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Roughhead Grenadier NAFO Subareas 2 and 3 Age Disaggregate Data (1992-2003)

by

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Abstract

The aim of this document is to compile all available information for the stock of roughhead grenadier in NAFO Subareas 2 and 3 which in turn will allow carry out an age disaggregate assessment in the future.

This document present the catch at age matrix as well as mean weights and lengths by age of roughhead grenadier in NAFO Subareas 2 and 3 between 1992 and 2003, resulting of applying the Spanish ALK available to the national catches length distributions.

We have also transformed the Spanish 3NO survey length distributions in age distributions applying a mix ALK (3M survey and catches ALK).

Introduction

The roughhead grenadier (*Macrourus berglax* Lacépède, 1802) is an abundant and widespread fish species in the north Atlantic and is usually found both on the shelf and on the continental slope (Scott and Scott, 1988; Savvatimsky, 1994). It is predominant in depths ranging from 400 to 1 200 m, although they may inhabit depths between 200-2 000 m (Snelgrove and Haedrich, 1985; de Cardenas *et al.*, 1996). It has, however, been found in depths up to 2 700 m (Wheeler, 1969).

The fishery for roughhead grenadier is unregulated as it has been mainly taken as by-catch in Greenland halibut fishery. However, roughhead grenadier is becoming an important commercial fish in NAFO Regulatory Area and reliable information is needed for its assessment. Catches of roughhead grenadier increased sharply from 1989 (333 tons) to 1990 (3 244 tons), since then total catches has been about 4 000 tons and increased 7 200 tons in 1998 remaining at this level in 1999. The catches decreased to about 4 000 tons in 2003 (NAFO, 2004).

With the catches of roughhead grenadier increasing in the most recent years, rising to historic maximum levels, it has been recognised that reliable information is needed to properly monitor and assess the status of this “new” resource. This is even more important as the collapse of traditional groundfish fisheries and the decrease in the abundance of other fish resources of the area continue.

The aim of this document is to compile all the available information for the stock of roughhead grenadier in NAFO Subareas 2 and 3. As well the objective is to prepare the necessary inputs (catch-at-age matrix, mean weight and length by age, maturity ogive, etc.) that allow us to carry out an analytic assessment in the future.

Materials, Methods and Results

Total catch numbers by age and year with their mean weights and length by age

The revised catch history by country for this stock from 1991 to 2003 is presented in Table 1.

Roughhead length frequencies by sex from the Spanish, Portuguese (R. Alpoim personal communication) and Russian (K. Gorchinsky, personal communication) trawl catches in Div. 3LMNO are available for different years. The Spanish and Portuguese length frequencies measured the length as preanal fin lengths (AFL) while the Russian ones are estimated as total lengths. The latter were converted to AFL using the Total Length/AFL relationship presented by Murua and Motos (1997). Table 2 shows the length distributions available by country and year.

The age structure of roughhead grenadier was estimated from otolith readings of specimens captured in NAFO Div.3LMN. Validation of age estimates derived from otolith reading was presented by Rodríguez Marín *et al.* (2002). Table 2 shows the years when ALK information were available, it should be mentioned that only Age Length Key (ALK) by sex of the Spanish catches were available.

Parameter values of the length-weight relationship by sex for roughhead grenadier, from the catches were available for Portugal (Alpoim, 2004) and Spain. In the Spanish case, there is available a constant value which were applied to both sexes and all years. In the Russian case we used the Portugal parameters. Table 3 shows the values of the parameters of the length-weight relationship in the form $W = a * AFL^b$.

The way to calculate the total catches length distribution by country was the following. For each country, when there was length frequencies by sex and Division, these frequencies were raised to the catches of the Divisions and after, all Divisions were added to have the each country total catch length distribution by sex and year (Tables 4, 5 and 6).

Only 1999, 2000, 2002 and 2003 Spanish catches ALK were available, for the years where ALK information were not available we apply a combined ALK by sex based on all the available data. The process to convert the total catches length distributions by sex and country in age distributions was the following. The Spanish ALK by sex and year was apply to the respective total length distribution by sex, year and country and then both sexes were added to have the age distributions by country and year. In this process mean weight and mean length by age, year and country were also calculated and presents in Tables 7, 8 and 9.

For each year the available national catch age distributions were added and they were risen to the SC total catch estimate of that year to get the total catch numbers by age and year as well as the associated mean weights and length by age. These results are presented in Table 10 and Fig. 1 and 2.

Flemish Cap Survey Ages Abundance Indices

The new Flemish Cap transformed survey series by age is presented in Murua and González, 2005.

Spanish 3NO Survey Ages Abundance Indices

The Spanish 3NO Survey length abundance indices between 1997 and 2004 (González-Troncoso, 2005) were transformed in age abundances applying the Flemish Cap ALKs for lengths between 0 and 24 cm and the Spanish commercial catches ALKs for lengths bigger than 24 cm. In 1997 and 1998 the 1999 Spanish commercial ALK was applied and in 2001 the 2002 one. The reason of applying a mix ALK was that Flemish Cap survey only cover the shallowest part of the bank (up to 700 m) while the roughhead grenadiers is distributed well beyond up to 2000 m (Murua and De Cárdenas, in press). We have chosen to use the survey ALK for lengths <24 cm to avoid the bias in the transformation due to the partial selection of individuals smaller than that length in the commercial ALK. The total abundance by age and year and MNPT of the Spanish 3NO Survey is presented in Table 11.

Maturity Ogive

Information about maturity was available from Russia (K. Gorchinsky, pers. com.) and Spain (Murua, 2003). The Russia information is based on macroscopical staging and is available by length, sex and year (1996-2004) while the Spanish was estimated microscopically for females only by length and age based upon samples collected between 1998-2000 in Flemish Cap and Flemish Pass.

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Table 1. Recent nominal catches (t.) for roughhead grenadier in Subarea 2+3.

	1991	1992	1993	1994	1995	1996	1997	1998	1999 ^a	2000	2001	2002	2003 ^d
Canada	215	595	345	79	84		240	39	108	201	164	244	182
EU-ESP		4125 ^b	2054 ^b	1720 ^b	2502 ^b	3090 ^b	3738	6050	5704	3948	2562	2588	3097
EU-PRT	4053 ^b	2000 ^b	1969 ^b	2223 ^b	1402 ^b	784 ^b	762	1089	1299	396	241	438	461
Russia								92 ^c	49	211	150	228	116
Japan												120	5
Estonia										1		25	93
Lithuania										1			
Norway													30
Others		5	27	2		4							
TOTAL	4268	6725	4395	4023	3982	4135	4740	7270	7160	4767	3117	3657	3984

^a Provisional.

