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Roundnose Grenadier (*Coryphaenoides rupestris*) and  
Roughhead Grenadier (*Macrourus berglax*) in NAFO Subareas 2+3

by

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Introduction

Based on the results of exploratory fishing by the USSR during the late 1950s and early 1960s, a commercial fishery for roundnose grenadier in NAFO Subareas 2+3 began in 1967 with a reported catch of about 17,000 t. From that time until extension of jurisdiction by Canada, nominal catches were greater than 20,000 t in most years (Table 1, Fig. 1). Catches declined to only about 2,000 t in 1980, but increased somewhat during the 1980s to about 7,000 t in 1986 and 1987 due to increased catches by the USSR and to some extent, GDR (Table 2). Catches have declined again since then as a result of declines in catches by 'traditional' countries in 'traditional' areas, and in 1993 there was no allocation to non-Canadian vessels inside the Canadian zone. Thus the only remaining fishery is restricted to by-catch associated with the Greenland halibut fishery primarily prosecuted by non-Canadian fleets outside 200 miles in Div. 3LMNO.

Previous assessments of roundnose grenadier (e.g., Atkinson et al. MS 1993) indicated that although catches by "traditional" countries declined since 1989, average catches remained between 4,000-5,000 t. This was because EU members such as Portugal reported increased catches during this period, primarily from Div. 3LM, as by-catch in the expanding directed fishery for Greenland halibut. Previously it had been recognised that the reported catches most likely represented a mixture of the two species, but before now it was not possible to estimate the relative proportions. Re-examination of the Portuguese data however (Alpoim et al. MS 1994), has resulted in the conclusion that all of the catches previously reported as roundnose grenadier beginning around 1987 were actually roughhead grenadier; roundnose were discarded. Anecdotal information suggests that in recent years, the amount of roundnose discarded by these vessels may have been about 20% of the reported roughhead catch in Div. 3N.

Paz and Iglesias (MS 1994) also reported that about 50% of the Spanish catch previously reported as roundnose grenadier in 1991 and 1992 was actually roughhead. It can be seen (Table 1) that catches of roughhead grenadiers have gradually increased since 1986, and were reported to be over 6,000 t in 1993. These catches were taken in the Regulatory Area outside Canada's 200 mile limit. The reported catch of roundnose grenadier also increased significantly between 1991 and 1992 and again in 1993. The catch of roundnose grenadier in the Regulatory Area in 1993 approximated the average catch from 1979-1993.

During the years of the directed fishery for roundnose grenadier, most of the catch was taken during the second half of the year (Table 3). This was related to the movement of this species into shallower water during this period, thus becoming more accessible to the fishing fleets. At present, the distribution of actual roundnose grenadier catches by area and season in the Regulatory Area in recent years has not been confirmed.

As noted previously (Savvatimsky et al. MS 1990), the existing database does not permit the use of analytical age structured techniques to assess this stock of roundnose grenadier. With the cessation of the directed fishery on the 'traditional' grounds in Div. 3K, there is no more recent catch rate data available since the analyses described by Atkinson et al. (MS 1993). There are survey data available, and these are described. Besides data on roundnose grenadier, the survey data for roughhead grenadier are presented.

#### Methods and Results

Atkinson et al. (MS 1993) presented the results of Canadian annual fall surveys to Div. 2J and 3K. Although the surveys do not cover the entire depth range in which roundnose grenadier are distributed, the most consistent concentrations found were in Div. 3K at about 51° N latitude. This is the same area of effort concentration during the 'traditional' commercial fishery. The biomass of fish in this area appeared to decline in recent years, and this decline continued into 1993 (Figure 2). As was noted previously, whether this is indicative of a real decline in biomass or a re-distribution to deeper waters outside the survey area is unknown. Very few fish were found in Div. 2J in 1993.

