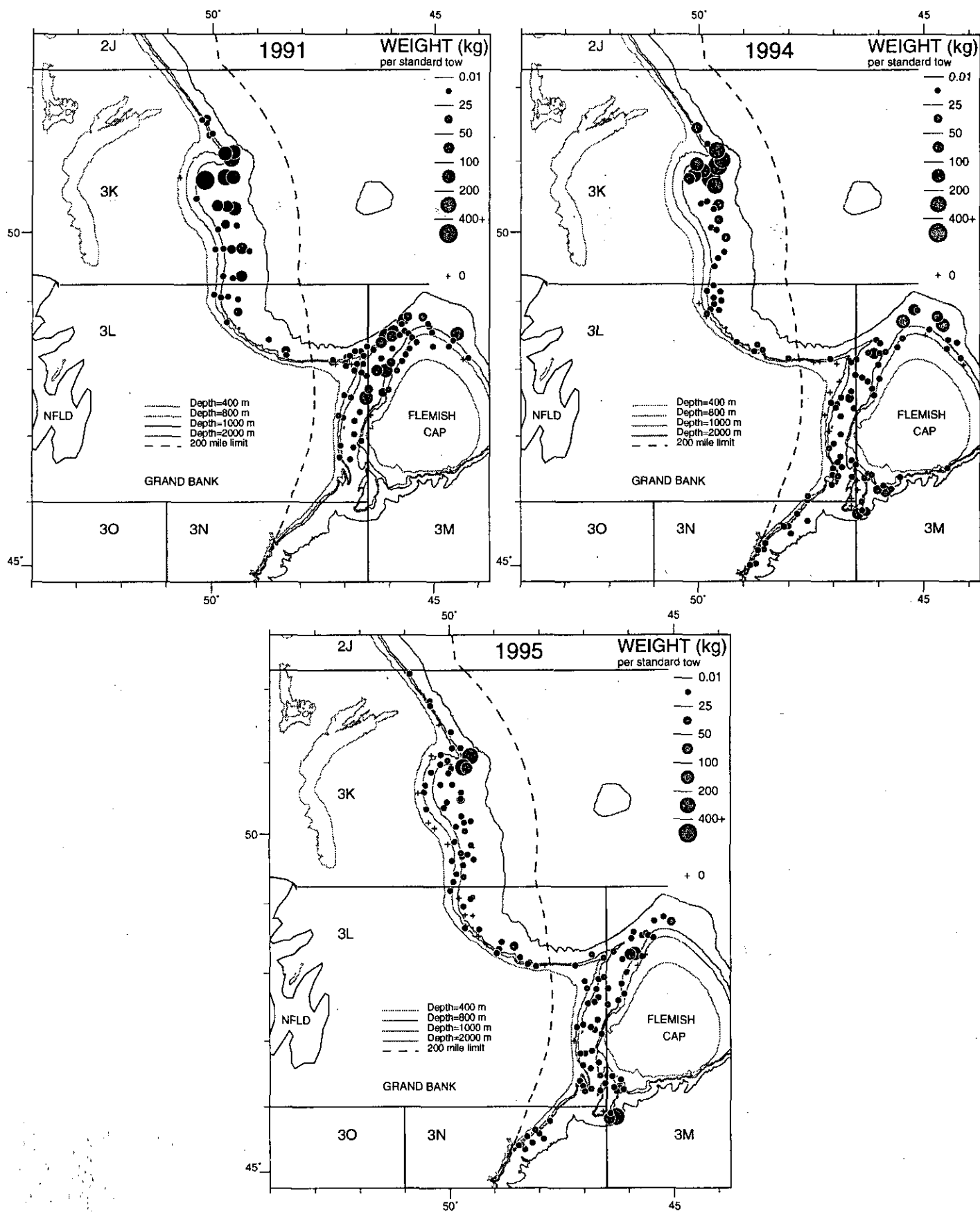


Fig. 9. Distribution of roundnose grenadier catches from Greenland halbut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch weight (kg) per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