^b First reported as roundnose grenadier.

^c Reported as roundnose grenadier in STATLANT 21A.

^d In 2003, STACFIS could not precisely estimate the catch.

Table 2 Roughhead grenadier data of catches length distributions and ALK available in the period 1992-2003.

Country	Data	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Spain	Length Dis.	X ¹	X	X	X	X	X	X	X	X	X	X	X
Portugal	Length Dis.	X ¹			X	X	X	X	X	X	X	X	X
Russia	Length Dis.							X	X	X	X	X	X
Spain	ALK								X	X		X	X

¹ Sex Combined.

Table 3. Length-weight relationship parameters by years and country as well as the value of R^2 .

Year	Sex	Portugal		
		a	b	R^2
1998	F	0,3457	2,7070	0,9947
	M	0,4407	2,6036	0,9934
	Total	0,3510	2,6959	0,9949
1999	F	0,2505	2,8735	0,9977
	M	0,1374	3,0938	0,9966
	Total	0,2137	2,9229	0,9975
2000	F	0,1757	2,9816	0,9933
	M	0,1368	3,0894	0,9958
	Total	0,1752	2,9822	0,9962
2001	F	0,1747	2,9563	0,9975
	M	0,1037	3,1441	0,9903
	Total	0,1514	3,0005	0,9974
2002	F	0,3364	2,7548	0,9936
	M	0,4964	2,5873	0,9952
	Total	0,3409	2,7480	0,9941
2003	F	0,6888	2,5123	0,9946
	M	0,6794	2,4713	0,9950
	Total	0,6148	2,5461	0,9943
All	Both	Spain		
		a	b	
		0,1139	2,8921	

Table 4 Roughhead grenadier Spanish Div. 3LMNO total catches length distributions by sex and year.

LENGTH GROUP	1992				Total	1993				Total	1994				Total	1995				Total
	Total Catches 3LMNO			I		Total Catches 3LMNO			I		Total Catches 3LMNO			I		Total Catches 3LMNO			I	
	M	F	I			M	F	I			M	F	I			M	F	I		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	932	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	1089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	3272	0	0	0	0	0	0	0	0	0	0	1091	1091	0	0	0	0	0	0	
6	11054	1337	1904	0	3241	0	0	0	0	279	449	1461	2189	0	0	0	0	0	0	
7	10647	4457	1260	0	5717	2686	2281	2031	6999	2686	2281	2031	6999	3822	0	0	0	3822	0	
8	10152	7408	5981	0	13389	6252	5604	2184	14040	6252	5604	2184	14040	7645	0	0	0	7645	0	
9	35525	28040	25423	474	53938	14022	13187	1357	28566	14022	13187	1357	28566	30579	11467	0	0	42046	0	
10	62760	10676	13332	0	24009	30629	34387	2826	67842	30629	34387	2826	67842	114672	122317	3800	240788	0	0	
11	92241	21221	8935	0	30156	26483	28818	1237	56538	26483	28818	1237	56538	99382	61136	0	160518	0	0	
12	132971	25844	20903	0	46747	33829	29438	781	64047	33829	29438	781	64047	80824	113542	0	194366	0	0	
13	199441	62898	56117	237	119251	45381	44428	1014	90823	45381	44428	1014	90823	61113	66582	0	127695	0	0	
14	430450	67524	67040	0	134564	87740	69570	696	158006	87740	69570	696	158006	92860	103167	0	196027	0	0	
15	654175	108235	63918	0	172153	101416	76476	717	178609	101416	76476	717	178609	155110	112974	0	268084	0	0	
16	580516	172848	118272	0	291120	130169	90329	581	221079	130169	90329	581	221079	108628	145737	0	254365	0	0	
17	520190	235537	161729	0	397266	194209	136029	588	330826	194209	136029	588	330826	200934	192728	0	393662	0	0	
18	466720	182940	191805	0	374746	184074	161972	1417	347463	184074	161972	1417	347463	276768	235859	0	512627	0	0	
19	416143	110519	151398	0	261918	146387	147862	635	294884	146387	147862	635	294884	325914	254911	0	580825	0	0	
20	375463	96148	110485	0	196633	85245	114635	1432	201312	85245	114635	1432	201312	161057	187245	0	348302	0	0	
21	348890	31078	83566	0	114645	46131	80747	776	127655	46131	80747	776	127655	84078	158895	0	242973	0	0	
22	312304	11788	83153	0	94941	24633	65074	518	90225	24633	65074	518	90225	52429	95478	0	147907	0	0	
23	263191	4437	98017	0	102455	8924	65359	169	74452	8924	65359	169	74452	9807	59513	0	69319	0	0	
24	209846	1100	106962	0	108062	2029	61855	0	63884	2029	61855	0	63884	3822	62759	0	66582	0	0	
25	158027	0	95248	0	95248	1084	63236	0	64320	1084	63236	0	64320	0	33886	0	33886	0	0	
26	134379	0	87714	0	87714	173	48077	20	48270	173	48077	20	48270	0	52362	0	52362	0	0	
27	94107	0	51165	0	51165	311	37391	0	37702	311	37391	0	37702	0	64352	0	64352	0	0	
28	90528	0	34513	0	34513	227	27139	0	27366	227	27139	0	27366	0	50746	0	50746	0	0	
29	81592	0	34913	0	34913	206	19696	0	19902	206	19696	0	19902	0	43079	0	43079	0	0	
30	53945	0	24335	0	24335	99	21016	0	21115	99	21016	0	21115	0	9807	0	9807	0	0	
31	39537	0	23450	0	23450	32	11950	0	11982	32	11950	0	11982	0	27856	0	27856	0	0	
32	26876	0	25896	0	25896	0	11831	0	11831	0	11831	0	11831	3822	17975	0	21797	0	0	
33	18360	0	5330	0	5330	16	6536	0	6552	16	6536	0	6552	0	14175	0	14175	0	0	
34	11196	0	5912	0	5912	16	6281	0	6297	16	6281	0	6297	0	8714	0	8714	0	0	
35	7120	0	4133	0	4133	0	3946	0	3946	0	3946	0	3946	0	0	0	0	0	0	
36	7072	0	1967	0	1967	0	1494	0	1494	0	1494	0	1494	0	0	0	0	0	0	
37	575	0	462	0	462	0	1615	0	1615	0	1615	0	1615	0	3800	0	3800	0	0	
38	349	0	0	0	0	0	1263	0	1263	0	1263	0	1263	0	0	0	0	0	0	
39	1074	0	198	0	198	0	210	0	210	0	210	0	210	0	0	0	0	0	0	
40	12446	0	118	0	118	0	865	0	865	0	865	0	865	0	0	0	0	0	0	
TOTAL	5875156	1174037	1765556	711	2940304	1172682	1491049	21529	2685260	1873265	2311061	3800	4188127							
Total Catches SC (ton)		4125			2054				1720				2521							
Number Samples		185			48				288				6							