Canada also conducted deepwater surveys (750-1500 m) in 1991 and 1994. The 1991 survey was carried out during August, while the 1994 survey was conducted during February. The 1994 survey was conducted using a new stratification scheme (Bishop MS 1994) covering depths to 1,500 m. Although the 1991 survey was conducted using a combination of stratified random stations and line transects, the data were post-stratified for this analysis. The results for roundnose grenadier (Figures 3 and 4) again show the concentration of fish on the 'traditional' grounds of Div. 3K at about 51° N. In this area, the highest catches were taken at depths between 1,000 and 1,500 m, supporting the argument that the surveys to only 1,000 m do not adequately measure the resource. Concentrations in the Sackville Spur area of Div. 3L, across the north of Flemish Cap, and in Flemish Pass were not as great as those in Div. 3K. Estimates of trawlable biomass from these two surveys (Table 4) indicate no change in Div. 3K, but declines in both 3L and 3M. Based on the 1994 survey results, the biomass by Division is lowest in Div. 3N.

The estimates of biomass for roughhead grenadiers (Table 4) were lower than for roundnose in Div. 3K, but higher for Div. 3L, and about the same as roundnose in Div. 3M. The increased estimates for Div. 3L and 3M in 1994 were probably at least in part the result of the increased survey area (Figures 4 and 5). It can be seen from these figures that there were no very large concentrations of roughhead grenadiers found, although the 1994 results suggest somewhat higher biomass in southern 3L and 3N. The biomass in Div. 3N in 1994 was the lowest of the 3 divisions, but was about 6 times higher than the estimate for roundnose grenadier.

#### Discussion

Previously, assessments of roundnose grenadier in Subareas 2+3 dealt with the resource and database in the 'traditional' fishing areas inside the Canadian 200 mile zone. Canadian industry has not pursued this resource, and with the gradual decline in allocations to non-Canadian fleets inside the zone, culminating in a complete elimination of these allocations in 1993, the database has become less and less useful for determining stock status. Deepwater surveys in Div. 3K in 1991 and 1994 suggest no change in status in Div. 3K during this time period. The current TAC for all of Subareas 2+3 inside the Canadian zone (3,000 t) is about 15% of the estimated biomass for this one division in which the traditional fishery was primarily prosecuted, and does not appear to be excessive.

The estimated biomass in Div. 3LM was slightly less than that in Div. 3K in 1991, and declined to only about 50% of the estimate for Div. 3K in 1994. The average annual catch based on revised breakdowns of the species for 1991-1993 was only about 2,200 t, but it is probable that there was substantial discarding. Thus the observed decline could have been the result of excessive fishing pressure, but it is not possible to verify this.

The biomass estimates of roughhead grenadier did not change for Div. 3K, but actually indicated some increase in Div. 3LM. Catches averaged about 5,100 t from 1991-1993, about 20% of the total (4 divisions) trawlable biomass estimated in 1994. The potential impact of this fishing pressure cannot be determined. It appears that in the most recent years, the largest catches of roughhead grenadier have been taken in Div. 3N, but the 1994 biomass estimate was lowest for this Division; the estimated 1993 catch was greater than the estimated biomass at the beginning of 1994.

Spain (Paz and Iglesias MS 1994) considered that in Div. 3N, the catch of roundnose grenadier was about 20% of the catch of roughhead. Unpublished information from Portugal also suggests a 20% catch of roundnose. It is interesting to note that the trawlable biomass of roundnose grenadier in this Division in 1994 was about 17% that of roughhead, in good agreement with the proportions reported for the commercial fishery.

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Table 1: Summary of nominal catches (t) of roundnose grenadier by Subarea and Division.