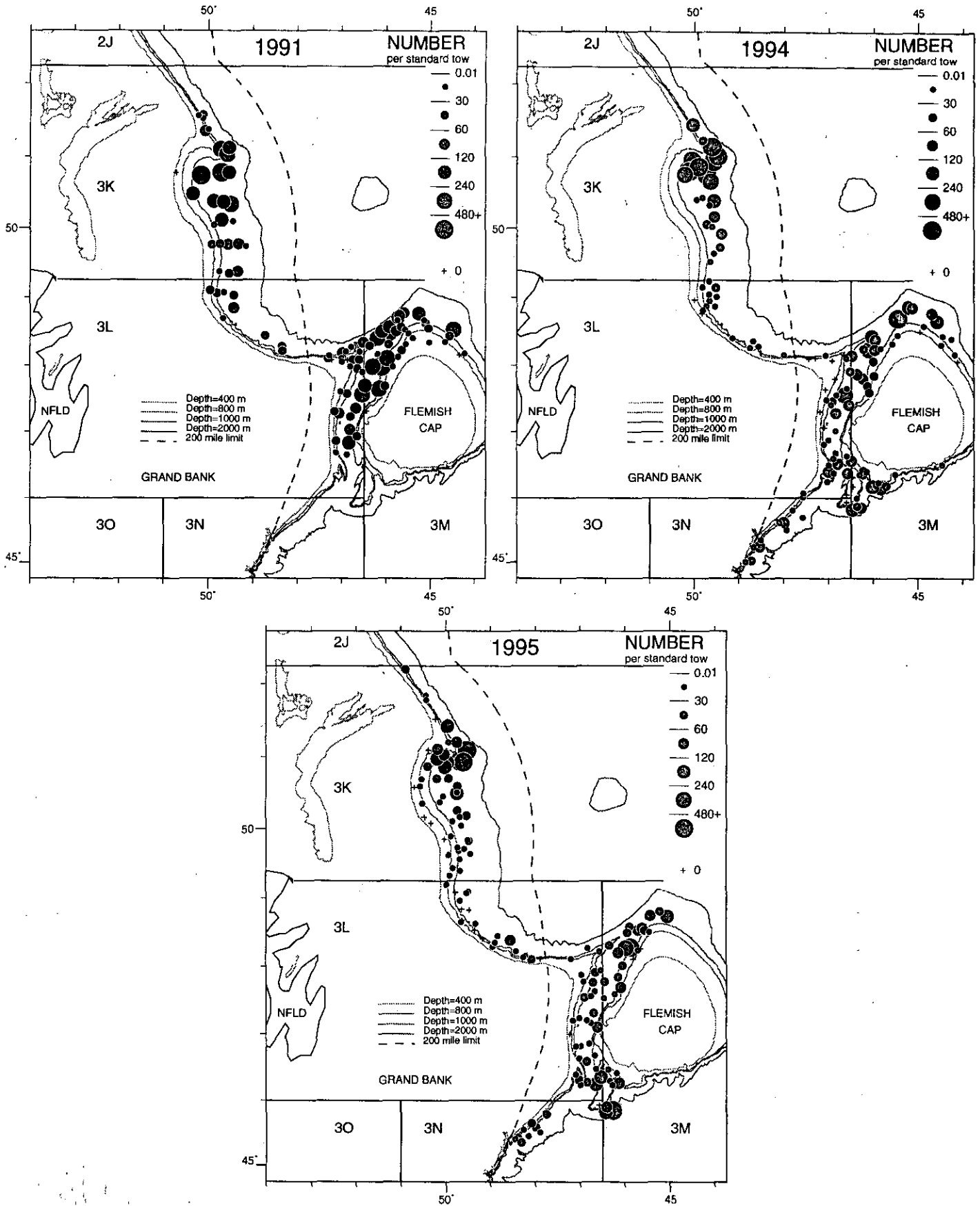


Fig. 10. Distribution of roundnose grenadier catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch number per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

