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Survey for Greenland Halibut in NAFO Divisions 1C-1D, 2009

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Abstract

In 1997 Greenland initiated a survey series covering NAFO Divisions 1CD at depths between 400 and 1 500 m. The survey is designed as a Stratified Random Bottom Trawl Survey aimed primarily at Greenland halibut and roundnose grenadier. The paper gives biomass and abundance estimates and length frequencies for Greenland halibut, roundnose and roughhead grenadier, and deep sea redfish together with age distribution of Greenland halibut. The biomass of Greenland halibut was estimated as 70.996 tons in 2009, which is a decrease compared to 2008 and about for the time series. The length distribution showed a mode around 50 cm as in previous years. The biomass of roundnose grenadier increased to 1.151 tons in 2009 but is still at a very low level.

Introduction

During the period 1987-1995 Japan Marine Fishery Resources Research Center (JAMARC) and Greenland Institute of Natural Resources jointly conducted 12 bottom trawl surveys (Jørgensen, 1998a) and 4 pelagic surveys (Jørgensen, 1997a) at West Greenland as part of a joint venture agreement on fisheries development and fisheries research in Greenland waters. The bottom trawl surveys were primarily aimed at Greenland halibut (*Reinhardtius hippoglossoides*) in NAFO Div. 1B-1D. In 1997 Greenland Institute of Natural Resources continued the bottom trawl surveys series with the Institute's own vessel PAAMIUT, that had been rigged for deep sea trawling. There has unfortunately not been any comparative trawlings between the Japanese research vessel SHINKAI MARU and PAAMIUT making comparisons between the surveys difficult. The PAAMIUT survey traditionally covers NAFO Div. 1CD, but in 2001 the survey area was expanded to include Div. 1A (to 74°N) and Div. 1B and in 2004 the northern part of the Baffin Bay (73°N-77°N) (Div. 1A) was surveyed.

Materials and Methods

The survey in 2009 covered Div. 1CD at depths between 400 and 1500 m and took place during 19/9-30/9 and included two days tagging experiment in Div. 1C.

Stratification

The survey covered NAFO Div. 1C-1D between the 3-nm line and the 200-nm line or the midline to Canada at depths between 400 and 1 500 m. The survey area was stratified in NAFO divisions and subdivided in 6 depth strata 401-600, 601-800, 801-1 000, 1 001-1 200, 1 201-1 400 and 1 401-1 500 m. The depth stratification was based on Greenland Geological Survey's 10 m depth contour maps, Canadian maps and depth soundings made during previous surveys. The area of each stratum was measured using "MapInfo Version 4.0" (Table 2).

The survey was planned as a Stratified Random Bottom Trawl Survey with in total 70 hauls. Each stratum was allocated at least two hauls. The remaining hauls were allocated in order to minimize the variance in the estimation of the biomass of Greenland halibut. *i.e.* strata with great variation in the catches of Greenland halibut in the

previous years surveys have got relatively more hauls than strata with little variation in the catches. In 2004 a new method of selecting stations was introduced. The method combines the use of a minimum between-stations-distance rule (buffer zone) with a random allocation scheme (Kingsley et al. 2004).

Vessel and gear

The survey was conducted by the 722 GRT trawler PAAMIUT, as in previous years, using an ALFREDO III trawl with a mesh size on 140 mm and a 30-mm mesh-liner in the cod-end. The ground gear was of the rock hopper type. The trawl doors were Greenland Injector weighing 2 700 kg. The Injector otter doors replaced the Perfect doors that have been used until 2003. The average net height was 20 cm higher with the new doors compared to the old, but the difference was not statistically significant (95% level) and it was concluded that the net performance has not changed by the introduction of new doors. Further information about trawl and gear is given in Jørgensen, 1998b.

A Furuno net sonde mounted on the head rope measured net height. Scanmar sensors measured the distance between the trawl doors. Wingspread, taken as the distance between the outer bobbins, was calculated as:

distance between outer bobbins = 10.122 + distance between trawl doors * 0.142

This relationship was estimated based on flume tank measurements of the trawl and rigging used in the survey (Jørgensen, 1998b).

Trawling procedure

Towing time was usually 30 min, but towing time down to 15 min was accepted. Average towing speed was 3.0 kn. Towing speed was estimated from the start and end positions of the haul, or in a few cases based on GPS observations (mean of records made every 5 min. during the haul). Trawling took place day and night.

Near-bottom temperatures were measured, by 0.1^{o}C, by a Seastar sensor mounted on an otter door.

Handling of the catch

After each haul the catch was sorted by species and weighed and the number of specimens recorded. Most fish species were sexed and measured as total length (TL) to 1.0 cm below. Grenadiers were measured as pre anal fin length (AFL) to 1.0 cm below. In case of large catches subsamples of the catch were measured.

Biomass and abundance estimates were obtained by applying the swept area method (estimated trawling speed * estimated bobbin spread*trawling time) taking the catchability coefficient as 1.0. All catches were standardized to 1 km^2 swept prior to further calculations.

In strata with one haul only SD was estimated as: SD= biomass or abundance.

Tagging experiment

Greenland halibut were tagged with floy-tags during 28/9-30/9 in Div. 1C in order to investigate the migration pattern in the Davis Strait. The experiment is a continuation of a similar experiment in Baffin Bay in 2007 and Davis Strait in 2008.

Results and Discussion

In total 68 successful hauls were made and all depth strata were covered by at least two stations. Haul by haul information on catches, depth, temperature etc. is given in Appendix 1 and the distribution of hauls by strata is given in Table 2.

In total 87 species or groups of fish species were recorded (Appendix 2).

Greenland halibut (*Reinhardtius hippoglossoides*)

Greenland halibut was caught in all hauls except one (Fig. 1, Appendix 1) and the biomass in Div. 1CD 400-1500 m was estimated at 70 966 tons (Table 2) which is a decrease compared to 83 465 in 2008 and about average for the time series (Table 1, Fig. 2). The reduction in biomass was primarily seen in Div. 1D depth stratum 1001-1200 m (-12.000 tons) but all strata in div 1C also showed minor decreases, while the biomass in the two deep strata in Div. 1D showed an increase. The estimate from 2009 is not statistically different (95% level) from previous years estimates. The highest densities (in weight) were found at depths > 1000 m. The weighted mean catch per tow also showed a decrease from 1.60 tons/km^2 in 2008 to 1.36 tons/km^2 in 2009 (Table 1, Fig 3).

The abundance in was estimated at 62.507*10^6 which is somewhat below average for the time series (69.000 *10^6) and a decease on about 10*10^6 compared to 2008 (Table 3, Fig 4). The highest density (in numbers) was seen in Div. 1C 1001-1200 m, while the density was lower in Div. 1D depth stratum 1001-1200 m than seen in previous years.

Estimated abundance by age in Div. 1CD is given in Table 4.

The length ranged from 20 cm to 105 cm (excluding a few larvae on 7-8 cm). The overall length distribution (weighted by stratum area) was totally dominated by a mode at 50 cm, where the mode use to be around 47- 49 cm, and very few fish < 40 cm were observed as in the previous years (Fig. 5). Generally the length distributions in the different depth strata were dominated by a single mode and fish size increased with depth and from north to south at the same depth (Fig. 6) as seen in previous surveys (Jørgensen, 1997b).

The age ranged from 2 to 17 years (excluding a few larvae).The overall age distribution (weighted by stratum area) in Div. 1CD was monomodal with a clear mode at age 7 (Fig. 7). Generally the age increased by depth but the age composition was dominated by ages 5-8 in all strata (Fig. 8). Mean weight - and length at age is given in Table 5. The ageing data should, however, be treated with caution especially for ages > 8.

Table 1. Biomass (tons), mean catch per tow standardized to km^2 (tons) and abundance of Greenland halibut in Div. 1CD and with S.E.

Year	Biomass	S.E.	Mean	S.E.	Abundance (*10^6)	S.E.
1997	56 260.2	4 399.6	1.07	0.08	53.613	4.118
1998	70 473.5	8 391.7	1.34	0.16	67.677	7.687
1999	64 398.0	6 912.1	1.27	0.14	61.366	6.265
2000	59 092.4	5 543.3	1.28	0.11	61.710	5.976
2001	77 554.0	13 013.6	1.57	0.26	80.814	14.221
2002	71 932.4	5 613.9	1.56	0.12	71.510	6.223
2003	68 717.2	6 411.9	1.39	0.13	72 556	7.764
2004	75 869.4	5 186.3	1.48	0.10	74.859	5.445
2005	80 865.4	8 365.7	1.54	0.16	73.001	7.317
2006	77 010.3	6 259.6	1.47	0.12	70.715	5.622
2007	74 356.8	9 455.4	1.48	0.19	67.427	8.492
2008	83 465.4	5 456.3	1.60	0.10	72.804	5.334
2009	70 966.2	5 110.3	1.36	0.10	62.507	4.419

Females stated maturing at age 8 and 100% maturity was reached at age 12 (Table 6).

Table 2. Mean catch per km^2 and biomass (tons) of Greenland halibut by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Biomass	SE
1C	401-600	3366	2	0.0246	82.9	82.9
	601-800	16120	5	0.3833	6179.5	1810.4
	801-1000	6066	13	1.6304	9889.8	1468.5
	1001-1200	611	2	2.5711	1570.9	377.8
1D	401-600	903	2	0.1741	157.2	11.2
	601-800	1940	2	0.6988	1355.6	269.3
	801-1000	3874	4	2.0337	7878.4	2176.2
	1001-1200	10140	18	1.9887	20165.7	3222.4
	1201-1400	6195	15	2.7584	17088.6	2034.8
	1401-1500	3091	5	2.1345	6597.7	1095.8
All				1.3568	70966.2	5110.5

Table 3. Mean catch per km^2 and abundance of Greenland halibut by Division and depth stratum, 2009.

Division	Depth (m)	Area	Hauls	Mean	Abundance	SE
1C	401-600	3366	2	39.4	132656	132656
	601-800	16120	5	528.9	8526452	2087614
	801-1000	6066	13	1604.2	9730858	1448688
	1001-1200	611	2	2403.5	1468536	233833
1D	401-600	903	2	123.5	111528	41656
	601-800	1940	2	671.2	1302191	136413
	801-1000	3874	4	1917.3	7427791	2140693
	1001-1200	10140	18	1512	15331426	2172156
	1201-1400	6195	15	2146.6	13298090	1678405
	1401-1500	3091	5	1675.1	5177804	928983
All				1195.0	62507332	4419314

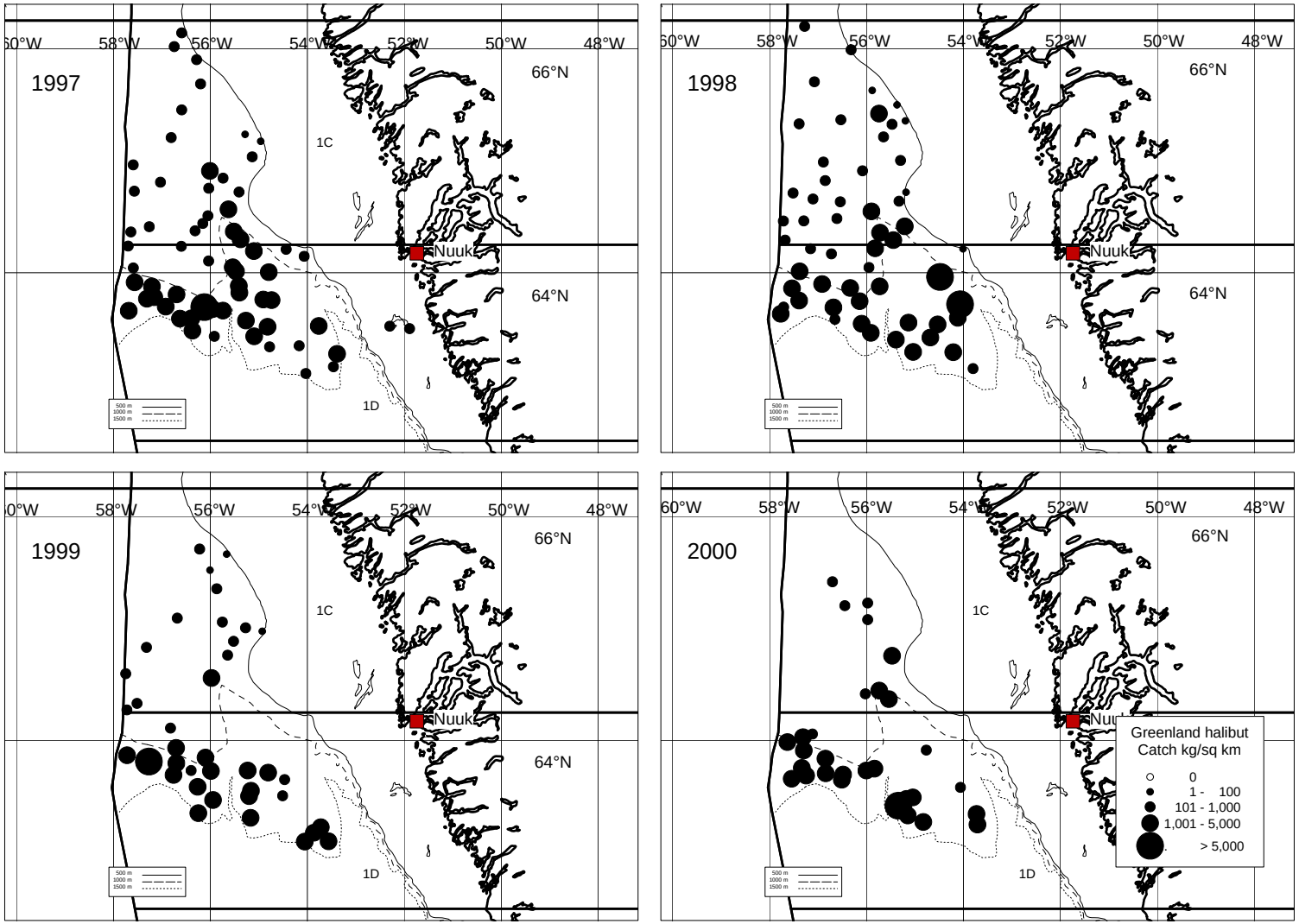

Fig. 1 Distribution of catches of Greenland halibut during 1997-2000 in kg km^{-2}.