Year	2G	2H	2J	3K	Other	Total	TAC	Roughhead Grenadier
1966								
1967		868	217	16,009	210	17,304		
1968	2,536	4,089	479	23,553	606	31,263		
1969	387	-	264	11,682	-	12,333		
1970	-	-	468	22,267	129	22,864		
1971	54,179	2,738	81	18,392	55	75,445		
1972	2,161	655	293	21,122	155	24,386		
1973	5,880	232	632	10,655	165	17,564		
1974	3,220	2,007	333	22,816	40	28,416	32,000	
1975	6,489	3,536	1,754	15,388	258	27,425	32,000	
1976	3,841	1,460	1,381	13,636	275	20,593	32,000	
1977	2,597	525	206	11,935	123	15,386	35,000	
1978	3,112	1,412	913	15,250	15	20,702	35,000	
1979	1,035	3,090	438	3,200	18	7,781	35,000	
1980	279	493	726	451	104	2,053	30,000	
1981	967	1,693	463	3,920	42	7,085	27,000	
1982	719	734	182	2,709	-	4,344	27,000	
1983	140	1,390	36	1,916	87	3,569	11,000	
1984	107	289	3	3,362	112	3,873	11,000	
1985	-	80	13	4,642	213	4,948	11,000	
1986	-	117	53	7,222	32	7,424	11,000	3
1987	80	254	213	6,682	68	7,297	11,000	1,001
1988	329	226	9	4,658	160	5,382	11,000	911
1989	32	202	47	4,361	24	4,666	11,000	290
1990	86	52	2	606	73	819	11,000	3,211
1991 *	0	0	45	89	18	627	11,000	4,486
1992 *	71	1	0	0	2,429	2,982	11,000	4,585 a
1993 *	125	2	0	0	4,281	4,408	11,000	6,347 b
1994							3,000	

\* Provisional (1991 catch could not be well estimated; based on revised data is estimated to be 5,000-10,000 t).

1994 TAC for Canadian zone only

1991 total includes 475 t from Division 'unknown'

1992 total includes 481 t from Division 'unknown'

Catches reported from 'Other' since 1987 contain a mix of roundnose and roughhead grenadiers.

NOTE: In SCS Doc. 94/13, Portugal indicated that catches from 1988 onwards previously reported as roundnose grenadier were actually roughhead grenadier. The table shows the revised estimates with Portugal removed. In SCR Doc. 94/23, Spain estimated their 1992 reported roundnose grenadier catch was actually about 52% roughhead grenadier (about 2,585 t). The table has been adjusted for this.

a includes estimated roughhead catches of 2,585 t by Spain and 2,000 t by Portugal.

b includes estimated roughhead catches of 4,378 t by Spain and 1,969 t by Portugal.

Table 2: Nominal catches (t) of roundnose grenadier in Subarea 2+3 by country and year.

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991*	1992*	1993*
Canada	-	-	-	-	9	10	2	20	155	150	449	-
FRG	-	-	23	178	13	-	8	-	-	11	34	-
GDR	1,640	2,586	3,650	3,740	4,571	4,469	3,380	2,352	1	-	-	-
Poland	15	50	51	12	17	1	17	17	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	-	-	-
USSR	2,689	933	147	1,018	2,801	2,725	1,890	2,230	538	286	-	4,281
Russia	-	-	-	-	-	-	-	-	-	-	30	-
Japan	-	-	2	-	13	79	85	46	125	157	80	127
EEC	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	-	-	-	-	-	-	-	-
Faroes	-	-	-	-	-	9	-	-	-	-	1	-
Norway	-	-	-	-	-	-	-	1	-	23	-	-
Cuba	-	-	-	-	-	4	-	-	-	-	-	-
Den(Green)	-	-	-	-	-	-	-	-	-	-	2	-
<b>TOTAL</b>	<b>4,344</b>	<b>3,569</b>	<b>3,873</b>	<b>4,948</b>	<b>7,424</b>	<b>7,297</b>	<b>5,382</b>	<b>4,666</b>	<b>819</b>	<b>627</b>	<b>2,982</b>	<b>4,408</b>

\* Provisional.

Note: Totals reflect report (SCS Doc. 94/13) that Portuguese catches were roughhead grenadiers.