LENGTH GROUP	1996				Total	1997				Total	1998				Total	1999				Total
	Total Catches 3LMNO			I		Total Catches 3LMNO			I		Total Catches 3LMNO			I		Total Catches 3LMNO			I	
	M	F	I			M	F	I			M	F	I			M	F	I		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	685	1748	0	2434	848	0	0	848	0	0	0	0	0	0	
8	0	0	0	0	0	15306	10782	0	26088	848	1735	0	2583	0	0	0	0	0	0	
9	0	0	0	0	0	22504	13357	0	35861	5342	8733	501	14575	0	0	0	0	0	0	
10	15481	74847	0	90328	22632	32354	0	54986	63184	55976	3739	122899	8582	6220	0	14802	0	0	0	
11	89712	46442	0	136154	31758	54963	0	86722	114208	122878	1542	238628	22597	7086	0	29684	0	0	0	
12	192005	285601	0	477606	67489	92860	0	160349	210739	210362	6437	427539	49919	67084	4724	121727	0	0	0	
13	261602	336462	0	598064	146771	125592	0	272364	341779	264089	4741	610609	109523	116845	1575	227942	0	0	0	
14	284404	313733	0	598138	255755	204807	0	460562	640067	399950	4317	1044335	152119	102830	0	254949	0	0	0	
15	266471	244011	0	510482	324102	315955	0	640057	1288136	743332	0	2031468	304868	167473	0	472341	0	0	0	
16	318074	70114	0	388188	449040	360839	1260	811139	1274836	845060	0	2119896	315182	266130	0	581312	0	0	0	
17	295749	177352	0	473101	325057	329949	1260	656267	978286	654666	0	1632952	388880	302191	0	691071	0	0	0	
18	285790	236306	0	522096	291087	273987	0	565075	581075	415378	0	996454	374629	216683	0	591312	0	0	0	
19	255820	170068	0	425887	297520	222128	0	519648	442096	382737	0	824833	340614	339669	0	680284	0	0	0	
20	225218	214361	0	439579	247201	245576	0	492777	238562	247650	0	486212	372424	296207	0	668631	0	0	0	
21	158726	295916	0	454642	125260	186737	0	311997	108124	239454	0	347578	146529	393604	0	540133	0	0	0	
22	28368	135879	0	164247	61957	150841	0	212798	44184	214913	0	259097	52045	282349	0	334394	0	0	0	
23	0	137383	0	137383	25141	168444	0	193585	26393	159022	0	185415	35117	327072	0	362188	0	0	0	
24	0	52291	0	52291	15491	123101	0	138592	8992	187381	0	196374	10000	254713	0	264712	0	0	0	
25	0	51306	0	51306	3231	111707	0	114938	1240	106692	0	107932	9527	237548	0	247075	0	0	0	

Table 5. Roughhead grenadier Portugal Div. 3LMNO total catches length distributions by sex and year.

LENGTH GROUP	1992				1993				1994				1995				
	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	
	M	F	I		M	F	I		M	F	I		M	F	I		
0				0												0	
1				0												0	
2				0												0	
3				0												0	
4				0												0	
5				0												0	
6				0												0	
7				0												0	
8				0												0	
9				0												0	
10				0								33110	29942	0		63052	
11				0								30753	36504	0		67257	
12				0								46574	60750	0		107324	
13				4065								77095	104375	0		181470	
14				52848								99780	109632	0		209413	
15				21801								115512	137590	0		253102	
16				107390								104573	148705	0		253278	
17				126700								91527	117593	0		209120	
18				150634								58586	100173	0		158759	
19				239613								26355	53690	0		80044	
20				144739								17927	45937	0		63864	
21				152746								7322	27345	0		34668	
22				137839								9698	24473	0		34171	
23				55206								7216	18578	0		25794	
24				149975								6593	16941	0		23534	
25				22066								7276	17571	0		24847	
26				25914								2937	9651	0		12589	
27				16233								2232	5035	0		7267	
28				29233								2267	4825	0		7092	
29				25021								1233	3362	0		4595	
30				4502								2091	5189	0		7280	
31				2575								1103	1986	0		3089	
32				8165								361	2050	0		2411	
33				1233								0	763	0		763	
34				4333								34	245	0		279	
35				178								456	110	0		566	
36				243								0	0	0		0	
37				257								0	0	0		0	
38				95								0	0	0		0	
39				0								0	0	0		0	
40				0								0	0	0		0	
TOTAL				1483603										752611	1083016	0	1835627
Total Catches SC (ton)				2000													1402
Number Samples				34													228