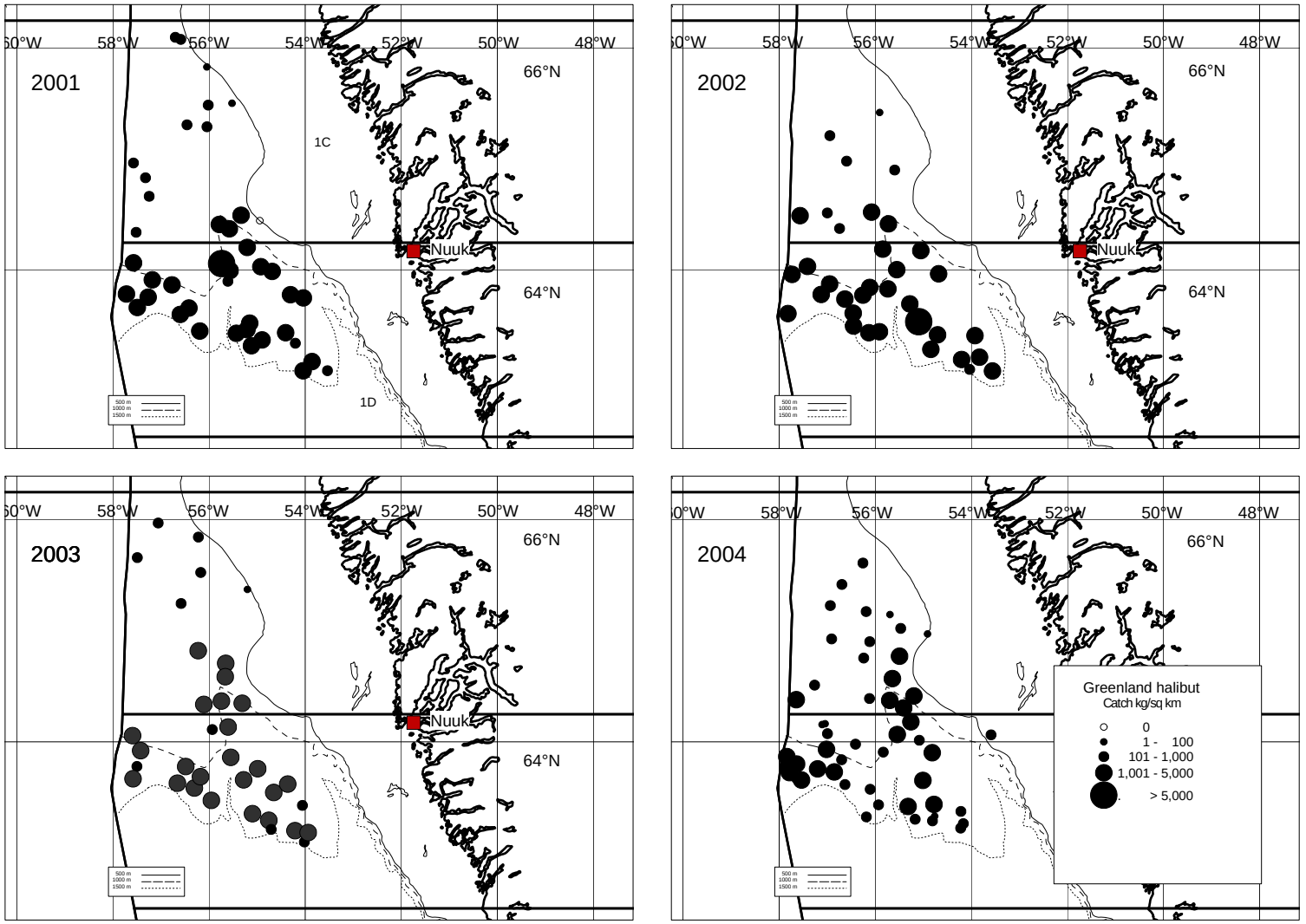

Fig. 1 (cont). Distribution of catches of Greenland halibut in 2001 - 2004 in kg km^{-2}

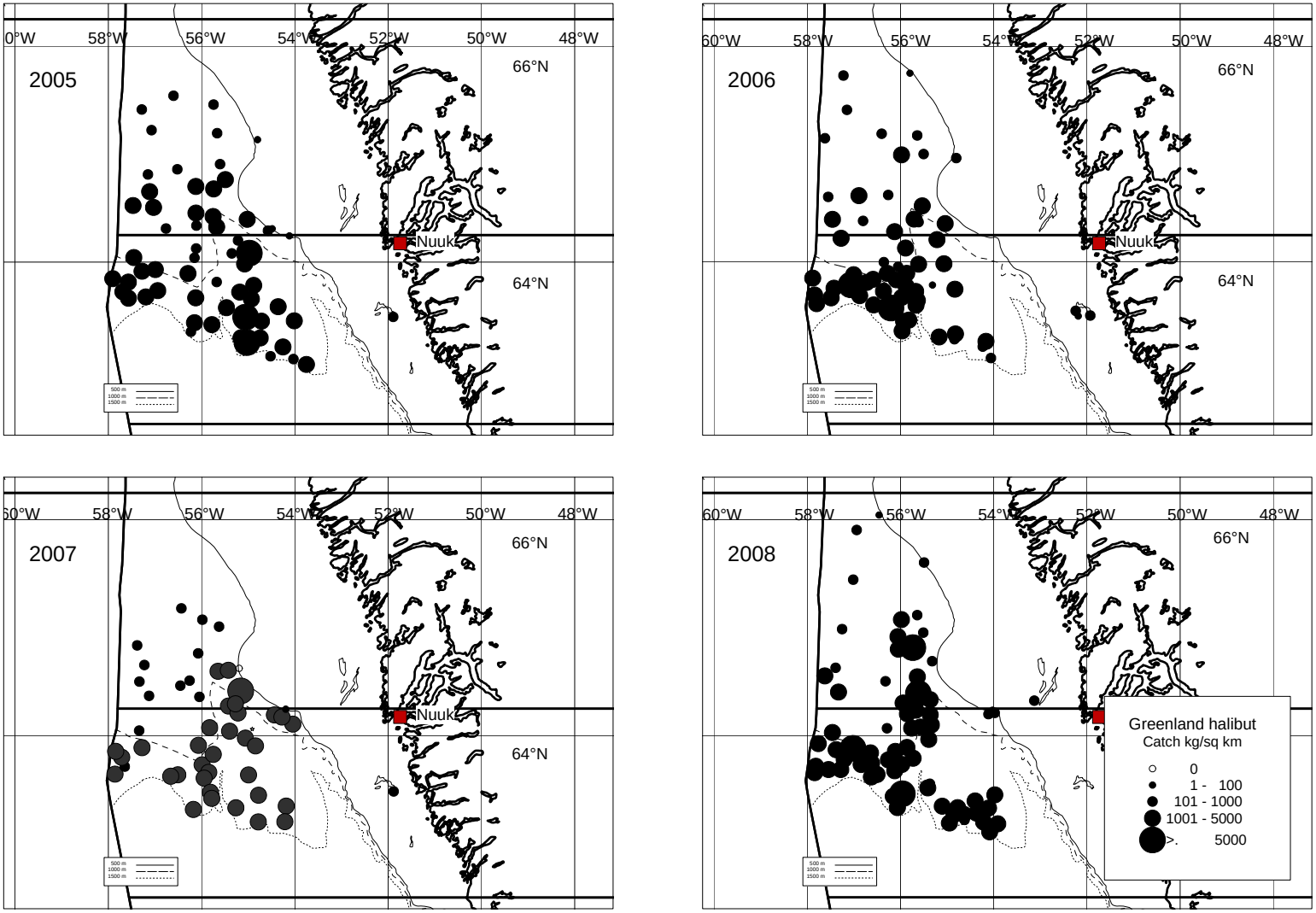

Fig. 1 (cont). Distribution of catches of Greenland halibut in 2005 - 2008 in kg km^{-2}

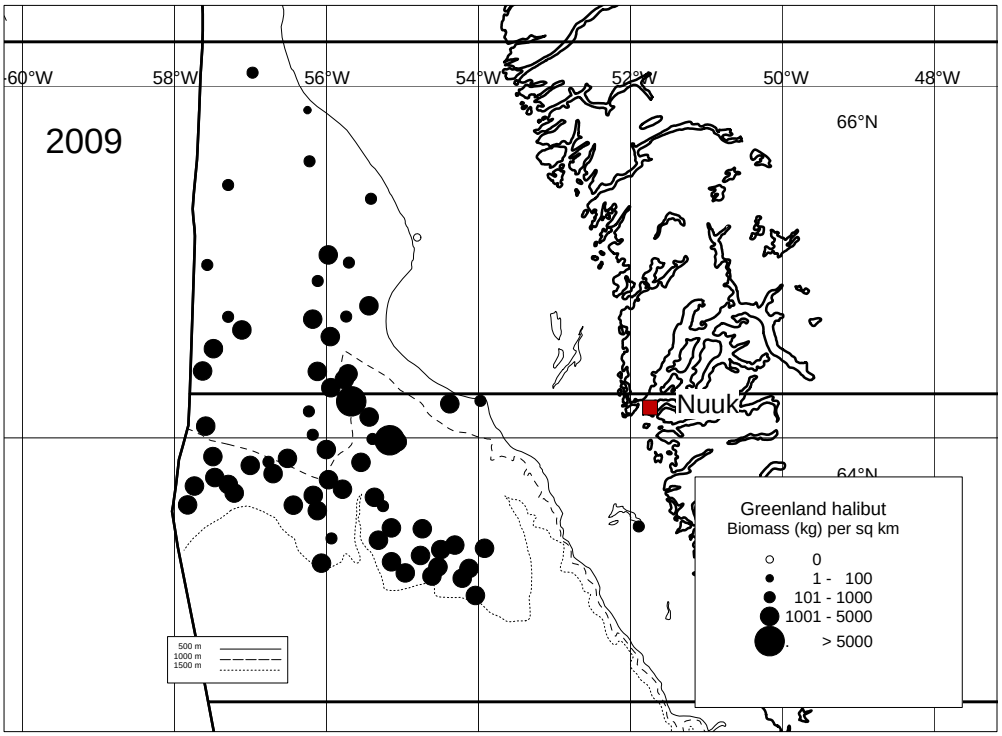

Fig. 1 (cont). Distribution of catches of Greenland halibut in 2009 in kg km^{-2}

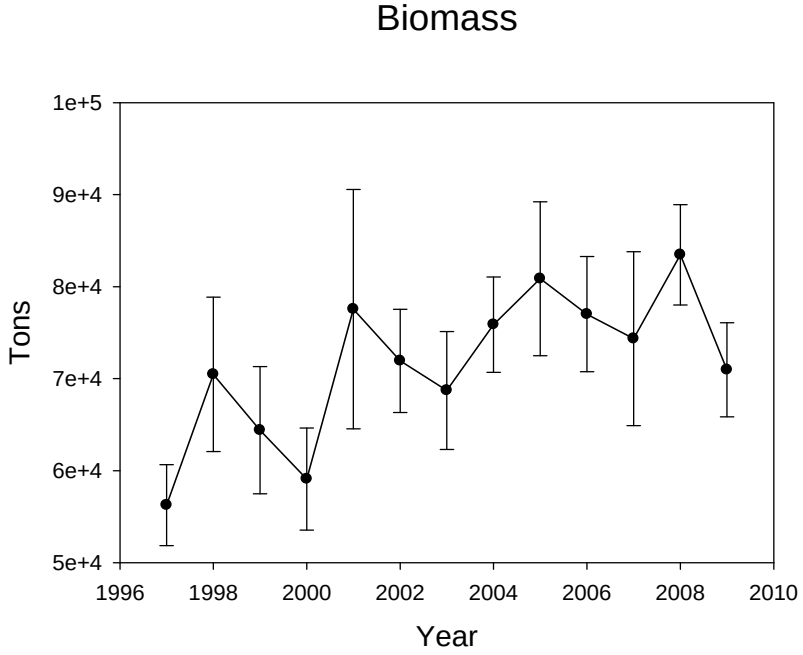

Fig. 2. Biomass (tons) of Greenland halibut by year with S.E.

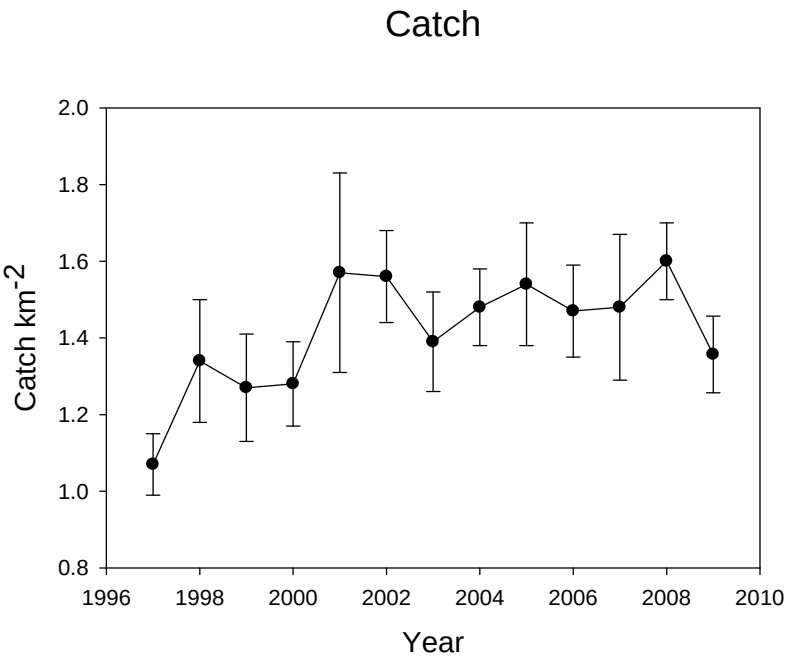

Fig. 3. Mean catch of Greenland halibut per sq. km (tons) standardized by stratum area with S.E.

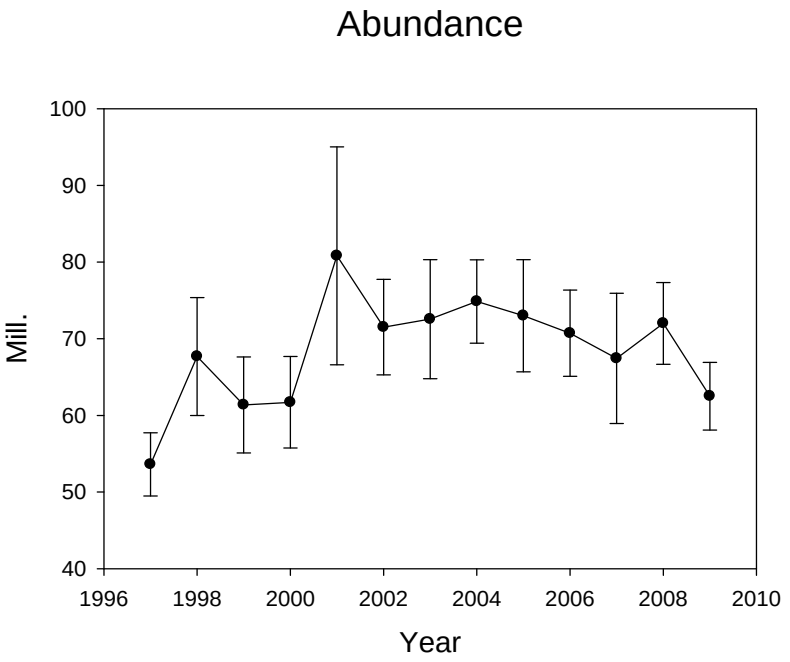

Fig. 4. Abundance (millions) of Greenland halibut by year with S.E..