Table 3: Nominal catches (t) of roundnose grenadier in Subarea 2+3 by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1982	4	-	3	5	3	4	559	563	410	698	1,465	630	4,344
1983	3	18	4	-	3	1	1	74	1,292	861	866	446	3,569
1984	31	13	6	19	-	5	-	45	460	3,018	123	153	3,873
1985	44	7	1	96	73	-	54	873	1,869	1,361	537	33	4,948
1986	6	5	-	-	-	-	117	2,818	2,093	1,555	494	336	7,424
1987	6	1	0	0	16	0	15	2,691	1,633	1,249	1,181	505	7,297
1988	2	0	6	-	8	16	783	834	661	1,381	1,538	153	5,382
1989	1	12	4	17	0	4	545	1,497	692	879	945	70	4,666
1990	4	12	22	-	2	-	121	363	21	71	61	21	819 a
1991 *	-	3	45	5	9	8	8	31	26	16	2	1	627 b
1992 *	173	634	740	606	928	606	194	255	399	208	155	112	5,567 c

\* Provisional.

a includes 121 t from month 'unknown'

b includes 473 t from month 'unknown'

c includes 557 t from month 'unknown'

Note: Totals reflect report (SCS Doc. 94/13) that Portuguese catches were roughhead grenadiers.

Table 4: Stratified-random estimates from Canadian deepwater surveys.

a) Roundnose grenadier

Division	1991		1994	
	Numbers	Weights (t)	Numbers	Weights (t)
3K	48,252,576	19,822	70,550,664	21,397
3L	17,065,958	4,394	8,495,133	1,546
3M	38,655,104	11,576	33,031,109	8,475
3N	not surveyed		2,211,571	516
<b>Total</b>	<b>103,973,638</b>	<b>35,791</b>	<b>114,288,477</b>	<b>31,935</b>

a) Roughhead grenadier

Division	1991		1994	
	Numbers	Weights (t)	Numbers	Weights (t)
3K	6,983,663	4,273	7,488,857	4,137
3L	11,154,304	6,354	14,347,454	8,960
3M	8,655,487	5,588	17,814,038	10,465
3N	not surveyed		4,848,764	3,028
<b>Total</b>	<b>26,793,454</b>	<b>16,214</b>	<b>44,499,113</b>	<b>26,589</b>