LENGTH GROUP	1996				1997				1998				1999			
	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total
	M	F	I		M	F	I		M	F	I		M	F	I	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	238	0	238	274	0	0	274
7	0	0	0	0	4232	2495	0	6727	2883	2867	0	5750	4597	2487	0	7084
8	2184	373	0	2557	22477	11273	0	33750	7806	7468	0	15274	27222	14742	0	41964
9	12280	3949	0	16229	49348	30100	0	79448	18689	19843	0	38532	78093	45257	0	123350
10	65713	42516	0	108229	127078	90070	0	217147	47922	44463	0	92384	81591	57248	0	138839
11	94356	76582	0	170938	233007	172147	0	405154	100821	100844	0	201665	127395	115244	0	242639
12	70397	58092	0	128489	190874	150699	0	341574	126309	123196	0	249505	206183	178973	0	385156
13	57277	66613	0	123889	126275	90517	0	216792	111475	99743	0	211218	214797	196434	0	411231
14	69810	78059	0	147869	92052	67884	0	159935	102895	114032	0	216927	168751	153257	0	322008
15	58929	91529	0	150459	67038	63146	0	130183	89326	90862	0	180187	106615	103555	0	210170
16	49383	95257	0	144640	36236	48288	0	84524	69244	72264	0	141508	56341	65491	0	121833
17	28068	75257	0	103325	20027	38087	0	58114	62657	64211	0	126868	42256	57517	0	99773
18	17868	71703	0	89571	7946	36672	0	44618	36100	47794	0	83894	22013	33316	0	55328
19	7990	38467	0	46456	3335	20171	0	23505	28730	36935	0	65665	14554	16548	0	31102
20	6075	25279	0	31354	543	8140	0	8683	35455	33857	0	69313	9735	19110	0	28845
21	868	23100	0	23968	409	3336	0	3746	21911	28255	0	50166	9637	20539	0	30176
22	306	12517	0	12823	0	3606	0	3606	8250	10885	0	19136	6168	10960	0	17128
23	0	7420	0	7420	0	5799	0	5799	15286	12497	0	27783	2999	8105	0	11104
24	0	6832	0	6832	0	7212	0	7212	7805	5410	0	13215	453	5278	0	5731
25	0	5115	0	5115	0	6911	0	6911	2353	3179	0	5532	1136	5691	0	6827
26	0	3427	0	3427	0	5524	0	5524	3795	2218	0	6014	481	3082	0	3563
27	0	2365	0	2365	0	2640	0	2640	1531	1676	0	3207	0	5802	0	5802
28	0	1775	0	1775	0	1001	0	1001	612	1673	0	2285	0	3919	0	3919
29	0	1446	0	1446	0	205	0	205	360	664	0	1023	0	2544	0	2544
30	0	934	0	934	0	0	0	0	176	725	0	901	0	1504	0	1504
31	0	378	0	378	0	0	0	0	161	508	0	669	0	459	0	459
32	0	96	0	96	0	230	0	230	558	366	0	924	0	386	0	386
33	0	0	0	0	0	0	0	0	0	279	0	279	0	178	0	178
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	521	0	521
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	541504	789085	0	1330588	980876	866152	0	1847028	903111	926951	0	1830061	1181290	1128146	0	2309436
Total Catches SC (ton)				784				762				1090				1299
Number Samples				224				192								149

Table 5 (cont.). Roughhead grenadier Portugal Div. 3LMNO total catches length distributions by sex and year.

LENGTH GROUP	2000				2001				2002				2003				
	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	Total Catches 3LMNO			Total	
	M	F	I		M	F	I		M	F	I		M	F	I		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	18	0	18	712	226	0	938
5	0	0	0	0	0	0	0	0	0	196	22	0	218	168	304	0	472
6	100	135	0	235	16	10	0	26	164	137	0	301	1292	980	0	2272	
7	2395	1251	0	3646	990	462	0	1452	754	1215	0	1969	8797	6080	0	14876	
8	15729	9703	0	25432	5136	3808	0	8944	6093	3281	0	9374	8491	10003	0	18494	
9	47907	43456	0	91363	25220	16752	0	41971	24677	13411	0	38088	30681	17333	0	48014	
10	93241	79081	0	172323	60586	44863	0	105449	66618	44107	0	110725	73691	54901	0	128592	
11	91332	73673	0	165006	59803	47007	0	106810	84360	64331	0	148691	97275	63301	0	160576	
12	108591	89240	0	197831	59082	48970	0	108052	99444	85999	0	185444	114688	104929	0	219617	
13	73838	70430	0	144269	46475	43748	0	90223	71906	63964	0	135870	77288	73044	0	150332	
14	42768	39454	0	82222	29493	30522	0	60015	45010	48837	0	93847	47146	50340	0	97485	
15	19335	17930	0	37264	14823	14713	0	29536	39352	31652	0	71004	31705	31936	0	63641	
16	6378	9612	0	15990	6055	8790	0	14845	22870	23762	0	46632	23555	26159	0	49714	
17	5210	8644	0	13854	3066	6522	0	9588	10357	15375	0	25733	12328	15553	0	27881	
18	1607	8670	0	10277	477	5921	0	6398	5590	8833	0	14422	4567	12784	0	17351	
19	60	6198	0	6258	0	4916	0	4916	2574	7876	0	10449	1604	6947	0	8551	
20	0	5361	0	5361	0	3816	0	3816	1669	6021	0	7690	2581	6348	0	8930	
21	0	6707	0	6707	0	3475	0	3475	1494	5057	0	6551	1406	6470	0	7876	
22	0	3607	0	3607	0	3782	0	3782	489	4800	0	5290	127	5252	0	5378	
23	0	4256	0	4256	0	3635	0	3635	237	5175	0	5412	190	4195	0	4385	
24	0	3004	0	3004	0	2767	0	2767	156	2849	0	3005	190	3422	0	3612	
25	0	1561	0	1561	0	1601	0	1601	100	2364	0	2464	365	2480	0	2845	
26	0	931	0	931	0	1568	0	1568	0	1519	0	1519	127	1261	0	1387	
27	0	677	0	677	0	855	0	855	10	1158	0	1168	147	1254	0	1401	
28	0	915	0	915	0	887	0	887	0	1018	0	1018	0	525	0	525	
29	0	745	0	745	0	548	0	548	12	248	0	260	0	90	0	90	
30	0	592	0	592	0	595	0	595	0	141	0	141	0	105	0	105	
31	0	747	0	747	0	262	0	262	0	104	0	104	0	0	0	0	
32	0	248	0	248	0	68	0	68	0	16	0	16	0	0	0	0	
33	0	219	0	219	0	22	0	22	0	0	0	0	0	0	0	0	
34	0	0	0	0	0	0	0	0	0	9	0	9	0	0	0	0	
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
36	0	0	0	0	0	11	0	11	0	0	0	0	0	0	0	0	
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	508491	487047	0	995538	311223	300896	0	612119	484134	443301	0	927435	539117	506223	0	1045340	
Total Catches SC (ton)				396				242				438					487
Number Samples				104				154				180					117

Table 7. Roughhead grenadier Spanish Div. 3LMNO total catches ages distributions, mean weight and mean length by year and age.