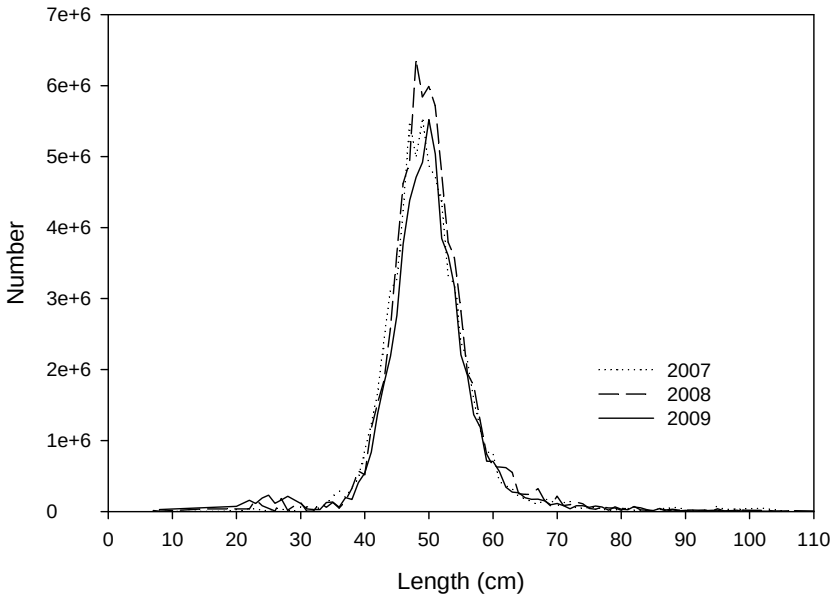

Fig. 5. Over all length distribution of Greenland halibut in numbers (weighted by stratum area) by year.

Table 4. Number by age by year of Greenland halibut (excluding larvae, age 0). No data from 2008.

AGE	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2009
1	0	0	0	78826	15585	71512	833452	314358	200672	132147	0	
2	536130	609093	184098	109496	281013	214536	3187890	255511	201882	641030	99520	613665
3	1704893	3722237	920490	479059	511722	285367	1468105	274564	569831	524114	268062	773577
4	3023773	4662948	4172888	3074341	4835796	2361529	2417001	4465950	1749900	2959669	802718	704747
5	9961295	14760362	11291344	15090231	20601616	11779876	12348567	14877198	12218823	13324592	12509462	7823793
6	15370847	19057854	15893794	16838191	26595603	26697300	21816458	30067732	19867351	20210890	18237159	12339572
7	13558728	14083592	19759852	14711646	17922784	18561065	18499540	14298142	21303055	15509156	19469186	22722253
8	5436358	5766084	4786548	5026106	4674899	6201987	6534966	6252194	12674030	13224793	11815872	9358562
9	1200931	1515966	859124	3214208	2550178	1857799	2403542	1724259	385774	731747	360855	3065130
10	948950	1211419	920490	1040152	780082	1340261	1244102	944766	1881136	1342871	1960085	2058523
11	584382	764751	613660	717770	705656	905723	581491	392534	158664	362986	0	1095209
12	466433	527881	675026	350292	369836	166242	224915	230820	1044342	958082	1030110	741972
13	187646	351921	429562	318336	345397	257412	264203	158687	36861	122337	26403	558339
14	96503	155657	429562	122157	195607	143024	207745	163836	410090	459693	502253	346258
15	262704	236870	184098	230208	225277	263139	67270	218713	85460	114617	27483	199826
16	187646	115051	61366	128242	91540	178780	206590	71775	13547	102977	182091	50494
17	64336	128586	61366	95352	80275	107268	72546	96352	118365	28973	49422	26348
18	16084	0	61366	57045	22628	35756	41219	6650	35465	0	26001	
19	0	0	0	27474	32325	83431	58531	37874	45452	0	0	
20	0	0	0	0	8081	0	22258				46549	
21						0	7419					
SUM	53607639	67670271	61304634	61709132	80845900	71512007	72507812	74851915	73000702	70750676	67413231	62478267

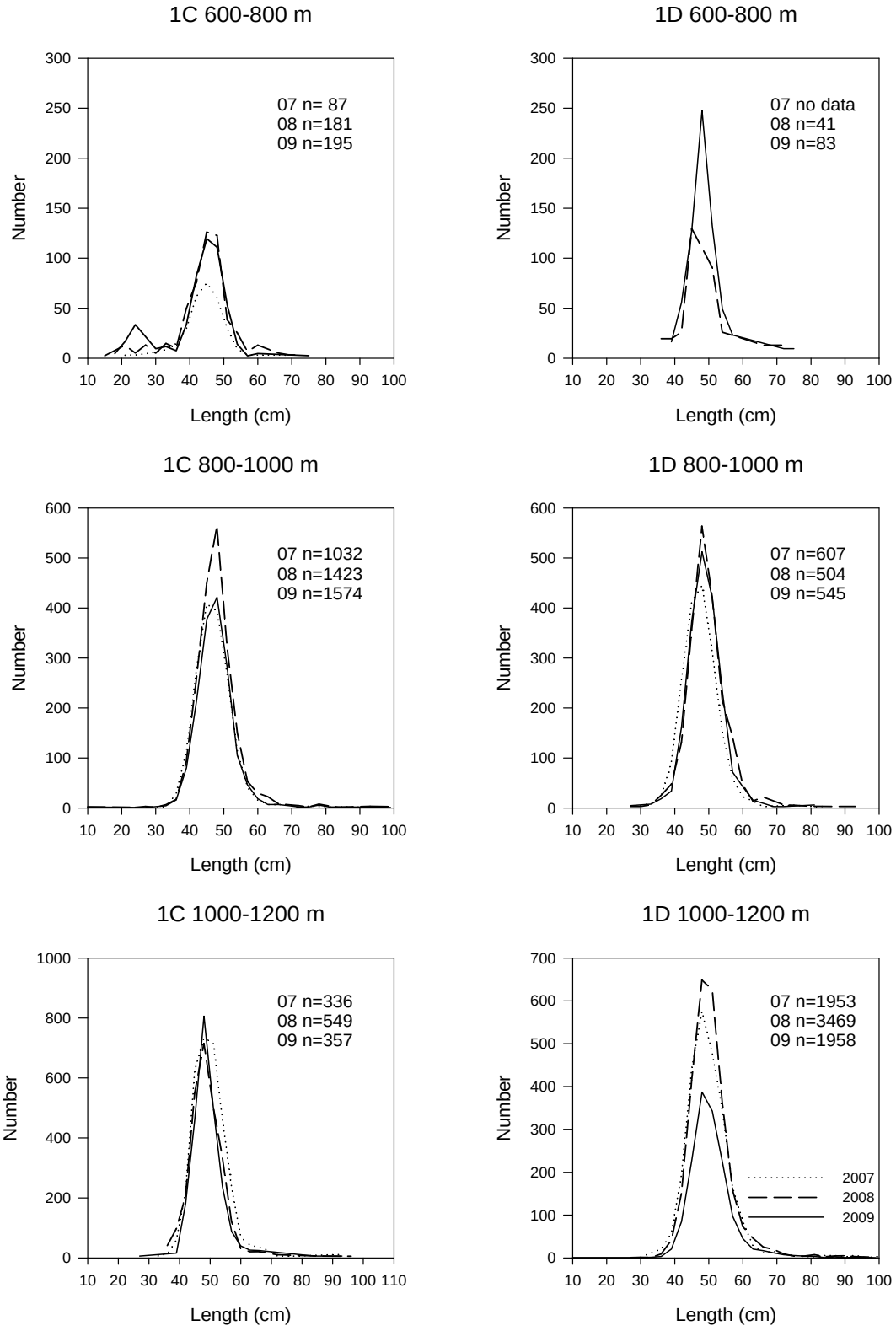

Fig. 6. Length distribution of Greenland halibut in numbers km^{-2} by Division and depth stratum. Div 1CD 600-1200 m.

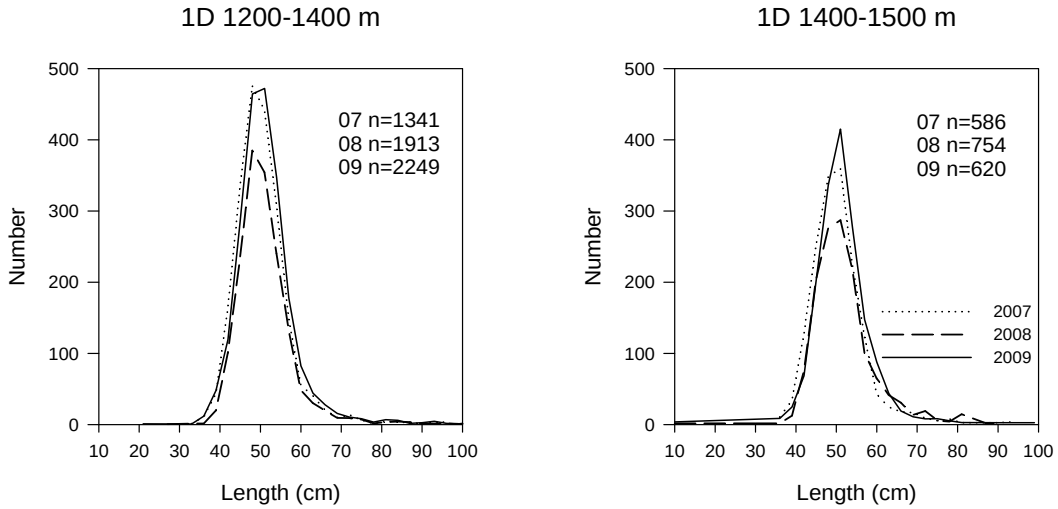

Fig. 6. cont. Length distribution of Greenland halibut in numbers km^{-2} by Division and depth stratum. Div. 1D 1200-1500 m.

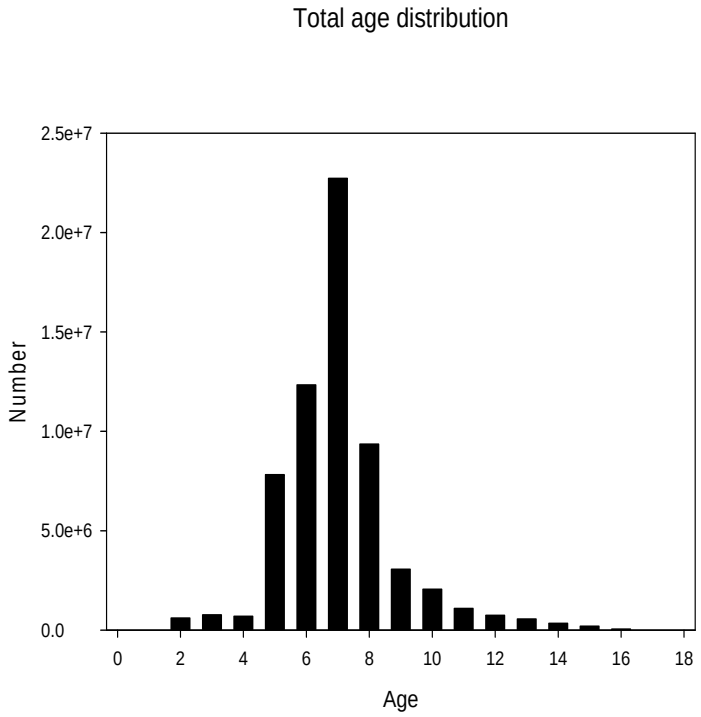

Fig. 7. Total age distribution in numbers (weighted by stratum area) by age.

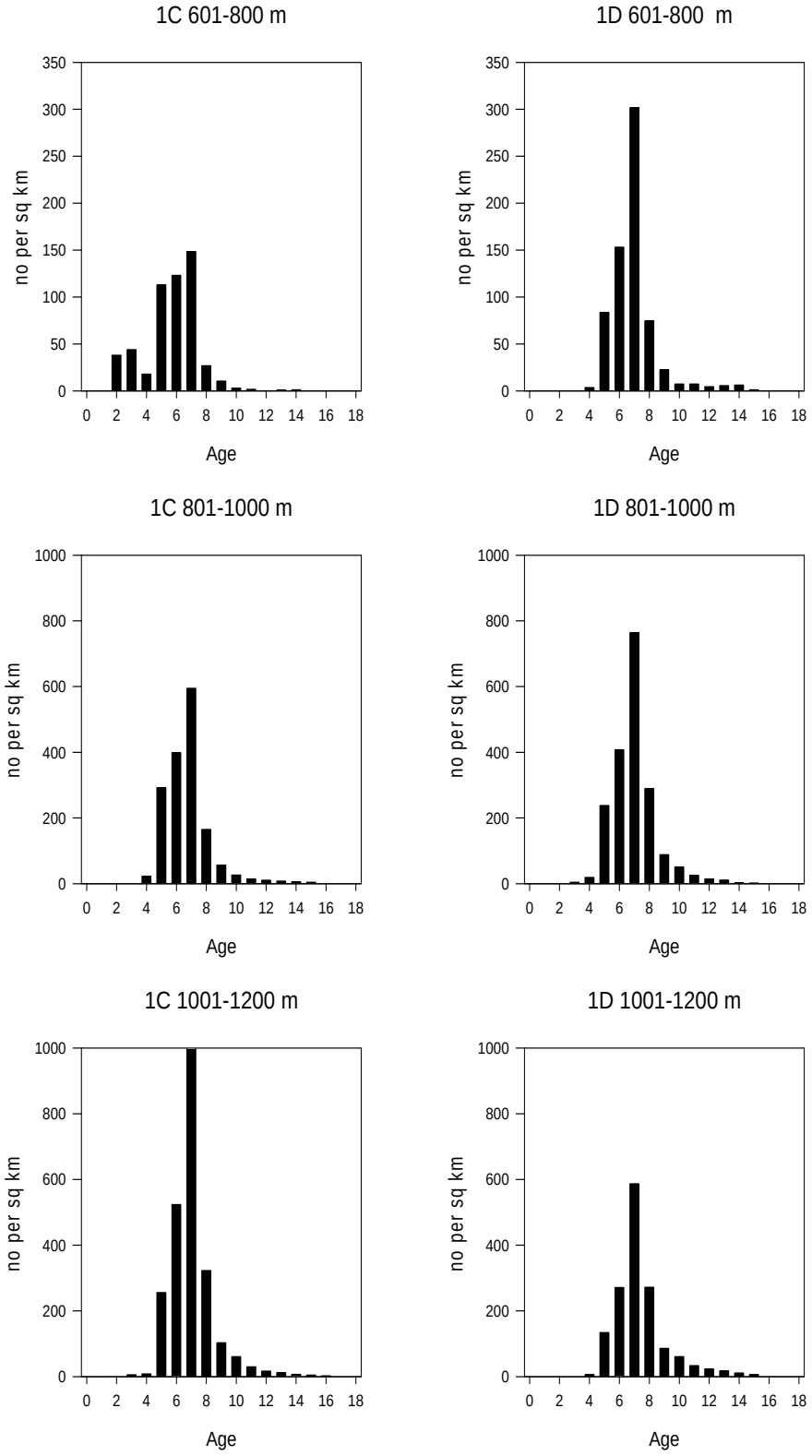

Fig. 8. Age distribution in no km^{-2} by division and depth stratum.