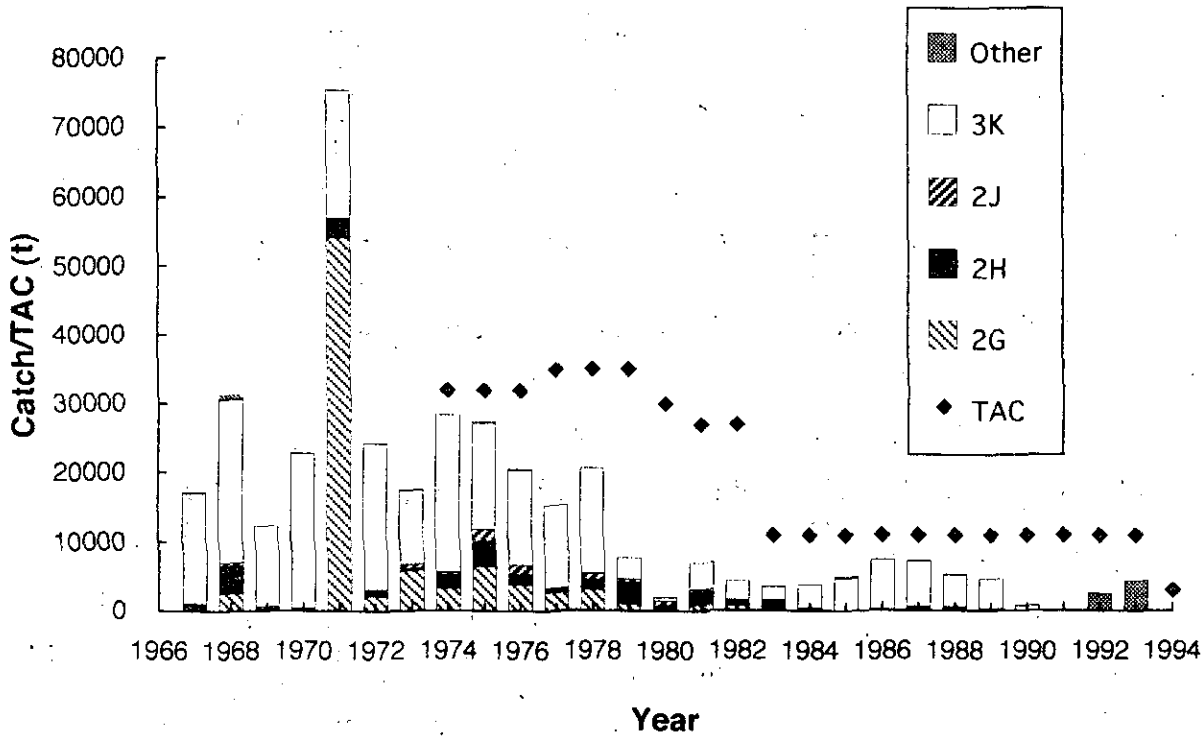


Figure 1: Catches of roundnose grenadier in SA 2+3 after adjustment for estimates of roughhead grenadier catch previously reported as roundnose grenadier by Spain and Portugal.