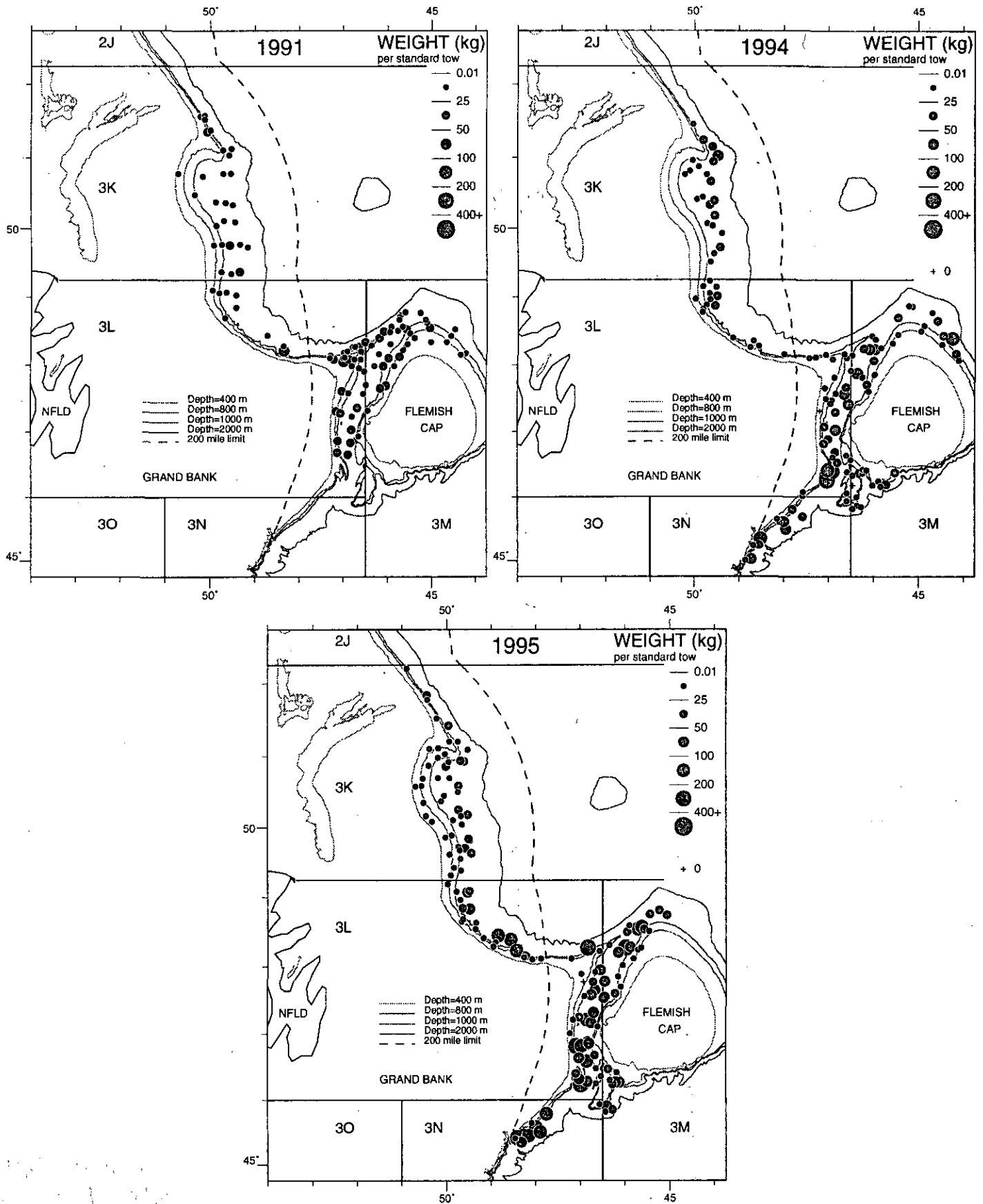


Fig. 11: Distribution of roughhead grenadier catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch weight (kg) per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)