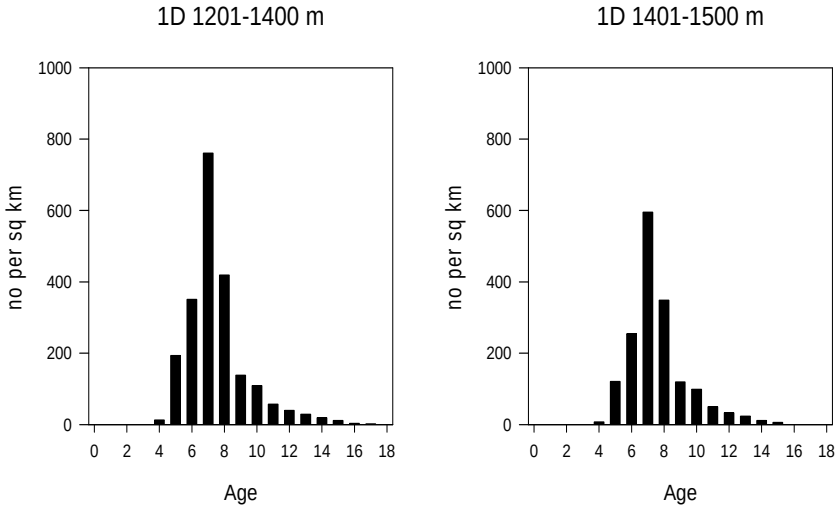

Fig. 8 cont.. Age distribution in no km^{-2} by division and depth stratum.

Table 5. Mean weight and length by year and age. No data 2008.

	1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2009	
AGE	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length	weight	length
1							25	13.5	28	14.4	20	16.0							18	13.3				
2	23	15.3	38	18.7	64	21.0	75	21.0	85	21.0	60	21.7	85	23.0			69	21.5	71	21.1	70	22.0	91	23.3
3	58	19.8	176	28.5	206	27.4	146	26.3	173	26.7	200	29.6	192	29.4			169	28.5	180	28.6	181.7	28.7	162	27.1
4	137	26.1	348	35.3	342	34.4	329	33.6	366	34.2	341	35.5	355	35.7	487	39.1	382	36.6	397	36.8	352.6	35.9	377	36.6
5	272	32.8	551	40.9	571	40.3	528	39.5	574	39.7	487	39.9	522	40.2	646	42.8	550	41.3	594	41.8	565.8	41.6	544	40.7
6	444	38.0	854	46.8	793	45.6	764	44.5	849	44.9	747	45.6	763	45.4	917	47.5	831	46.7	867	47.0	859.6	47.2	771	45.4
7	737	43.9	1218	51.9	1196	51.4	1074	49.8	1159	49.9	1132	51.7	1116	51.2	1293	52.5	1137	51.6	1142	51.4	1072	51.1	1025	50.0
8	1070	49.9	1572	56.8	1665	57.9	1376	53.7	1541	54.8	1370	55.6	1419	55.9	1638	56.5	1569	56.5	1531	56.1	1541	56.6	1540	56.3
9	1454	55.6	2075	60.6	2057	61.1	1631	56.8	1844	58.0	1844	60.7	1861	59.8	1942	60.2	1754	58.8	2189	61.2	1635	57.5	1856	59.8
10	2043	61.2	2293	63.1	2441	64.1	2077	61.5	2259	61.8	2037	62.5	2115	62.6	2191	62.3	2301	63.8	2502	64.2	2123	62.4	2208	62.9
11	2815	66.7	2867	66.5	2812	66.9	2503	63.9	3316	65.0	2508	66.0	2668	66.8	2924	67.8	2878	68.0	3588	70.9			2816	67.7
12	3828	72.6	3453	69.9	4000	72.9	3014	67.5	3450	68.7	3011	69.7	3190	70.4	3237	68.2	3464	71.2	3450	70.2	3049	68.6	3492	70.9
13	4840	77.3	4538	74.7	5679	79.5	3612	70.4	3866	71.3	3558	71.6	3178	70.6	3683	72.4	4617	77.0	4951	77.5	3300	70.0	4019	73.3
14	6679	84.0	5112	77.6	7613	86.7	3893	72.8	5257	77.8	4650	78.5	3845	75.5	3889	71.1	5305	79.1	5324	79.0	4548	76.4	5586	79.8
15	7711	87.8	7141	85.1	8477	91.2	5409	78.3	6324	81.9	5149	79.0	4340	76.0	4740	74.8	6468	86.0	7029	86.1	6443	85.5	6709	83.9
16	9166	94.6	8385	88.9	9925	88.5	6873	85.5	7203	86.0	6786	84.8	5747	81.3			13320	100.0	8415	89.3	8402	90.8	9700	94.0
17	10797	97.8	10684	95.4			8492	91.8	8954	92.4	8520	90.3	6200	84.0	6498	82.0			9588	95.0	9565	92.5	9198	93.0
18					12500	99.0	8590	92.3	8760	93.0	9385	93.0			893	93.0	9570	97.0			9200	95.0		
19			12850	99.0			9645	91.5	11500	102.0	8553	90.3			10220	93.0	14150	101.0						
20									14400	105.0											12330	102.0		

Table 6. Maturity by age for female Greenland halibut 2009.

Age	Maturing	Immature	n
2	.	100	1
3	.	100	1
4	.	100	6
5	.	100	11
6	.	100	7
7	.	100	4
8	60	40	10
9	83.33	16.67	12
10	95	5	20
11	96.3	3.7	27
12	100	.	32
13	100	.	33
14	100	.	40
15	100	.	25
16	100	.	8
17	100	.	4

Roundnose grenadier (*Coryphaenoides rupestris*)

Roundnose grenadier was caught in most of the survey area but the catches were very low (Fig. 9, Appendix 1). The biomass has been very low for more than a decade (Table 7) and far below the level seen in the late 80'. The biomass in the 2009 was estimated at 1151.1 tons which is an increase from 546.1 tons in 2008 that was lowest estimate on record. Most of the biomass was found in Div 1D at depths greater than 801 m (Table 8).

The abundance increased from the lowest level on record in 2008 on $4.75*10^6$ to $16.58*10^6$ in 2009 but this is still on a very low level compared to the late 80'ies (Jørgensen 1998a). The increase in abundance is probably due to a change in catchability. The highest densities were found in Div. 1D 801-1000 m, primarily driven by one "large" catch (Table 9).

Table 7. Biomass (tons) and abundance of roundnose grenadier with S.E. by year.

Year	Biomass	S.E.	Abundance ($*10^6$)	S.E. ($10*^6$)
1997	5 686.5	926.4	32.44	7.06
1998	7 263.3	2 530.2	75.24	27.36
1999	2 771.8	445.5	29.10	8.96
2000	5 593.7	2 616.8	99.52	67.31
2001	1 577.2	516.4	24.70	8.80
2002	1 593.1	462.7	18.61	8.91
2003	774.2	144.0	6.90	1.27
2004	633.0	98.2	10.56	2.53
2005	733.0	116.0	12.18	3.75
2006	658.6	192.2	10.83	4.28
2007	838.0	206.4	13.16	4.50
2008	546.1	81.3	4.75	0.70
2009	1 151.1	516.1	16.58	10.01

Table 8. Mean catch per km^2 and biomass (tons) of roundnose grenadier by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Biomass	SE
1C	401-600	3366	2	0.0005	1.8	1.8
	601-800	16120	5	0.0019	31.3	26.3
	801-1000	6066	13	0.0095	57.7	29.0
	1001-1200	611	2	0.0075	4.6	1.3
1D	401-600	903	2	0.0108	9.7	0.8
	601-800	1940	2	0.0044	8.6	5.2
	801-1000	3874	4	0.1542	597.5	509.4
	1001-1200	10140	18	0.0193	195.2	54.4
	1201-1400	6195	15	0.0243	150.5	27.7
	1401-1500	3091	5	0.0306	94.5	39.6
All				0.0220	1151.3	516.1

Table 9. Mean catch per km^2 and abundance of roundnose grenadier by Division and depth stratum, 2009.

Div.	Deoth (m)	Area	Hauls	Mean	Abundace	SE
1C	401-600	3366	2	6.6	22109	22109
	601-800	16120	5	55.7	897232	705953
	801-1000	6066	13	209.4	1270268	771070
	1001-1200	611	2	132.5	80980	23552
1D	401-600	903	2	37.5	33841	22057
	601-800	1940	2	51.7	100270	47280
	801-1000	3874	4	2754.4	10670582	9903932
	1001-1200	10140	18	218.0	2210468	936192
	1201-1400	6195	15	148.4	919355	201180
	1401-1500	3091	5	120.4	372116	125430
All				316.9	16577220	10005859

Pre anal fin length ranged from 2 to cm 21 cm. The grenadiers were generally small and the over all length distribution (weighted by stratum area) was dominated by a mode around 4-8 cm as in 2007-2008 (Fig. 10).

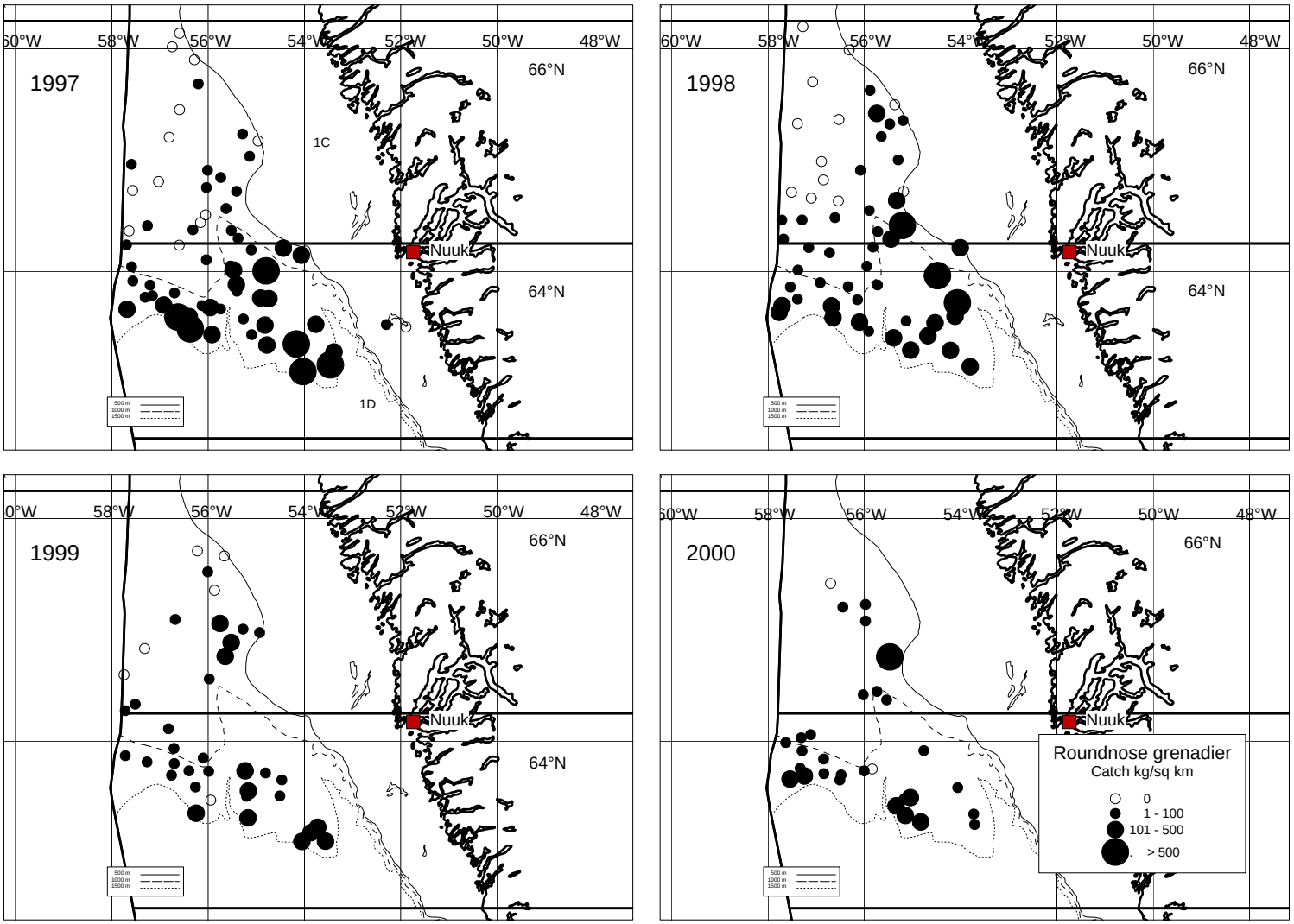

Fig. 9. Distribution of catches of roundnose grenadier in 1997-2000 in kg km^{-}

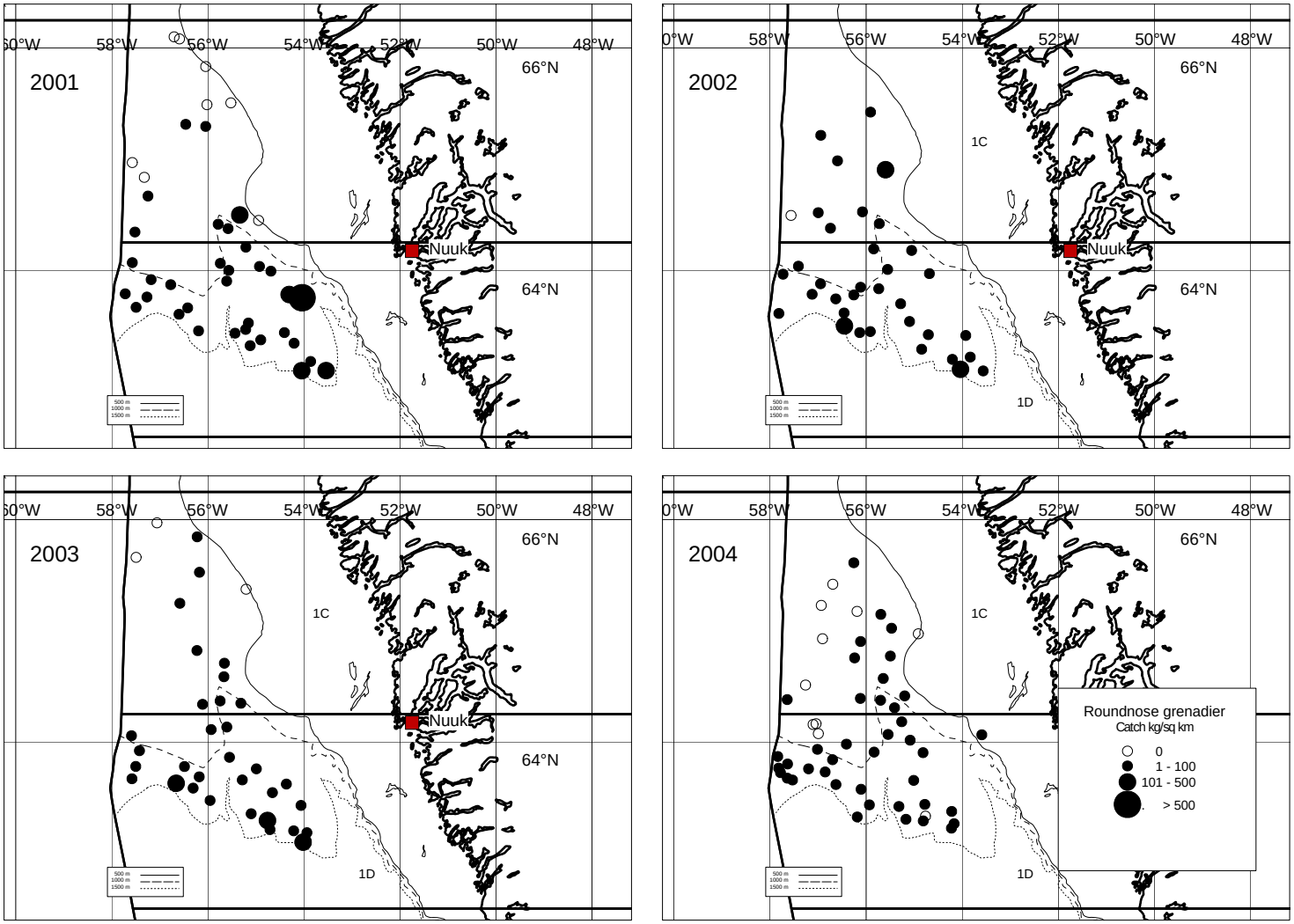

Fig. 9 cont. Distribution of catches of roundnose grenadier during 2001-2004.