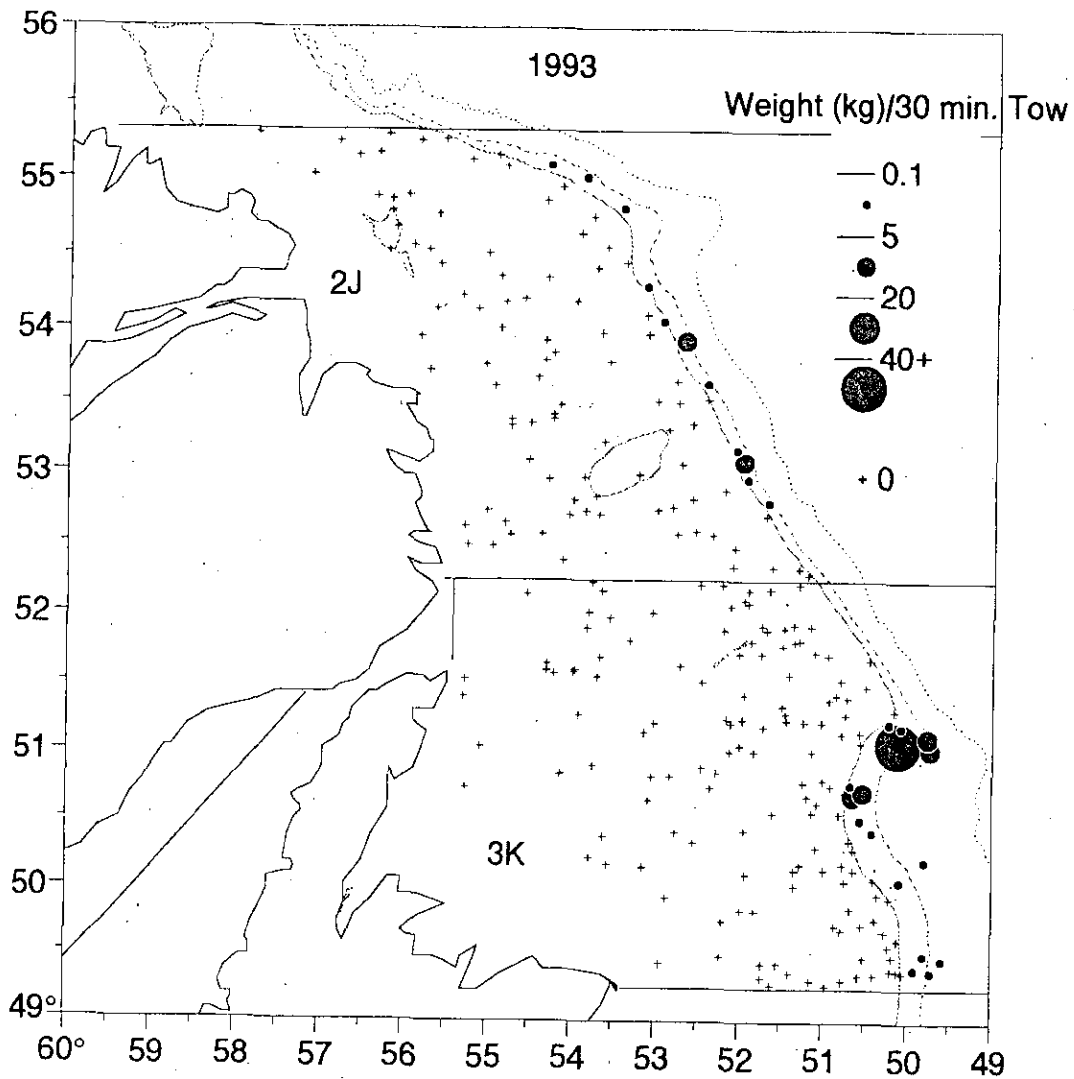


Figure 2: Distribution of catches of roundnose grenadier in Div. 2J and 3K during the fall, 1993 Canadian research survey.

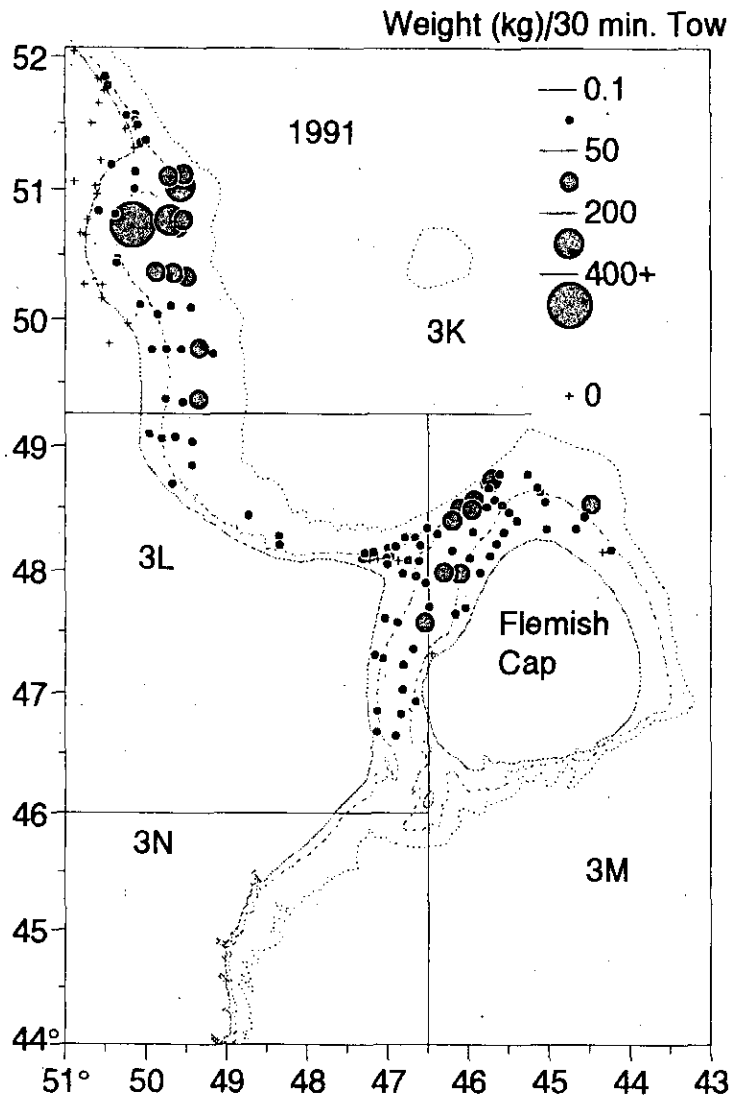


Figure 3: Catches of roundnose grenadier during Canadian deepwater survey, 1991.