Abundance												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	3657		546						47			
2	29760	17713	17010	13014	442	13753	4596	1073	2071	3465	2458	10577
3	56917	58636	55821	117997	37798	67431	60997	6152	19832	22566	23112	74866
4	94280	39216	75954	238242	138755	90273	212713	24871	77946	68202	57568	196297
5	176492	70627	87906	224916	481113	199284	500480	169259	270686	244803	190064	171198
6	439164	171343	168742	280540	872016	501975	1239767	362539	779240	683545	668755	358496
7	654944	231862	225550	303364	665634	747355	1926894	594521	825228	883656	739150	980433
8	874620	443115	385385	507107	727326	1057849	2747321	976946	1202396	1034534	1023600	1535303
9	756384	508543	453912	639157	721432	935688	2042071	924965	1556912	826016	720437	1259461
10	552851	355727	341600	538850	583461	646875	1108357	742555	969428	517311	374317	725361
11	507105	250371	251159	437745	534171	540527	722401	864983	436911	328029	365340	367871
12	480284	213204	195967	314467	401799	441843	529876	510620	381612	221322	257183	277516
13	386551	174463	137743	184861	245746	300985	339727	589692	213962	123838	134665	130964
14	323694	142570	104714	129645	127167	213457	230567	446822	169279	79788	71513	57239
15	187153	91919	63478	78639	74151	107931	119845	218112	111281	48327	46398	49858
16	117584	56434	38684	63669	54256	74659	76070	101578	57557	33307	49112	66173
17	74305	34706	23647	37264	43790	57653	44266	65846	25201	22531	57218	31462
18	58308	30552	19791	30421	38154	41423	46692	93668	20035	20045	43672	11646
19	41947	24250	15674	20566	27818	31094	41063	76116	28343	15936	24026	14938
20	23289	12969	9650	14109	8199	20257	28047	79324	17546	11177	14244	6752
21	13905	7724	5716	8158	1848	12780	18939	54911	17311	6638	10561	289
22	7007	2095	2873	3054	888	4925	8192	27527	12338	4457	4392	2269
23	7344	1889	2110	1394	1889	3400	6628	22660	9349	3491	4745	458
24	7613	375	1626	950		1729	2893	7618	9864	2524	2866	627
Total ages	5875156	2940304	2685260	4188127	5787853	6113147	12058403	6962359	7214377	5205506	4885394	6330055

Mean Weight (gr)												
Age	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
1	11		16					16				
2	40	51	49	71	102	60	76	102	72	62	39	47
3	86	77	85	94	105	81	101	110	96	90	83	80
4	119	111	115	114	128	121	125	133	128	128	126	126
5	180	184	173	163	182	183	179	193	182	187	187	173
6	246	236	236	225	223	241	245	243	231	241	253	228
7	311	320	313	313	288	315	316	335	299	302	314	297
8	385	414	412	415	387	390	380	417	374	379	384	398
9	493	500	509	525	504	491	462	544	481	482	467	466
10	616	585	590	602	612	601	564	638	550	570	565	598
11	765	736	716	703	734	731	703	750	696	686	643	821
12	888	886	836	788	814	839	830	908	791	788	768	938
13	1058	1101	1039	959	941	1004	1001	1107	1018	978	900	1109
14	1266	1324	1280	1280	1190	1217	1230	1256	1292	1275	1291	1460
15	1514	1546	1530	1567	1650	1495	1496	1606	1499	1576	1452	1850
16	1749	1777	1729	1810	1798	1779	1764	1779	1708	1781	1752	1951
17	2002	1989	2005	2020	2053	2251	2047	1965	1919	2060	1976	2369
18	2292	2326	2333	2319	2172	2417	2429	2315	2315	2369	2367	3038
19	2473	2508	2553	2489	2261	2529	2675	2435	2611	2611	2766	2937
20	2823	2777	2889	2785	2628	2867	2906	2860	3126	2960	3091	2886
21	3160	2898	3076	2930	3092	3195	3031	3015	3685	3232	2882	4177
22	3884	3422	3637	3444	3192	3471	3636	3576	3809	3734	3790	3679
23	4040	3299	3525	3521	2505	3485	3574	3663	4260	3770	3208	4206
24	4979	4172	4453	4062		4541	4075	4436	4662	4490	4198	4220

Mean Length (cm)												
Age	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
1	4.7		5.5					5.5				
2	7.4	8.1	8.0	9.1	10.5	8.7	9.3	10.5	9.3	8.7	7.5	8.0
3	9.8	9.5	9.8	10.2	10.6	9.6	10.4	10.7	10.2	10.0	9.7	9.6
4	11.0	10.7	10.9	10.9	11.3	11.1	11.2	11.5	11.3	11.3	11.2	11.2
5	12.7	12.8	12.5	12.3	12.8	12.8	12.7	13.0	12.8	12.9	12.9	12.6
6	14.2	14.0	14.0	13.7	13.7	14.1	14.1	14.1	13.9	14.1	14.3	13.8
7	15.4	15.5	15.4	15.4	15.0	15.4	15.5	15.8	15.2	15.2	15.4	15.1
8	16.5	17.0	16.9	17.0	16.5	16.6	16.5	17.0	16.4	16.4	16.5	16.7
9	18.0	18.1	18.2	18.4	18.1	18.0	17.6	18.6	17.8	17.9	17.7	17.7
10	19.4	19.1	19.2	19.3	19.4	19.3	18.8	19.6	18.7	18.9	18.9	19.3
11	20.9	20.6	20.5	20.4	20.7	20.6	20.3	20.8	20.3	20.2	19.7	21.5
12	22.0	22.0	21.6	21.2	21.4	21.6	21.5	22.2	21.2	21.1	21.0	22.5
13	23.4	23.7	23.2	22.6	22.5	23.0	22.9	23.8	23.1	22.7	22.0	23.7
14	24.9	25.3	25.0	24.9	24.3	24.5	24.6	24.8	25.0	24.9	25.1	26.1
15	26.5	26.7	26.6	26.8	27.3	26.4	26.4	27.1	26.5	26.9	26.1	28.5
16	27.8	28.0	27.7	28.1	28.0	27.9	27.8	28.1	27.5	28.0	27.9	28.9
17	29.3	29.2	29.2	29.3	29.6	30.4	29.4	29.1	28.8	29.5	29.1	31.0
18	30.7	30.8	30.9	30.8	30.2	31.2	31.3	30.8	30.8	31.0	31.0	33.8
19	31.5	31.7	31.8	31.6	30.6	31.7	32.4	31.4	32.1	32.1	32.7	33.4
20	33.0	32.8	33.2	32.8	32.1	33.2	33.3	33.1	34.2	33.5	34.1	33.1
21	34.2	33.3	34.0	33.4	34.1	34.4	33.8	33.8	36.2	34.5	33.2	37.8
22	36.7	35.3	36.0	35.3	34.5	35.4	36.0	35.8	36.6	36.3	36.5	36.2
23	37.2	34.7	35.5	35.5	31.6	35.3	35.8	36.2	38.0	36.4	34.3	37.9
24	40.2	37.8	38.7	37.5		38.9	37.5	38.7	39.3	38.8	37.8	38.0

Table 9. Roughhead grenadier Russia Div. 3LMNO total catches ages distributions, mean weight and mean length by year and age.