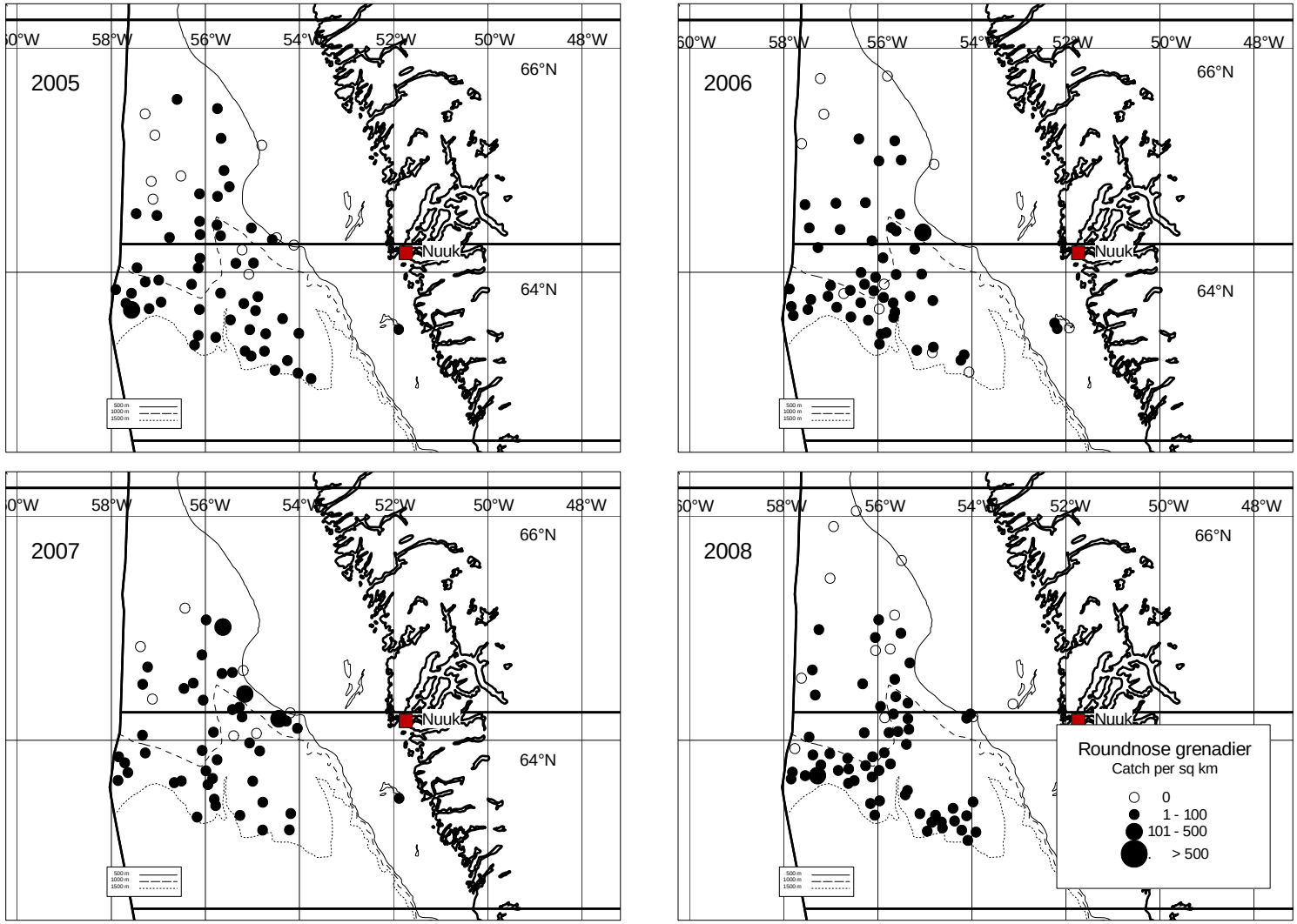

Fig. 9 cont. Distribution of catches of roundnose grenadier during 2005-2008.

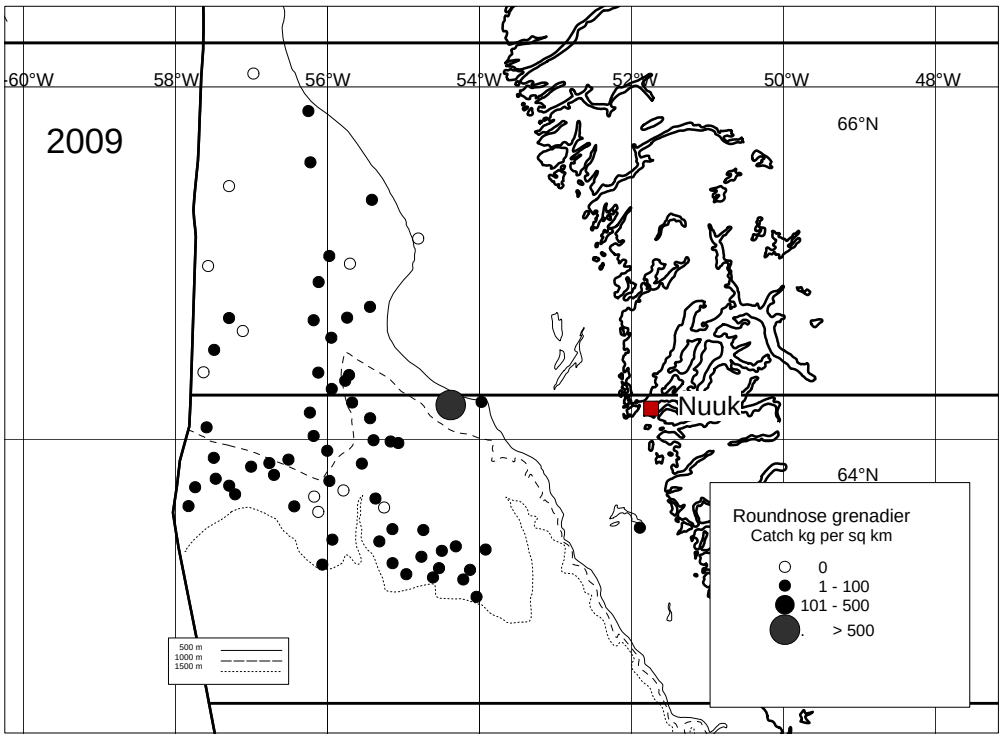

Fig. 9 cont. Distribution of catches of roundnose grenadier during 2009.

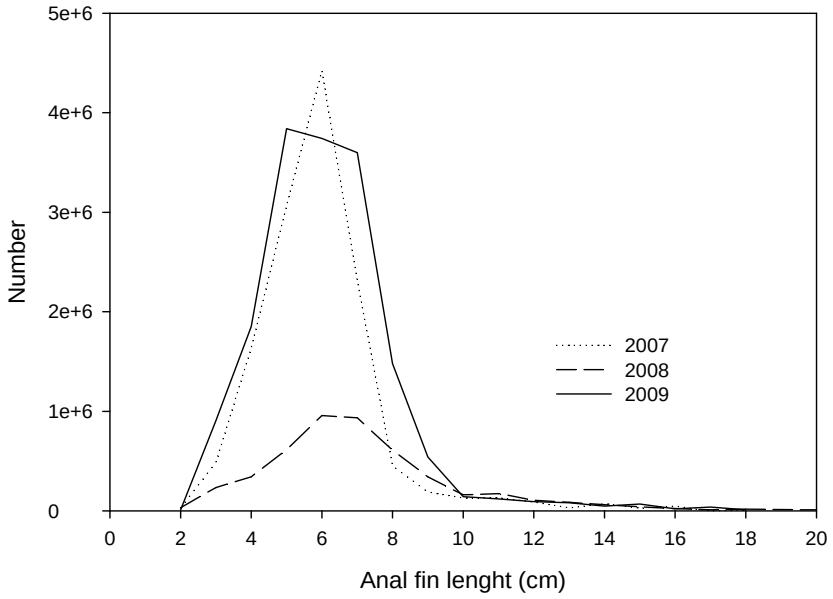

Fig. 10. Overall length distribution of roundnose grenadier (pre anal fin length) in numbers (weighted by stratum area) by year.

Roughhead grenadier (*Macrourus berglax*)

Roughead grenadier was caught in all hauls except one. The catches were, however, generally low (Fig. 11, Appendix 1). The biomass was estimated at 3795.7 tons in 2009 compared to 4533.7 tons in 2008 and the 2009 estimate is the second lowest in the time series (Table 10).

The highest densities were found between at depths at 1401-1500 min Div. 1D but the largest biomass was found in Div. 1C 601-800 m (Table 11) as in the previous two years. The decrease biomass was seen in most strata except in the two deep strata in Div. 1D.

Table 10. Biomass and abundance of roughhead grenadier by year in Div. 1CD with S.E.

Year	Biomass	S.E.	Abundance ($*10^6$)	S.E. ($*10^6$)
1997	2 258.6	250.1	4.60	0.45
1998	4 314.1	377.9	11.62	1.01
1999	5 166.2	854.1	14.07	2.04
2000	7 178.1	2 226.5	20.28	7.18
2001	4 576.6	456.3	13.87	1.55
2002	7 907.6	823.6	19.62	1.76
2003	5 657.5	700.8	15.37	2.57
2004	4 314.3	452.6	11.16	1.32
2005	5 602.6	419.5	14.00	1.31
2006	5 148.2	621.2	11.84	1.09
2007	3 467.6	374.6	8.18	1.08
2008	4 533.7	970.2	9.94	1.35
2009	3 795.7	299.2	8.21	0.67

Table 11. Mean catch per km^2 and biomass (tons) of roughhead grenadier by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Biomass	SE
1C	401-600	3366	2	0.0275	92.5	35.4
	601-800	16120	5	0.0748	1205.9	190.4
	801-1000	6066	13	0.0395	239.6	53.6
	1001-1200	611	2	0.0169	10.3	6.0
1D	401-600	903	2	0.0716	64.7	64.7
	601-800	1940	2	0.0727	140.9	42.0
	801-1000	3874	4	0.0755	292.5	143.9
	1001-1200	10140	18	0.0579	587.1	84.9
	1201-1400	6195	15	0.1049	649.8	75.9
	1401-1500	3091	5	0.1657	512.2	97.2
All				0.0726	3795.7	299.2

Table 12. Mean catch per km^2 and abundance of roughhead grenadier by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Abundace	SE
1C	401-600	3366	2	59.2	199247	110810
	601-800	16120	5	221.2	3566412	533030
	801-1000	6066	13	97.0	588541	108779
	1001-1200	611	2	40.1	24504	5362
1D	401-600	903	2	154.8	139744	139744
	601-800	1940	2	117.3	227548	116886
	801-1000	3874	4	157.2	609006	250650
	1001-1200	10140	18	120.8	1224753	152582
	1201-1400	6195	15	153.4	950391	92882
	1401-1500	3091	5	220.1	680340	127960
All				157.0	8210488	672725

The total abundance decreased slightly from $9.94*10^6$ in 2008 to $8.21*10^6$ in 2009 (table 12) and was back at the 2007 level which was the lowest in the time series (Table 10). The highest densities were found in Div. 1C 601-800 m and Div. 1D 1401-1500 m.

Pre anal fin length ranged from 2 to 39 cm and the over all length distribution showed modes at 12 and 17 cm (Fig. 12).

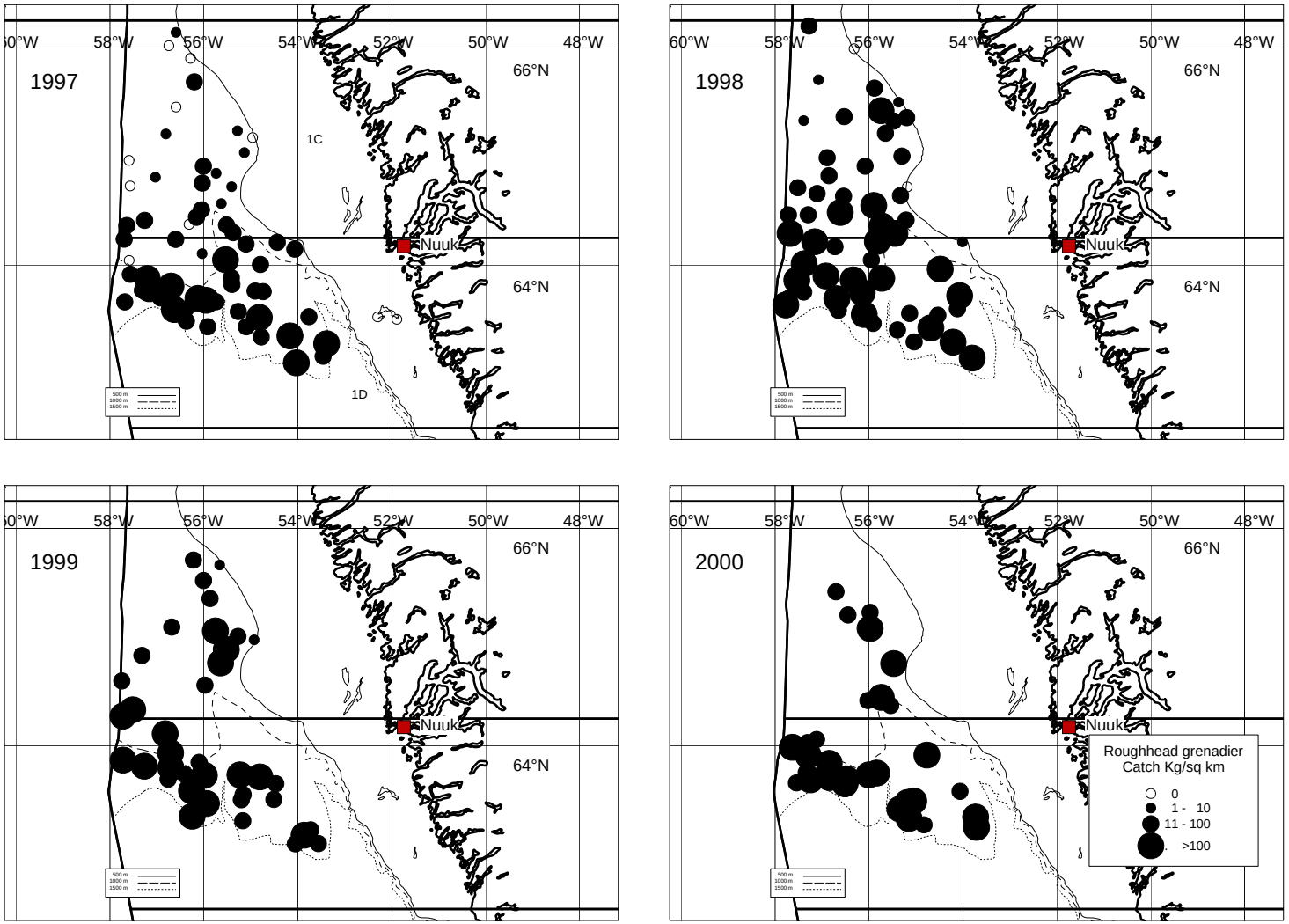

Fig. 11 Distribution of catches of roughhead grenadier in 1997-2000 in kg km^{-2}.