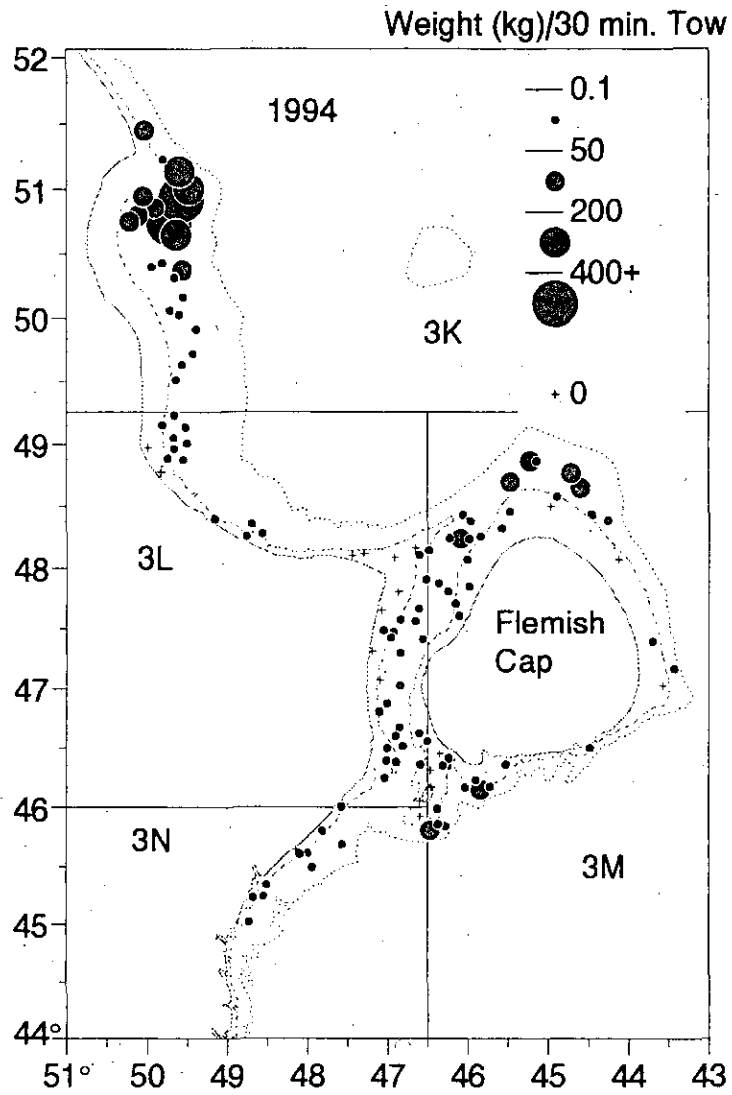


Figure 4: Catches of roundnose grenadier during Canadian deepwater survey, 1994.