Abundance												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1							47	104098	66	376	303	521
2							2083	20670	2539	1638	505	2564
3							6074	2538	12771	6223	2475	4635
4							5976	1482	18881	9842	5166	7260
5							8586	2972	30804	22704	12977	6755
6							18754	5209	51974	50364	37014	14336
7							22571	7520	34699	50706	35812	27374
8							20384	7853	35760	41194	34633	30342
9							12317	4972	34253	24006	25896	16753
10							6845	2917	16417	10906	16288	8508
11							4759	2418	8388	5317	16610	4601
12							3721	1512	7646	3717	13960	4269
13							2616	1796	5035	2600	8580	2011
14							2011	1199	4637	1834	5698	1659
15							1176	516	2577	1087	3665	1521
16							837	292	1199	637	2841	1862
17							640	173	530	437	2969	828
18							626	231	432	277	1730	160
19							514	138	621	169	718	201
20							410	193	310	115	304	69
21							243	109	238	60	278	
22							116	59	128	33	30	5
23							68	47	53	19	88	
24							36	9	17	3	10	
Total ages							121408	168920	269975	234264	228552	136234

Mean Weight (gr)												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1							30	10	13	13	15	38
2							107	51	115	85	72	98
3							155	139	164	138	162	184
4							225	260	225	210	258	286
5							330	373	329	325	371	383
6							435	493	430	418	492	493
7							523	652	568	522	591	571
8							630	831	724	661	741	777
9							798	1075	956	857	928	877
10							971	1260	1160	1035	1141	1126
11							1190	1593	1507	1325	1288	1582
12							1421	1945	1752	1610	1536	1807
13							1725	2324	2183	1996	1778	2308
14							2112	2608	2674	2478	2311	2643
15							2583	3343	3060	2950	2497	3057
16							2998	3625	3676	3296	3042	3199
17							3458	4169	3987	3729	3602	3672
18							3873	4684	4808	4204	4065	4363
19							4160	4858	5327	4801	4544	4255
20							4695	6056	6407	5725	5387	4056
21							4838	6335	7273	5936	5030	
22							5375	6921	7040	6232	6293	5404
23							5333	7258	9292	6295	4883	
24							6692	9573	9350	6689	6677	

Mean Length (cm)												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1							5.1	3.6	4.1	4.1	3.4	4.9
2							8.2	6.5	8.8	8.1	6.9	7.2
3							9.5	9.1	9.9	9.6	9.3	9.3
4							10.9	11.3	11.0	11.1	11.1	11.2
5							12.6	12.7	12.4	12.8	12.7	12.6
6							14.0	14.0	13.6	13.9	14.2	13.9
7							15.0	15.4	14.9	15.0	15.2	14.9
8							16.1	16.7	16.1	16.1	16.5	16.6
9							17.6	18.2	17.7	17.6	17.9	17.6
10							18.9	19.2	18.8	18.7	19.2	19.3
11							20.4	20.8	20.6	20.3	20.1	21.8
12							21.7	22.4	21.7	21.7	21.4	22.9
13							23.2	23.9	23.4	23.4	22.5	25.3
14							25.0	24.8	25.0	25.2	24.9	26.7
15							26.9	27.2	26.3	26.8	25.5	28.3
16							28.3	27.9	27.8	27.8	27.2	28.7
17							29.9	29.3	28.8	29.0	29.0	30.4
18							31.2	30.6	30.7	30.2	30.2	32.6
19							32.1	31.0	31.7	31.6	31.5	32.2
20							33.6	33.5	33.8	33.6	33.6	31.6
21							34.0	34.0	35.3	34.1	32.7	
22							35.3	35.1	34.9	34.6	35.5	35.5
23							35.1	35.7	38.3	34.7	32.3	
24							38.3	39.3	38.4	35.5	36.3	

Table 10. Roughhead grenadier Subarea 2 + Div. 3LMNO total catches ages distributions, mean weight and mean length by year and age.

Abundance												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	4015	0	1276	0	0	0	47	105678	118	397	484	1745
2	32675	37900	39785	14170	5093	42364	21782	129419	32334	15762	6004	37461
3	62493	125464	130563	142713	95128	241501	144669	156143	190221	107185	99759	172996
4	103515	83910	177653	319309	315476	467969	391704	223852	302378	217109	256630	464119
5	197522	151123	205608	370483	709214	653031	791095	641078	527982	421557	483287	372390
6	508971	366628	394680	564837	1162396	925505	1620101	949703	1118199	915576	1046058	562838
7	792864	496122	527552	619505	924380	992327	2212826	961740	982683	1049510	973771	1190123
8	1122312	948145	901398	879044	999031	1270530	3015016	1237561	1341920	1169704	1266419	1708755
9	1079639	1088143	1061679	911875	921953	1071115	2226078	1040108	1692732	913046	873862	1354953
10	841149	761160	798988	685964	698674	717076	1216448	808124	1044521	565130	454136	772799
11	798146	535726	587450	518743	608704	582942	800521	918977	472835	357370	443332	395749
12	751577	456199	458358	377202	456632	476790	586220	542169	414313	243226	317515	300307
13	581997	373304	322175	230586	278554	327191	376383	622668	234349	137969	168123	141190
14	477570	305061	244921	170442	144886	233190	263854	471140	185664	89352	91212	63059
15	259033	196682	148473	97761	83705	118696	132473	228458	121040	53952	58607	53929
16	162051	120754	90481	76395	60403	80719	82658	106189	62548	36845	60044	71310
17	100425	74262	55310	44953	48179	61559	46647	68900	27522	24892	68823	33417
18	76282	65373	46289	34512	41578	43885	48320	97060	22066	21902	51435	12159
19	53919	51888	36662	23579	30192	32846	42275	78589	30941	17283	27893	15590
20	30009	27751	22571	15449	8871	21390	28848	81283	18898	12004	16356	7035
21	17980	16527	13370	8864	1996	13502	19408	56097	18411	7093	12197	297
22	8430	4482	6720	3196	948	5188	8372	28017	13093	4742	4971	2341
23	8561	4042	4935	1534	2034	3581	6746	23244	9841	3718	5442	472
24	8481	803	3802	968	0	1821	2945	7743	10342	2667	3232	646
Total ages	8079616	6291449	6280698	6112082	7598026	8384718	14085434	9583939	8874953	6387992	6789591	7735681
Total Catch SC	6725	4395	4023	3982	4135	4740	7270	7160	4767	3117	3657	3984