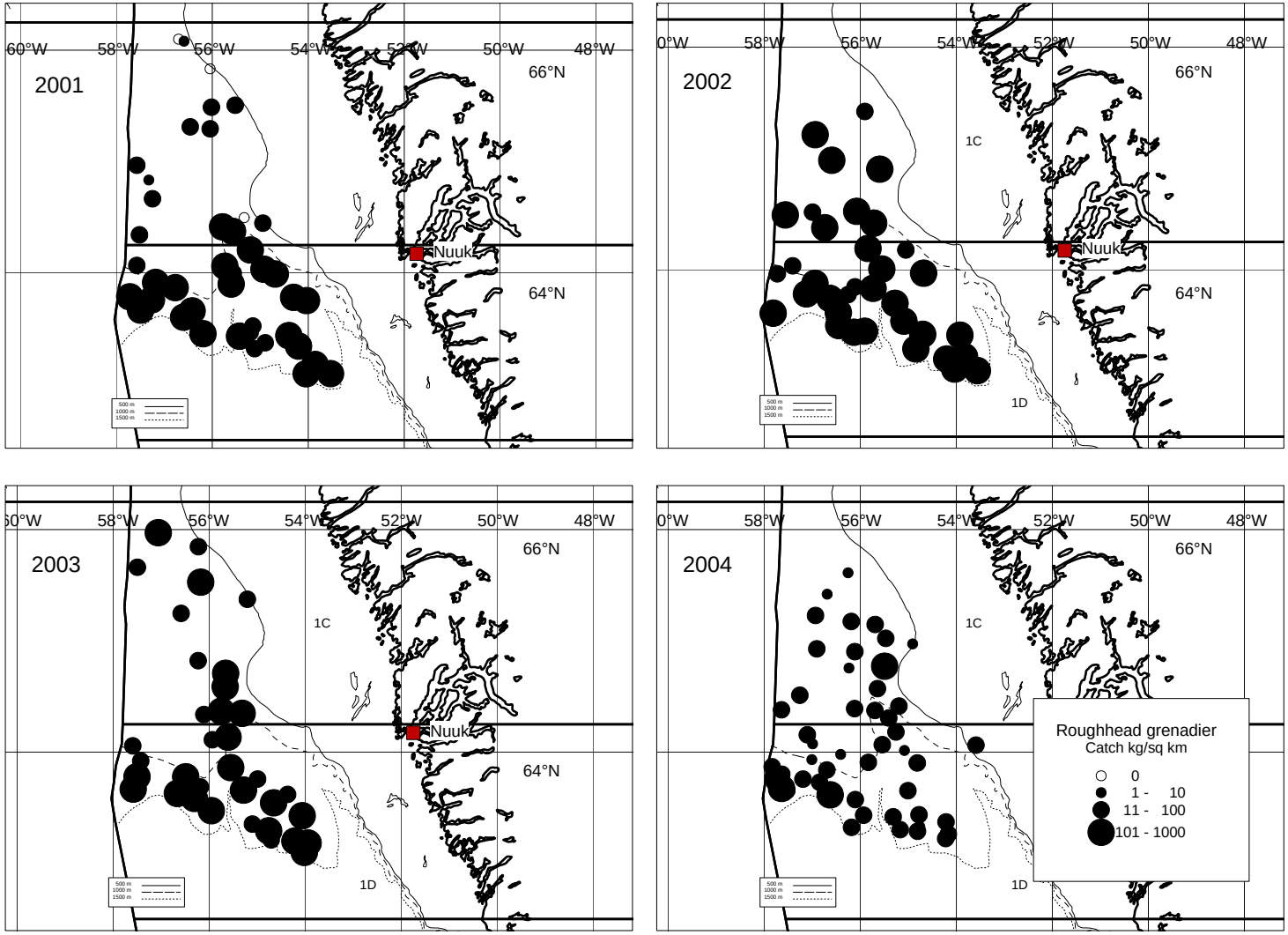

Fig. 11 cont.. Distribution of catches of roughhead grenadier during 2001-2004

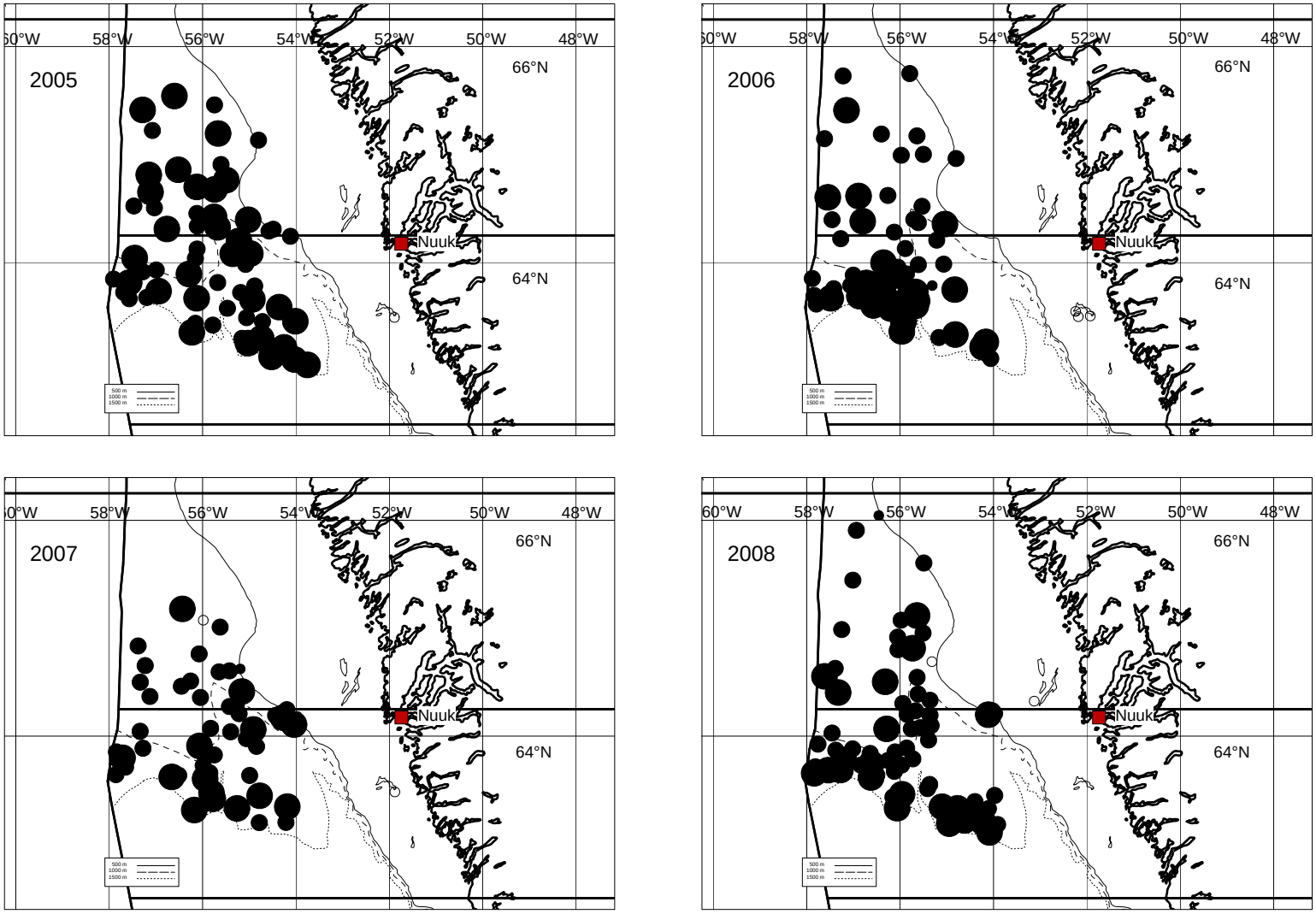

Fig. 11 cont.. Distribution of catches of roughhead grenadier during 2005-2008

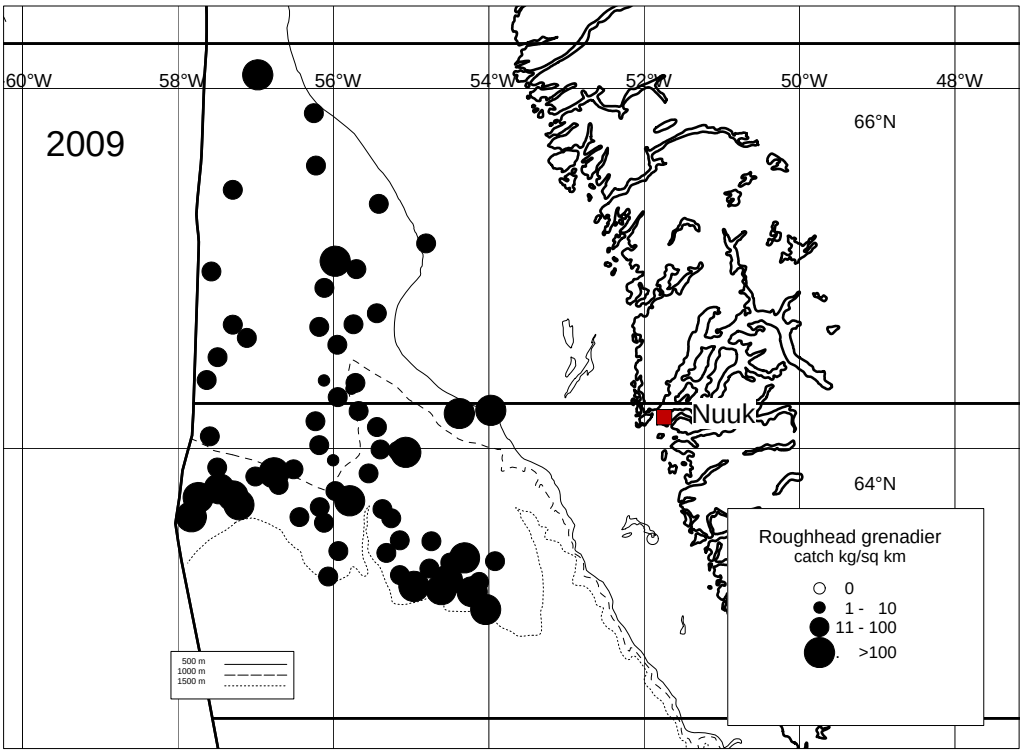

Fig. 11 cont.. Distribution of catches of roughhead grenadier during 2009

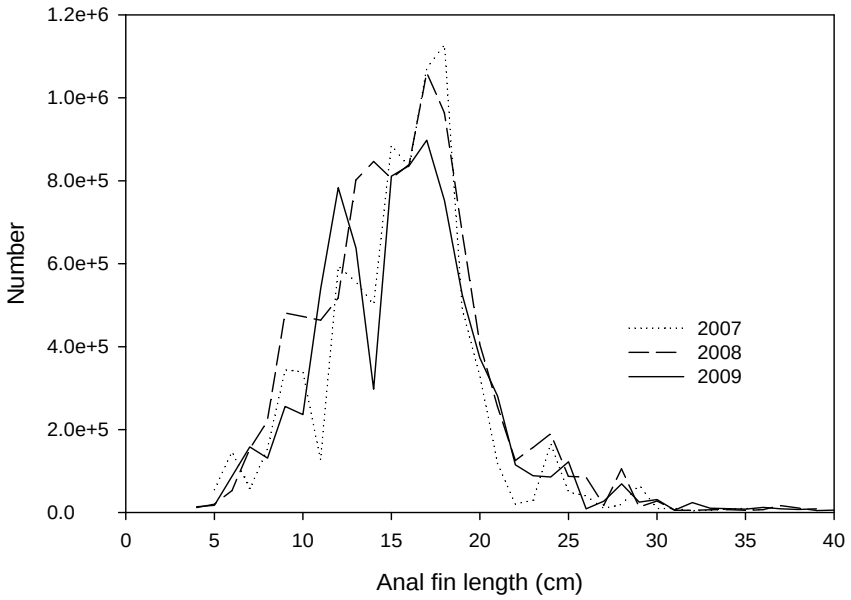

Fig. 12. Overall length distribution (pre anal fin length) of roughhead grenadier in numbers (weighted by stratum area) by year.

Deep-sea redfish (*Sebastes mentella*)

Deep-sea redfish + *Sebastes* sp. was caught in 26 of the 68 valid hauls (Fig 13). The biomass was estimated at 7796.4 tons compared to 13199.0 tons in 2009 and only 574.2 tons in 2007 where the coverage of relevant depths, however, was poor (Table 13). The Biomass estimate is to a large extend driven by a few large catches (Appendix 1). Almost all the biomass was found at depths < 800 m and about 2/3 of the biomass was found in Div. 1C 401-800 m, while the highest density was found in Div. 1D 401-600 m (Table 14)

The abundance was estimated at $35.04*10^6$ compared to $52.94*10^6$ in 2009 which was the highest in the time series. All most all the abundance was found in Div. 1C < 800 m with the highest density in Div. 1D 401-600 m (Table 15) as in 2008.

The length ranged from 11 to 56 cm with a clear mode at 19-21 cm and a minor mode at 26 cm. The deep-sea redfish have not been aged, but the 19-21 cm mode probably represents age 3, but there were no sign of them as age one in 2007, further there are a number of old fish in 2008 and 2009 not seen as younger fish in previous years (expect that the mode at 27 cm in 2008 could correspond to the mode at 22 cm in 2006). The change in biomass and abundance hence rather reflects a change in catchability and better survey coverage at shallow depths compared to previous years than incoming new strong year classes (Fig. 14).

Table 13. Biomass and abundance of deep-sea redfish including a few redfish sp. by year in Div. 1CD with S.E.

Year	Biomass	S.E.	Abundance $*10^6$	S.E.$*10^6$
1997	2 464.3	787.1	14.69	5.50
1998	2 408.1	503.9	18.83	4.50
1999	2 484.9	1 007.7	12.93	4.09
2000[1)]				
2001	2 063.4	873.5	16.34	6.47
2002[1)]				
2003	1 493.4	684.5	7.13	3.08
2004	2 329.1	1 986.8	13.34	11.31
2005	2 546.2	1 683.3	7.28	3.16
2006	2 188.4	700.7	18.20	8.40
2007[1)]	574.2	230.0	3.00	1.31
2008	13 199.0	6 482.9	52.94	17.70
2009	7 796.4	3 916.8	35.04	17.72

[1)] Poor coverage of relevant depths.