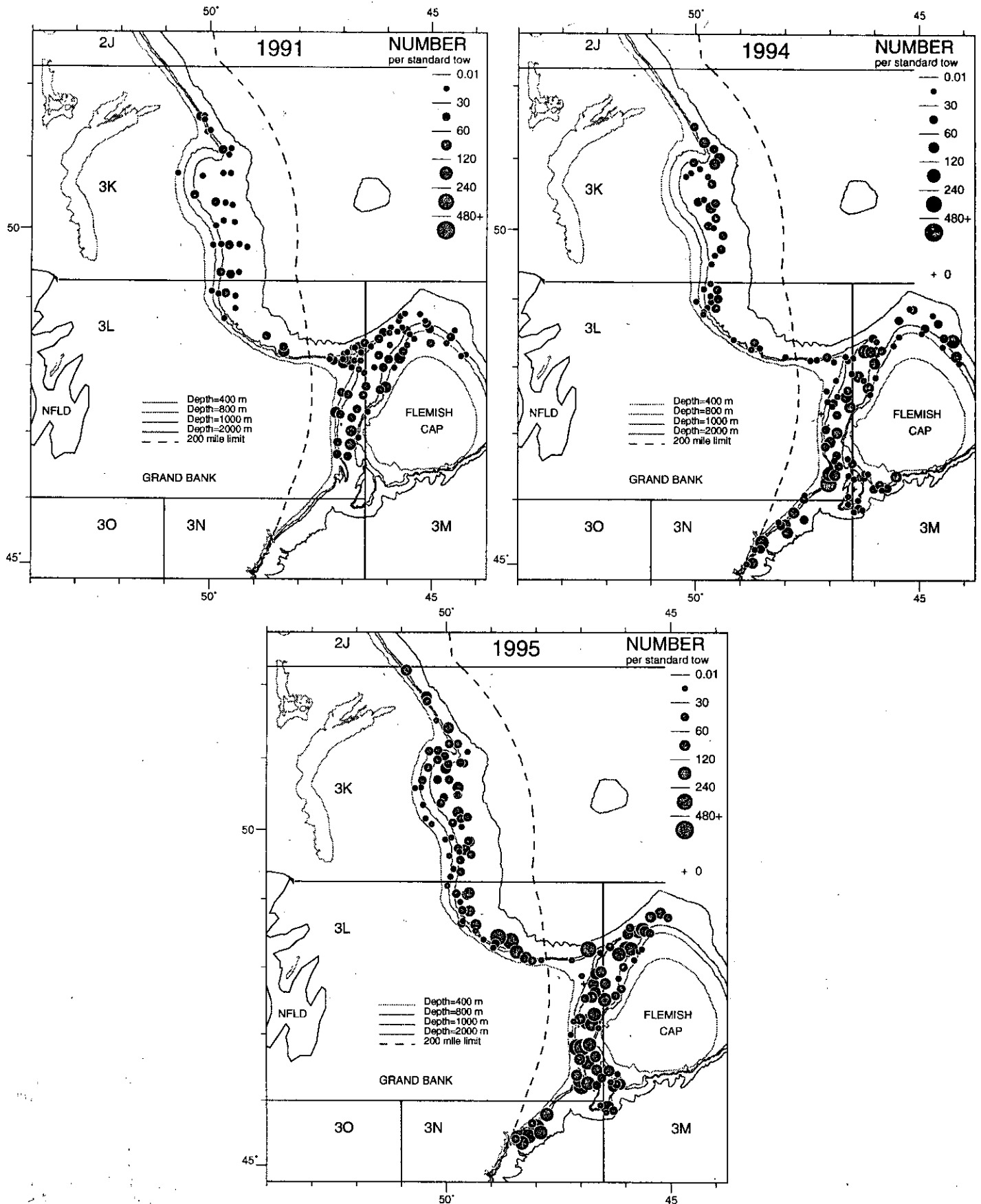


Fig. 12. Distribution of roughhead grenadier catches from Greenland halibut directed Canadian surveys of NAFO Divisions 3KLMN from 1991-1995. Surveys were conducted by the Cape Adair (1991, 650 m - 1800 m), Zandvoort (1994, 750 m - 1500 m) and FRV Teleost (1995, 500 m - 1700 m). Circles represent catch number per standard tow (1.75 nautical miles). Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area (east of line)