Mean Weight (gr)												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	11		16				30	10	14	13	22	34
2	40	51	49	80	165	107	107	127	116	99	61	91
3	86	77	85	113	156	147	143	180	158	137	154	148
4	119	111	115	143	184	211	177	244	194	176	218	213
5	186	184	173	230	216	262	229	317	243	227	268	278
6	258	236	236	325	260	300	281	365	276	271	306	299
7	337	320	313	434	348	355	342	434	327	324	353	333
8	440	414	412	524	451	421	403	487	393	397	414	423
9	594	500	509	612	560	516	490	591	498	499	498	483
10	748	585	590	677	653	618	600	677	568	587	607	616
11	922	736	716	776	767	743	749	785	725	709	692	854
12	1063	886	836	885	851	855	876	949	828	824	840	979
13	1226	1101	1039	1106	984	1033	1052	1151	1068	1033	989	1155
14	1446	1324	1280	1443	1245	1252	1299	1305	1353	1343	1412	1521
15	1683	1546	1530	1705	1696	1534	1544	1657	1561	1652	1565	1903
16	1928	1777	1729	1966	1837	1799	1823	1832	1787	1851	1852	1998
17	2212	1989	2005	2220	2083	2257	2100	2023	2010	2132	2078	2407
18	2478	2326	2333	2459	2197	2421	2466	2358	2441	2429	2440	3056
19	2669	2508	2553	2643	2283	2534	2707	2474	2716	2662	2822	2954
20	3052	2777	2889	2887	2643	2870	2942	2887	3207	3000	3140	2899
21	3363	2898	3076	3029	3105	3198	3063	3036	3739	3263	2939	4177
22	3993	3422	3637	3487	3192	3471	3663	3584	3851	3754	3807	3682
23	4092	3299	3525	3556	2514	3485	3592	3699	4289	3787	3240	4206
24	4998	4172	4453	4067		4541	4108	4442	4670	4493	4206	4220

Mean Length (cm)												
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	4.7		5.5				5.1	3.6	4.7	4.1	4.0	4.8
2	7.4	8.1	8.0	9.2	9.9	8.8	8.6	8.9	8.9	8.9	7.3	7.7
3	9.8	9.5	9.8	10.2	10.4	9.8	10.1	9.9	9.9	9.9	9.7	9.7
4	11.0	10.7	10.9	10.9	11.2	11.1	11.2	11.3	11.0	11.1	11.1	11.2
5	12.7	12.8	12.5	12.4	12.6	12.4	12.6	12.7	12.5	12.7	12.5	12.5
6	14.2	14.0	14.0	13.8	13.7	13.7	14.0	13.7	13.7	13.9	14.1	13.6
7	15.4	15.5	15.4	15.3	15.0	15.3	15.4	15.5	15.1	15.2	15.4	15.0
8	16.6	17.0	16.9	16.8	16.5	16.6	16.4	16.8	16.3	16.4	16.5	16.7
9	18.1	18.1	18.2	18.2	18.1	17.9	17.6	18.5	17.8	17.8	17.7	17.7
10	19.5	19.1	19.2	19.2	19.3	19.2	18.9	19.6	18.7	18.9	18.9	19.3
11	20.9	20.6	20.5	20.4	20.7	20.6	20.3	20.8	20.3	20.2	19.8	21.5
12	22.0	22.0	21.6	21.2	21.4	21.6	21.5	22.2	21.2	21.2	21.0	22.5
13	23.3	23.7	23.2	22.7	22.5	23.0	22.9	23.8	23.1	22.8	22.1	23.7
14	24.8	25.3	25.0	24.9	24.3	24.6	24.6	24.8	25.0	24.9	25.1	26.1
15	26.4	26.7	26.6	26.7	27.2	26.4	26.3	27.1	26.5	26.9	26.0	28.5
16	27.7	28.0	27.7	28.1	28.0	27.8	27.7	28.1	27.5	27.9	27.8	28.9
17	29.2	29.2	29.2	29.4	29.5	30.3	29.4	29.1	28.8	29.5	29.1	30.9
18	30.6	30.8	30.9	30.8	30.2	31.2	31.3	30.8	30.8	31.0	30.9	33.8
19	31.5	31.7	31.8	31.5	30.6	31.7	32.3	31.4	32.0	32.0	32.7	33.4
20	33.0	32.8	33.2	32.8	32.1	33.2	33.3	33.1	34.1	33.5	34.1	33.1
21	34.1	33.3	34.0	33.4	34.1	34.3	33.8	33.8	36.1	34.5	33.2	37.8
22	36.6	35.3	36.0	35.3	34.5	35.4	36.0	35.8	36.5	36.3	36.5	36.2
23	37.0	34.7	35.5	35.2	31.6	35.3	35.8	36.2	38.0	36.4	34.3	37.9
24	40.2	37.8	38.7	37.5		38.9	37.5	38.7	39.3	38.8	37.8	38.0

Table 11. Spanish 3NO survey total abundance and mean numbers per tow by age and year

Spanish 3NO Survey Total Abundance								
Edad	1997	1998	1999	2000	2001	2002	2003	2004
1	0	5165	5438	11545	67228	325985	529797	511040
2	32481	156218	982698	902686	532368	648260	2184155	606283
3	141816	965738	1955847	1579722	748942	496842	1552355	3414010
4	220962	1518901	3200880	839747	655183	309680	1071563	2060154
5	322711	1063589	3380992	6176255	2104780	755159	1176158	2047164
6	1060652	1625224	2196379	4854350	3352016	1393211	1840783	2546145
7	2034967	2648325	1896552	2264971	3347877	1843908	3427229	2549054
8	696115	3691333	1840944	1510625	1960709	1454321	3420153	3361223
9	698216	1296299	849876	1472413	1316343	1011123	1511756	3754385
10	387456	1130638	345851	1324369	1432969	1006692	1058672	3193367
11	522924	484043	208830	237202	359326	518317	885167	1441700
12	491170	629574	141245	289124	134303	679038	399211	829087
13	256042	636745	106606	155790	98888	166503	266659	491326
14	88802	306068	103961	253670	66946	139673	137612	256698
15	61218	256735	84223	144054	58647	94770	154609	96287
16	36815	83717	30922	88211	54347	145589	151930	85891
17	17475	55386	20814	41454	68832	134222	97853	39520
18	25523	83711	26515	38650	54681	78120	19093	29615
19	19643	69006	18018	50319	34288	58443	25086	7274
20	12816	47903	16783	25896	16017	15827	13895	1914
21	8795	25795	11017	17761	14776	15540	0	1914
22	4572	13835	3661	7003	3765	7023	4435	1914
23	5406	11338	2301	6583	5331	5231	0	0
24	0	2404	1179	1184	3760	2913	0	0