Table 14. Mean catch per km^2 biomass (tons) of Deep Sea Redfish by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Biomass	SE
1C	401-600	3366	2	0.7067	2378.8	2189.0
	601-800	16120	5	0.2129	3431.8	2775.6
	801-1000	6066	13	0.0015	9.0	4.0
	1001-1200	611	2	0.0013	0.8	0.8
1D	401-600	903	2	2.0196	1823.7	1684.6
	601-800	1940	2	0.0191	37.0	12.4
	801-1000	3874	4	0.0232	89.7	89.7
	1001-1200	10140	18	0.0010	10.1	5.1
	1201-1400	6195	15	0.0013	7.9	4.7
	1401-1500	3091	5	0.0025	7.6	7.6
All				0.1495	7796.4	3916.8

Table 15. Mean catch per km^2 and abundance of Deep Sea Redfish. by Division and depth stratum, 2009.

Div.	Depth (m)	Area	Hauls	Mean	Abundace	SE
1C	401-600	3366	2	5128.3	17261881	15445832
	601-800	16120	5	698.2	11255454	6955675
	801-1000	6066	13	7.5	45524	22939
	1001-1200	611	2	7.8	4786	4786
1D	401-600	903	2	6652.7	6007367	5194311
	601-800	1940	2	55.8	108321	2341
	801-1000	3874	4	70.0	271250	271250
	1001-1200	10140	18	3.4	34945	17058
	1201-1400	6195	15	4.0	24533	13716
	1401-1500	3091	5	8.6	26620	26620
All				669.9	35040681	17720365

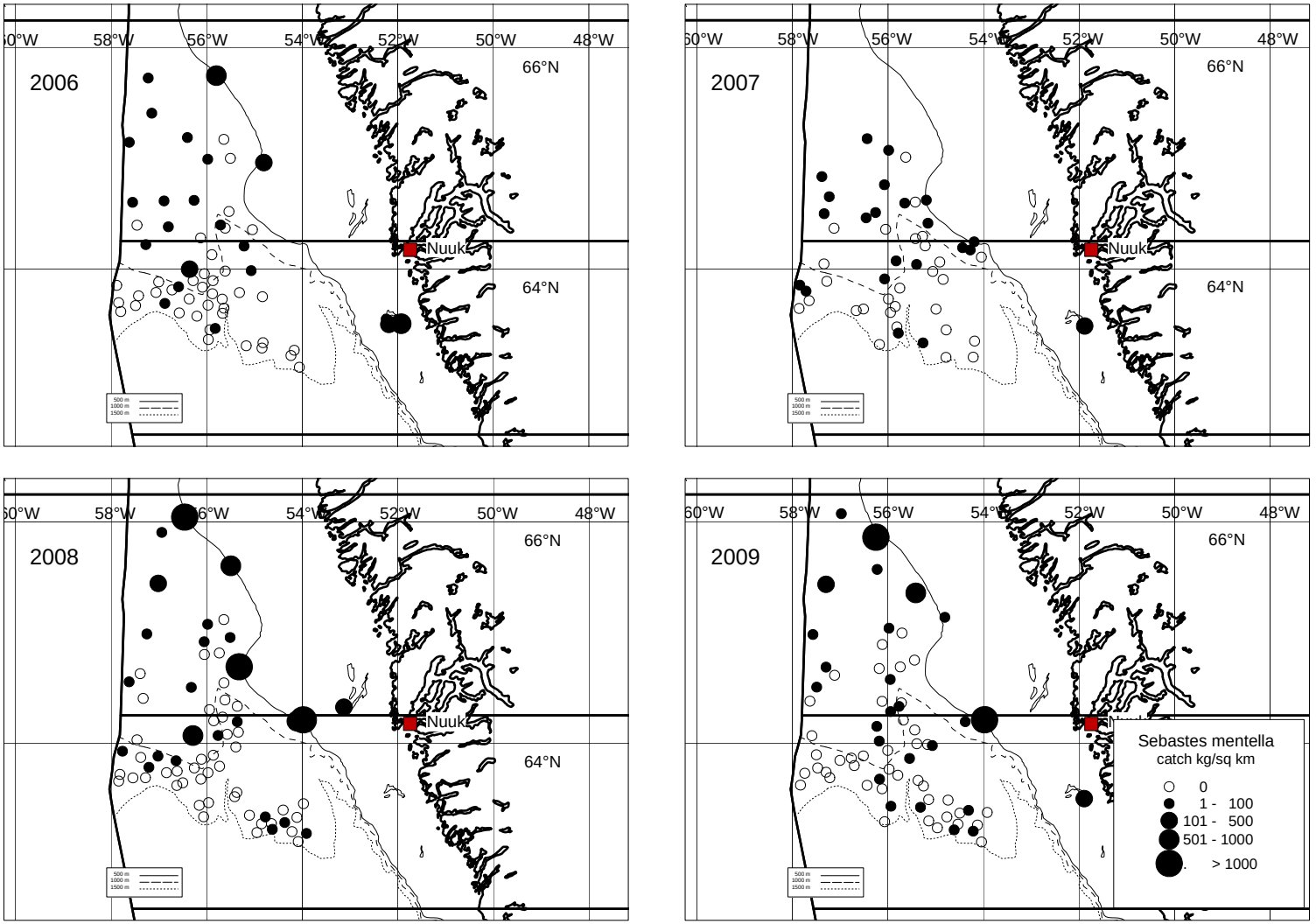

Fig. 13. Distribution of catches of deep sea redfish during 2006-2009

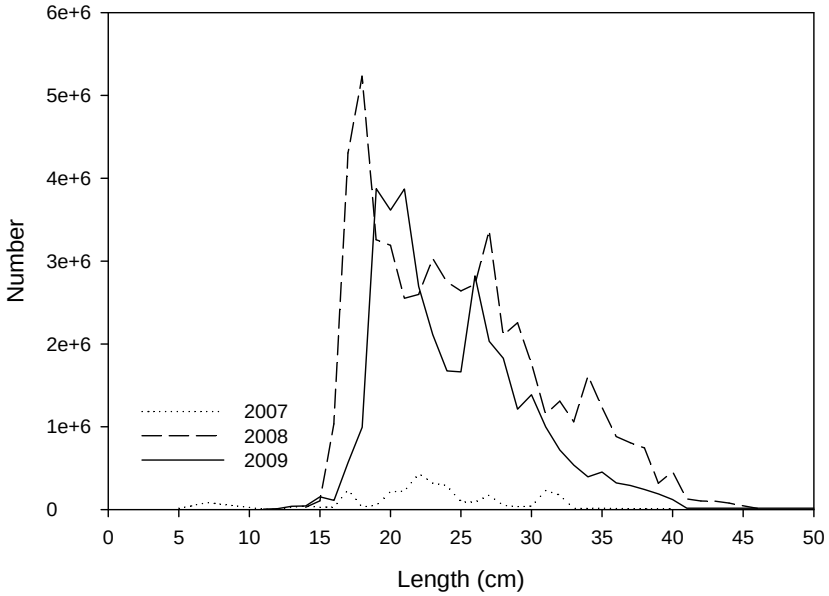

Fig. 14. Overall length distribution of deep sea redfish in numbers (weighted by stratum area) by year

Temperature

The bottom temperature ranged from 2.5°C to 4.7°C. The mean temperature was generally decreasing by depth as in previous years (Table 16).

The mean temperatures decreased in Div 1D 401- 600 and 601-800 by about 0.5 °C otherwise there were only minor changes in mean temperature by depth compared to 2008.

Temperatures by Division, depth stratum and year is given in Fig. 15

Table 16. Mean temperature, S.E and number of observations by NAFO Division and depth stratum.

Div.	Depth stratum (m)																	
	401-600			601-800			801-1000			1001-1200			1201-1400			1401-1500		
	□C	SE	n	□C	SE	n	□C	SE	n	□C	SE	n	□C	SE	n	□C	SE	n
1C	4.5	.22	2	3.6	.32	5	3.9	.03	13	3.7	.01	2						
1D	4.4	.16	2	3.9	.02	2	3.9	.08	4	3.7	.01	18	3.7	.02	15	3.6	.03	5

Tagging experiment.

In total 2078 Greenland halibut were tagged with floyd ”spaghetti” tags in Div. 1C

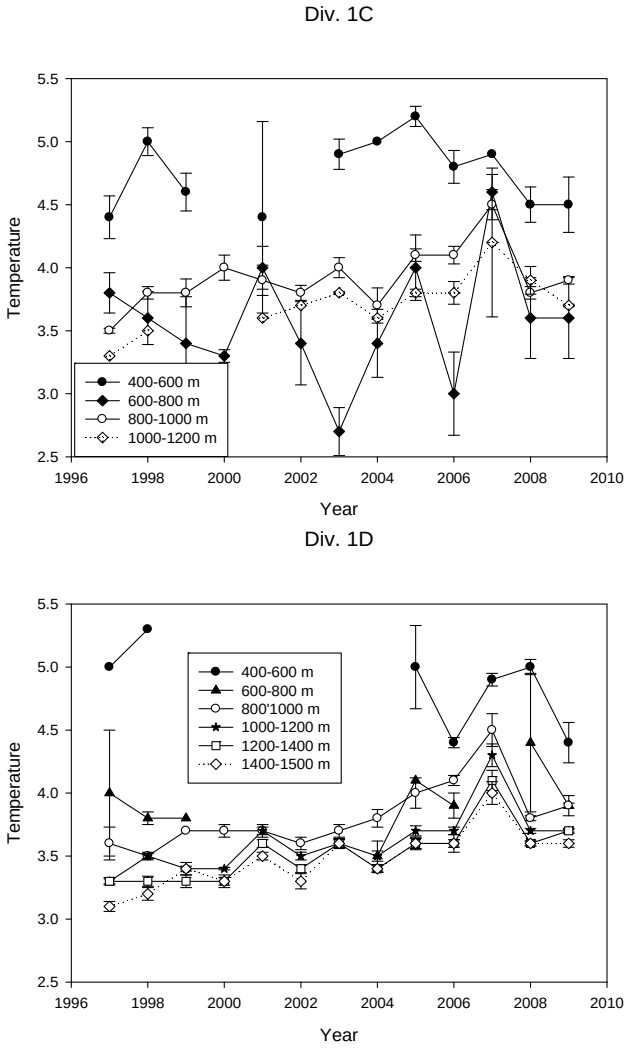

Fig 15. Mean temperatures by division depth stratum and year with S.E.

References

Jørgensen, O A. 1997b. Movement patterns of Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum.) at West Greenland, as inferred from Trawl Survey Distribution and Size Data.. *J. Northw. Atl. Fish. Sci*.; **21**:23-37.

Jørgensen, O A. 1997a. Pelagic occurrence of Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum) in West Greenland waters. *J. Northw. Atl. Fish. Sci*.; **21**:39-50.

Jørgensen O. A. 1998a. Results of the Joint Japan Greenland Trawl Surveys at West Greenland 1987-1995 on Greenland Halibut (*Reinhardtius hippoglossoides*) and Roundnose Grenadier (*Coryphaenoides rupestris*). *NAFO Sci. Council Studies* No 31. 21-56.

Jørgensen O.A. 1998b. Survey for Greenland Halibut in NAFO Division 1C-1D. NAFO SCR Doc. 98/25. Serial No. N3010, 26 pp.

Jørgensen O.A. 1999. Survey for Greenland Halibut in NAFO Division 1C-1D, 1998. NAFO SCR Doc. 99/30. Serial No. N4086, 25 pp.

Jørgensen O.A. 2000. Survey for Greenland Halibut in NAFO Division 1C-1D, 1999. NAFO SCR Doc. 00/10. Serial No. N4232, 26 pp.

Jørgensen O.A. 2001. Survey for Greenland Halibut in NAFO Division 1C-1D, 2000. NAFO SCR Doc. 01/23. Serial No. N4392, 23 pp.

Jørgensen O.A. 2002. Survey for Greenland Halibut in NAFO Division 1A-1D, 2001. NAFO SCR Doc. 02/30. Serial No. N4637, 31 pp.

Jørgensen O.A. 2003. Survey for Greenland Halibut in NAFO Division 1C-1D, 2002. NAFO SCR Doc. 03/20. Serial No. N4829, 27 pp.

Jørgensen O.A. 2004. Survey for Greenland Halibut in NAFO Division 1C-1D, 2003. NAFO SCR Doc. 04/19. Serial No. N4967, 26 pp.

Jørgensen O.A. 2005. Survey for Greenland Halibut in NAFO Division 1C-1D, 2004. NAFO SCR Doc. 05/13. Serial No. N5052, 28 pp.

Jørgensen O.A. 2006. Survey for Greenland Halibut in NAFO Division 1C-1D, 2005. NAFO SCR Doc. 06/27. Serial No. N5246, 30 pp.

Jørgensen O.A. 2007. Survey for Greenland Halibut in NAFO Division 1C-1D, 2006. NAFO SCR Doc. 07/29. Serial No. N5381, 32 pp.

Jørgensen O.A. 2008. Survey for Greenland Halibut in NAFO Division 1C-1D, 2007. NAFO SCR Doc. 08/17. Serial No. N5510, 31 pp.

Jørgensen O.A. 2009. Survey for Greenland Halibut in NAFO Division 1C-1D, 2008. NAFO SCR Doc. 09/16. Serial No. N5645, 28 pp.

Kingsley, M.C.S., P. Kanneworff and D.M. Carlsson. 2004. Buffered random sampling: a sequential inhibited spatial point process applied to sampling in trawl survey for northern shrimp *Pandalus borealis* in West Greenland waters. ICES J. Mar. Sci. 61:12-24.

Appendix 1. Catch weight and - numbers (not standardized to kg/km^2) of Greenland halibut, roundnose and roughhead grenadier and deep-sea redfish by haul. Depth in m, swept area in km^2 and bottom temperature in °C. Catch weight < 0.05 kg=0.0. Invalid stations are excluded.