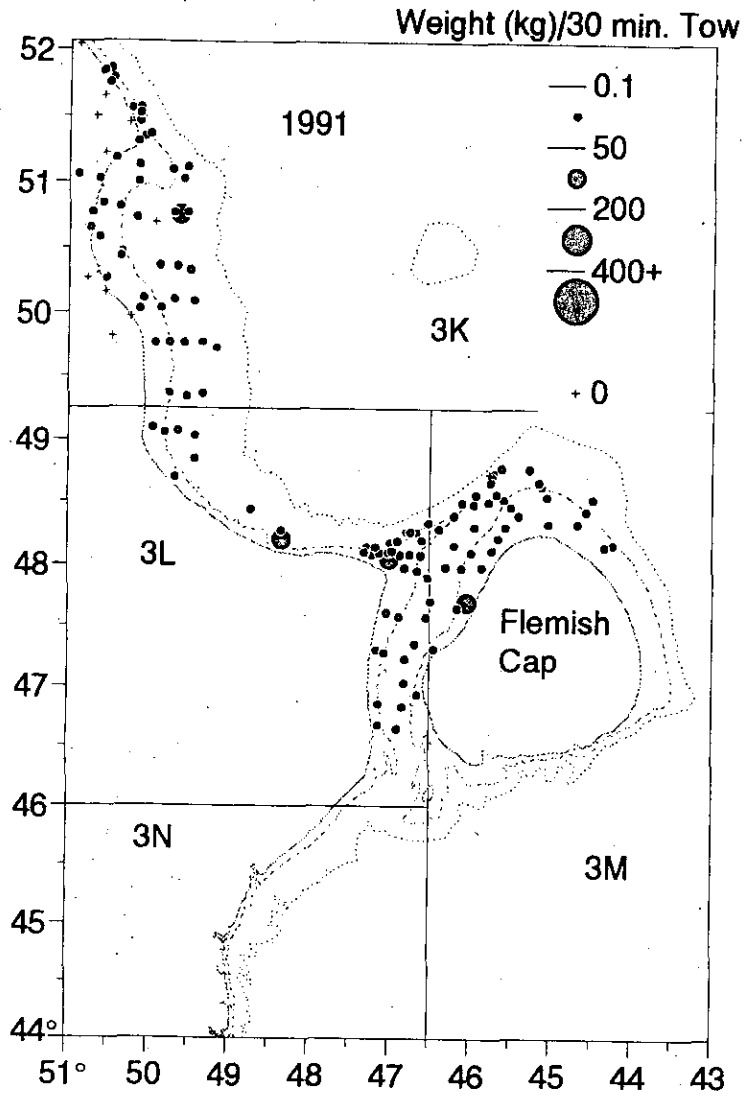


Figure 5: Catches of roughhead grenadier during Canadian deepwater survey, 1991.

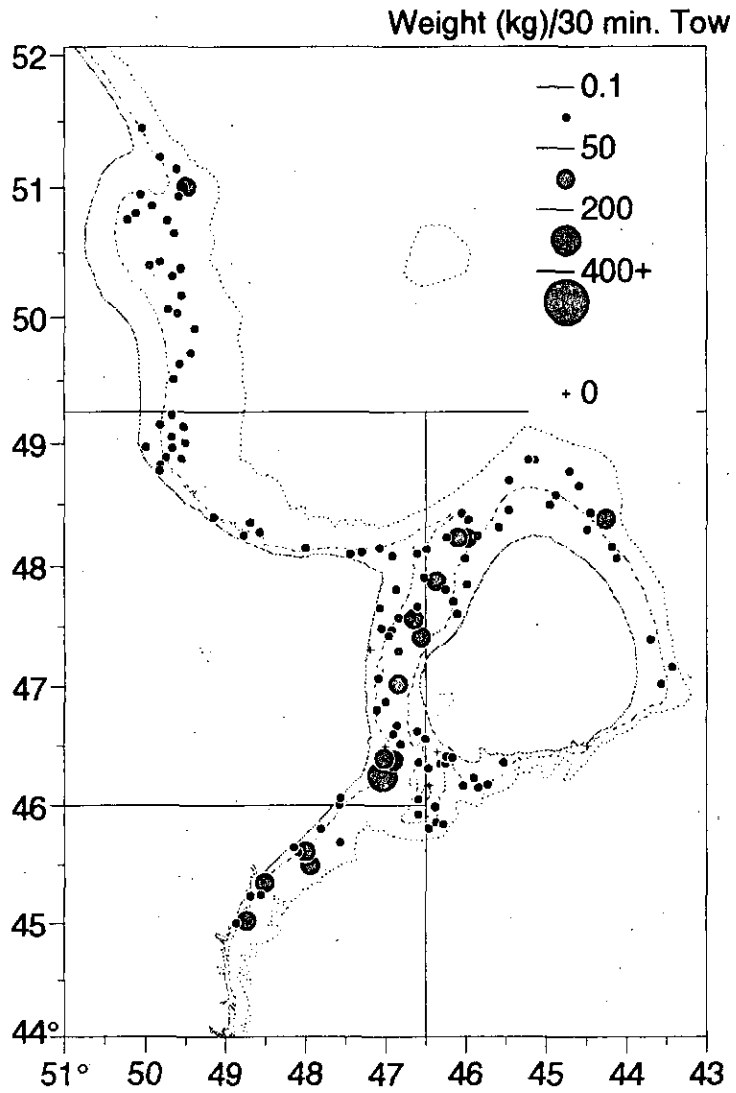


Figure 6: Catches of roughhead grenadier during Canadian deepwater survey, 1994.