Spanish 3NO Survey Mean Numbers Per Town								
Edad	1997	1998	1999	2000	2001	2002	2003	2004
1	0.000	0.005	0.006	0.012	0.069	0.358	0.572	0.542
2	0.037	0.159	1.022	0.913	0.548	0.712	2.356	0.643
3	0.162	0.984	2.034	1.598	0.771	0.546	1.675	3.620
4	0.252	1.547	3.328	0.849	0.675	0.340	1.156	2.184
5	0.368	1.083	3.515	6.247	2.167	0.830	1.269	2.171
6	1.210	1.655	2.284	4.910	3.451	1.531	1.986	2.700
7	2.321	2.697	1.972	2.291	3.447	2.027	3.697	2.703
8	0.794	3.760	1.914	1.528	2.019	1.598	3.689	3.564
9	0.796	1.320	0.884	1.489	1.355	1.111	1.631	3.981
10	0.442	1.152	0.360	1.340	1.475	1.106	1.142	3.386
11	0.597	0.493	0.217	0.240	0.370	0.570	0.955	1.529
12	0.560	0.641	0.147	0.292	0.138	0.746	0.431	0.879
13	0.292	0.649	0.111	0.158	0.102	0.183	0.288	0.521
14	0.101	0.312	0.108	0.257	0.069	0.154	0.148	0.272
15	0.070	0.261	0.088	0.146	0.060	0.104	0.167	0.102
16	0.042	0.085	0.032	0.089	0.056	0.160	0.164	0.091
17	0.020	0.056	0.022	0.042	0.071	0.148	0.106	0.042
18	0.029	0.085	0.028	0.039	0.056	0.086	0.021	0.031
19	0.022	0.070	0.019	0.051	0.035	0.064	0.027	0.008
20	0.015	0.049	0.017	0.026	0.016	0.017	0.015	0.002
21	0.010	0.026	0.011	0.018	0.015	0.017	0.000	0.002
22	0.005	0.014	0.004	0.007	0.004	0.008	0.005	0.002
23	0.006	0.012	0.002	0.007	0.005	0.006	0.000	0.000
24	0.000	0.002	0.001	0.001	0.004	0.003	0.000	0.000

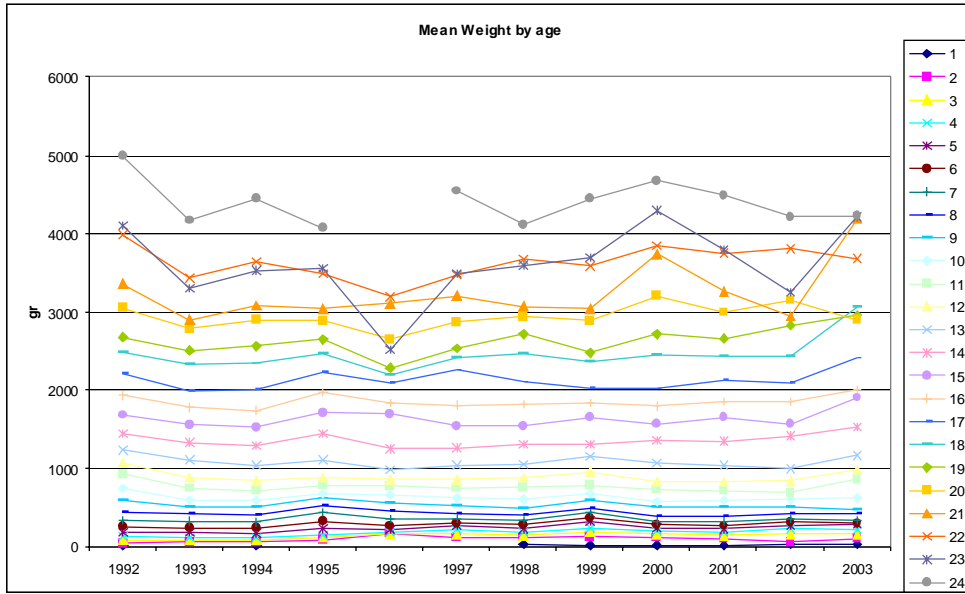


Fig. 1. Roughhead grenadier catches mean weight by age

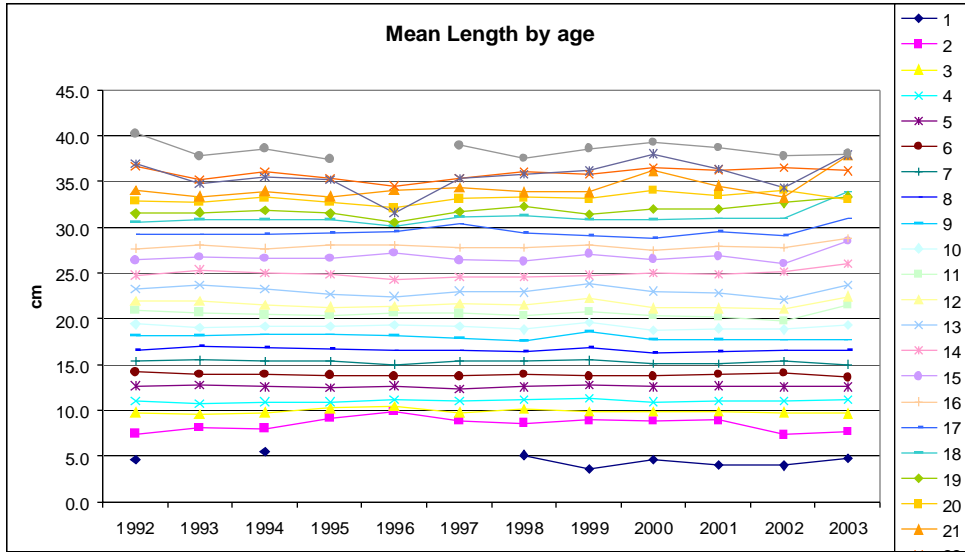


Fig. 2. Roughhead grenadier catches mean length by age.