					Grl. halibut		Roundnose gre.		Roughhead gre.		*S. mentella*	
St. No	S. Area	Div.	Depth	Temp.	Weight	Number	Weight	Number	Weight	Number	Weight	Number
1	0.06462	1D	544	4.6	10.5	5	0.6	4	9.3	20	251.1	801.6
2	0.05356	1D	864	4.1	151.4	160	29.4	558	9.7	18	5.0	15
5	0.07603	1D	1051	3.7	405.2	175	0.6	10	2.0	6	0.0	0
7	0.06384	1C	1033	3.7	124.7	129	0.3	6	0.5	2	0.2	1
8	0.08227	1C	956	3.7	239.0	182	0.3	6	2.0	4	0.6	4
9	0.08115	1C	886	3.8	91.5	89	0.4	9	0.0	1	0.0	0
10	0.08183	1C	1058	3.7	261.0	228	0.8	14	2.2	4	0.0	0
12	0.08124	1C	962	3.9	144.4	119	0.8	10	1.7	6	0.2	1
13	0.08064	1C	873	4.0	229.9	228	0.8	15	2.4	6	0.0	0
14	0.05273	1C	946	3.9	49.5	52	0.3	7	1.2	4	0.0	0
15	0.05883	1C	825	4.1	162.2	178	3.8	101	5.3	12	0.0	0
17	0.08149	1C	854	4.0	71.6	65	1.1	18	1.3	6	0.0	0
18	0.08099	1C	836	3.8	217.0	234	0.3	5	8.5	20	0.1	1
19	0.07710	1C	851	4.0	73.4	71	0.0	0	5.4	9	0.0	0
21	0.07599	1C	422	4.7	0.0	0	0.0	0	2.9	7	4.3	41
22	0.04809	1C	688	4.2	7.0	8	0.4	11	4.4	11	43.2	112
23	0.08100	1C	712	4.0	40.6	51	0.1	3	4.7	23	2.6	9
24	0.07612	1C	586	4.3	3.8	6	0.1	1	1.3	2	103.3	739.7
26	0.08352	1C	668	3.1	22.0	45	0.0	0	9.4	18	1.6	14
27	0.04320	1C	632	2.5	10.4	16	0.0	0	2.6	12	4.6	36
28	0.07983	1C	738	4.0	61.2	75	0.0	1	4.1	8	0.7	4
29	0.08256	1C	810	3.9	46.8	49	0.1	2	1.7	7	0.3	1
30	0.08455	1C	828	3.8	85.3	87	0.0	0	5.1	8	0.0	0
31	0.08216	1C	831	3.8	85.2	97	0.6	6	1.1	3	0.3	1
32	0.06720	1C	869	3.8	115.4	123	0.0	0	2.7	8	0.0	0
33	0.08100	1D	946	3.7	91.0	90	2.4	11	3.3	8	0.0	0
34	0.11114	1D	1135	3.7	248.5	209	1.0	3	4.0	7	0.0	0
35	0.07841	1D	1306	3.7	211.7	205	0.6	5	9.2	13	0.0	0
36	0.07985	1D	1334	3.6	221.7	189	1.4	5	15.0	15	0.0	0
37	0.07856	1D	1468	3.6	244.3	205	1.0	7	13.4	21	0.0	0
38	0.07957	1D	1382	3.7	105.3	82	1.5	4	9.5	9	0.0	0
39	0.06844	1D	1468	3.5	122.3	91	1.6	8	8.8	7	0.0	0
40	0.07631	1D	1193	3.7	317.5	264	1.5	7	3.8	10	0.0	0
41	0.08109	1D	1180	3.7	129.1	100	0.4	2	1.5	5	0.0	0
42	0.08099	1D	1091	3.7	61.9	59	1.4	11	9.0	21	0.0	0
43	0.08202	1D	972	3.8	260.0	225	3.1	37	5.9	13	0.0	0
45	0.08456	1D	920	3.7	85.9	70	0.1	1	0.8	3	0.0	0
46	0.08247	1D	1061	3.8	140.9	110	1.5	13	1.7	3	0.0	0
47	0.07502	1D	1227	3.6	356.1	264	0.0	0	8.9	17	0.0	0
48	0.04016	1D	1183	3.7	98.0	76	0.0	0	3.2	8	0.2	1
49	0.03987	1D	1353	3.6	40.1	33	1.6	6	2.7	6	0.0	0
50	0.08018	1D	1282	3.5	209.9	140	0.0	0	6.0	13	0.0	0
51	0.08076	1D	1195	3.6	77.7	54	1.3	5	5.5	16	0.2	1
53	0.07333	1D	1445	3.6	203.6	155	2.1	7	6.8	16	0.0	0
54	0.07721	1D	1212	3.7	168.3	121	1.2	5	3.0	1	0.3	1
55	0.07445	1D	1372	3.7	159.3	120	1.7	5	3.0	6	0.0	0
56	0.08283	1D	1348	3.7	116.6	84	1.6	7	9.0	15	0.0	0
57	0.07173	1D	1226	3.7	205.1	174	2.6	20	5.6	8	0.0	0
58	0.06967	1D	1429	3.7	127.8	96	0.6	2	19.5	24	0.9	3
59	0.05608	1D	1315	3.7	145.2	100	2.2	12	11.6	9	0.0	0
60	0.07625	1D	1258	3.7	249.4	179	2.7	19	9.4	17	0.8	2
61	0.07727	1D	1428	3.6	90.1	73	6.2	21	12.2	13	0.0	0
62	0.04628	1D	1169	3.7	47.4	44	2.2	13	2.9	5	0.0	0
63	0.07148	1D	1056	3.7	324.3	274	7.0	123	2.2	6	0.0	0

65	0.07932	1D	1152	3.7	126.8	103	2.3	36	10.4	12	0.2	1
66	0.05668	1D	1182	3.7	113.9	83	0.5	11	1.1	4	0.0	0
68	0.06312	1D	1126	3.6	71.2	58	0.1	1	5.5	5	0.0	0
70	0.04208	1D	1131	3.7	57.0	44	0.9	4	3.8	6	0.0	0
71	0.04284	1D	1195	3.7	33.4	28	0.0	0	0.9	3	0.0	0
72	0.04083	1D	1295	3.7	114.2	84	2.7	8	2.7	5	0.0	0
73	0.04946	1D	1217	3.7	145.5	115	1.1	17	6.4	9	0.3	1
74	0.07236	1D	1297	3.7	436.0	359	1.6	29	7.0	16	0.0	0
76	0.06098	1D	1132	3.7	43.2	36	1.0	13	4.4	9	0.0	0
77	0.08237	1D	1158	3.6	150.6	125	1.8	12	7.8	18	0.6	1
78	0.08033	1D	1112	3.7	131.8	116	0.9	14	1.8	6	0.0	0
80	0.07322	1D	772	3.9	41.0	44	0.1	2	3.7	13	0.9	4
81	0.05259	1D	784	3.9	44.1	39	0.4	4	5.0	3	1.3	3
82	0.07663	1D	426	4.3	14.3	13	0.9	1	0.0	0	11.8	69

Appendix 2. List of species and groups of species recorded in Div. 1C-D in 2009 with observed maximum catch weight (kg), maximum number per tow, minimum and maximum depth(m), minimum and maximum bottom temperature (°C) and most northern observation, respectively (Weight <50 g given as 0.0 kg).

Obs	art	species	maxwgt	maxno	mindepth	maxdepth	mintemp	maxtemp	maxpos
1	ARS	Agentina silus	6.3	28	544.0	864.0	4.1	4.6	64.2108
2	ALA	Alepocephalus agassizzi	146.6	110	864.0	1444.5	3.6	4.1	64.3781
3	RHB	Amblyraja hyperborea	13.3	1	1314.5	1429.0	3.6	3.7	63.2668
4	RRD	Amblyraja radiata	0.8	1	426.0	668.0	3.1	4.6	66.0757
5	CAD	Anarhichas denticulatus	36.4	6	771.5	1444.5	3.6	4.0	64.9960
6	ANC	Anopologaster cornuta	0.1	1	1131.0	1192.5	3.7	3.7	63.7973
7	ANT	Antimora rostrata	21.3	51	712.0	1468.0	3.5	4.1	65.5721
8	ARZ	Arctozenius rissoi	0.2	3	426.0	1429.0	3.7	4.3	64.1940
9	BAM	Bajacalifornia megalops	0.6	2	956.0	1306.0	3.7	3.7	64.2850
10	BAT	Bathylagus euryops	4.4	100	688.0	1468.0	3.5	4.2	65.5721
11	BAS	Bathylagus sp.	0.1	1	1057.5	1057.5	3.7	3.7	64.3643
12	BSP	Bathyraja spinicauda	0.2	1	586.0	712.0	4.0	4.3	65.8630
13	BEG	Benthosema glaciale	0.1	38	426.0	1468.0	2.5	4.6	66.0757
14	POC	Boreogadus saida	0.0	1	688.0	688.0	4.2	4.2	65.3592
15	BOA	Borostomias antarctica	0.4	8	810.0	1429.0	3.5	4.0	65.0402
16	USK	Brosme Brosme	0.7	1	544.0	544.0	4.6	4.6	64.2108
17	CAU	Caulophryne jordani	0.1	1	1382.0	1382.0	3.7	3.7	63.7362
18	CFB	Centroscyllium fabricii	29.5	28	586.0	1296.5	3.5	4.3	65.8630
19	CRT	Ceratidae	0.0	1	1112.0	1112.0	3.7	3.7	64.1189
20	CHL	Chaenophryne longiceps	0.2	1	1179.5	1179.5	3.7	3.7	63.8439
21	CHA	Chauliodus sloani	0.1	3	854.0	1468.0	3.6	4.0	64.8923
22	CHN	Chiasmodon niger	0.2	6	712.0	1468.0	3.5	4.0	65.5721
23	CBB	Coryphaenoides brevibarbis	0.1	5	1217.0	1444.5	3.6	3.7	63.9865
24	CGR	Coryphaenoides guntheri	4.7	26	1090.5	1468.0	3.5	3.7	64.1189
25	RNG	Coryphaenoides rupestris	29.4	558	426.0	1468.0	3.5	4.6	65.8630
26	COM	Cottunculus microps	0.2	2	668.0	1131.5	3.1	4.0	66.0757
27	COT	Cottunculus thomsonii	1.2	2	825.0	1217.0	3.7	4.1	64.7507
28	LUM	Cyclopterus lumpus	2.6	1	1057.5	1226.0	3.7	3.7	64.3643
29	CLM	Cyclothone microdon	0.0	16	632.0	1444.5	2.5	4.1	66.0757
30	DPK	Dolopichthys longicornis	0.0	1	946.0	946.0	3.7	3.7	64.0668
31	AEE	Einara edentula	0.0	1	956.0	1195.0	3.6	3.7	64.2850
32	EUR	Eurypharynx pelecanoides	0.1	1	1134.5	1195.0	3.7	3.7	63.8937
33	COD	Gadus morhua	30.8	110	421.5	937.5	4.3	4.7	65.8630
34	ONA	Gaidropsarus argentatus	0.2	3	688.0	962.0	3.8	4.2	65.3592
35	ONN	Gaidropsarus ensis	2.7	4	632.0	1468.0	2.5	4.0	66.0757
36	ONS	Gaidropsarus sp	0.0	1	885.5	885.5	3.8	3.8	64.3781
37	WIT	Glyptocephalus cynoglossus	0.8	1	738.0	956.0	3.7	4.1	65.0402
38	GOB	Gonostoma bathyphilum	0.0	1	783.5	1444.5	3.6	3.9	64.1514
39	PLA	Hippoglossoides platessoides	4.8	33	421.5	962.0	3.1	4.7	66.0757
40	HOA	Holtbyrnia anomala	0.1	1	810.0	1314.5	3.6	4.0	64.8923
41	HAF	Hydrolagus affinis	21.9	4	1227.0	1444.5	3.6	3.7	63.7094
42	LYD	Lampanyctus crocodilus	0.0	1	956.0	956.0	3.7	3.7	64.2850
43	LMC	Lampanyctus macdonaldi	9.9	226	426.0	1468.0	3.1	4.3	66.0757
44	LSP	Lampanyctus sp.	3.0	136	885.5	1057.5	3.7	3.8	64.3781
45	LAI	Lampenyctus intricarius	0.0	1	956.0	956.0	3.7	3.7	64.2850
46	LEP	Lepedion eques	0.4	8	421.5	1090.5	3.7	4.7	65.1392
47	LIZ	Linophryne bicornis	0.6	1	1428.0	1428.0	3.6	3.6	63.1046
48	LIF	Liparis fabricii	0.1	4	668.0	668.0	3.1	3.1	66.0757
49	LPA	Lycodes paamiuti	0.2	1	632.0	771.5	2.5	3.9	65.4372
50	LSQ	Lycodes squamiventer	0.2	1	1306.0	1306.0	3.7	3.7	63.7752
51	LYT	Lycodes terraenova	0.4	1	1429.0	1429.0	3.7	3.7	63.2152
52	LYM	Lycodonus mirabilis	0.0	1	1258.0	1258.0	3.7	3.7	63.2028
53	RHG	Macrourus berglax	19.5	24	421.5	1468.0	2.5	4.7	66.0757
54	RSP	Malacoraja spinacidermis	0.1	1	962.0	1212.0	3.7	3.9	64.5756
55	MAL	Malacosteus niger	0.2	1	712.0	1352.5	3.6	4.0	65.5721
56	MAM	Maulisa mauli	0.0	1	868.5	1157.5	3.6	3.8	64.3796
57	MMI	Maulisia microlepis	0.2	2	1212.0	1429.0	3.7	3.7	63.9865
58	MAT	Melanostigma atlanticum	0.0	1	946.0	946.0	3.7	3.7	64.0668
59	WHB	Micromesistius poutassou	0.8	6	421.5	544.0	4.6	4.7	65.1392
60	BLI	Molva dypterygia	1.6	3	421.5	864.0	4.1	4.7	65.1392
61	MYP	Myctophum punctatum	0.0	2	885.5	1467.5	3.5	3.8	64.3781
62	MYX	Myxine glutinosa	0.1	1	712.0	712.0	4.0	4.0	65.5721
63	NZB	Nezumia bairdi	2.2	21	783.5	1467.5	3.5	4.1	65.0402
64	PMO	Normichthys operosus	0.0	1	836.0	836.0	3.8	3.8	65.0402
65	NOT	Notacanthus chemnitzii	8.6	11	586.0	1468.0	2.5	4.3	65.8630

66	NOK	Notoscopelus kroeyri	0.1	4	426.0	1382.0	3.1	4.3 66.0757
67	PAC	Paraliparis copei	0.0	2	1134.5	1134.5	3.7	3.7 63.8937
68	PSP	Paraliparis sp.	0.1	7	668.0	1372.0	3.1	4.0 66.0757
69	PHY	Phyllorhinichthys micractis	0.1	1	1090.5	1090.5	3.7	3.7 63.8645
70	POL	Polyacanthonotus rissoanus	0.1	1	783.5	1468.0	3.5	4.0 64.9960
71	RFL	Raja fyllae	0.7	1	668.0	1468.0	3.1	3.7 66.0757
72	RLT	Raja lintea	3.4	1	1296.5	1382.0	3.7	3.7 63.9865
73	RBT	Rajella bathyphila	3.4	1	971.5	1352.5	3.6	3.8 63.8836
74	GHL	Reinhardtius hippoglossoides	436.0	359	426.0	1468.0	2.5	4.6 66.0757
75	RAT	Roulina attrita	0.2	1	1296.5	1296.5	3.7	3.7 63.9865
76	ROM	Roulina maderensis	0.1	1	688.0	1281.5	3.5	4.2 65.3592
77	SCO	Scopelosarus lepidus	3.9	27	771.5	1468.0	3.5	4.0 65.0402
78	REG	Sebastes marinus	1.6	1	632.0	632.0	2.5	2.5 65.4372
79	REB	Sebastes mentella	251.1	802	421.5	1429.0	2.5	4.7 66.0757
80	RED	Sebastes sp.	0.0	1	1192.5	1192.5	3.7	3.7 63.7973
81	SER	Serrivomer beani	0.5	6	688.0	1468.0	3.5	4.2 65.3592
82	GSK	Somniosus microcephalus	80.0	1	1212.0	1212.0	3.7	3.7 63.4193
83	STO	Stomias boa	0.1	6	712.0	1467.5	3.5	4.1 65.5721
84	SYN	Synapobranchus kaupi	116.5	28	668.0	1468.0	3.1	4.2 66.0757
85	TRA	Trachyrynchus murrayi	2.2	8	864.0	1226.0	3.7	4.1 64.3796
86	TRM	Triglops murray	0.0	2	421.5	421.5	4.7	4.7 65.1392
87	XEC	Xenodermichthys copei	0.1	1	1050.5	1157.5	3.6	3.7 64.2083