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# Survey for Greenland Halibut in NAFO Divisions 1C-1D, 2008

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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. The biomass of Greenland halibut was estimated as 83 465 tons in 2008, which is the highest in the time series: The length distribution showed a mode around 48 cm as in previous years. The biomass of roundnose grenadier is still at a very low level and was estimated as 546 tons, the lowest in the time series.

## 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 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, too.

## Materials and Methods

The survey in 2008 covered Div. 1CD at depths between 400 and 1500 m and took place during 19/9-10/10. The survey included a tagging experiment in Div. 1C during 29/9-1/10.

### 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 times down to 15 min were 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 a trawl 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 0.5 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 29/9-1/10 2008 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.

## Results and Discussion

In total 70 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 81 species or groups of fish species were recorded (Appendix 2).

**Greenland halibut (*Reinhardtius hippoglossoides*)**

Greenland halibut was caught in all hauls (Fig. 1, Appendix 1) and the biomass in Div. 1CD 400-1500 m was estimated at 83 465.4 (Table 2) which is the highest in the time series and an increase from 74 357 tons in 2007 (Table 1, Fig.2). The biomass estimates showed little variation by stratum compared to previous years, with the highest densities in Div. 1C 1000-1200 m and Div. 1D 1000-1400 m. The increase in biomass was seen in all strata in 1C and the shallow strata in Div. 1D. Stratum 1D 1200-1400 m and 1D 1400-1500 m showed a minor decrease compared to 2007. The estimate from 2008 is statistically different (95% level) from the estimates in 1997 and 2000 but not statistically significant from the remaining years. (Jørgensen, 2008, 2007, 2006; 2005; 2004; 2003; 2002; 2001; 2000; 1999 and 1998b). The weighted mean catch per tow also showed slight increase from 1.48 tons/km$^2$ in 2007 to 1.60 tons/km$^2$ in 2008 and the highest in the time series (Table 1, Fig 3.).

The abundance in was estimated at 72.804*10$^6$ compared to 67.427*10$^6$ in 2007 (Table 3, Fig 4) and the 2008 estimate is a little above average for the time series. The highest densities in numbers was seen in Div. 1CD 800-1200 m. The increase in abundance was seen in all strata except Div. 1D 1200-1400 m (Table 3), where the abundance decreased slightly compared to 2007.

The length ranged from 15 cm to 111 cm (excluding a few larvae on 7-8 cm). The overall length distribution (weighted by stratum area) was totally dominated by a mode at 47- 49 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).

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 | 72.004 | 5.334 |

Table 2. Biomass (tons) of Greenland halibut by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Biomass | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 0.1744 | 586.9 | 243.3 |
| | 601-800 | 16120 | 5 | 0.4742 | 7643.5 | 1812.4 |
| | 801-1000 | 6066 | 11 | 2.052 | 12447.1 | 3657.2 |
| | 1001-1200 | 611 | 2 | 3.8976 | 2381.4 | 1108.5 |
| 1D | 401-600 | 903 | 2 | 0.0578 | 52.2 | 41.1 |
| | 601-800 | 1940 | 2 | 0.4555 | 883.7 | 626.5 |
| | 801-1000 | 3874 | 4 | 2.235 | 8658.4 | 856.2 |
| | 1001-1200 | 10140 | 18 | 3.1912 | 32358.3 | 2814.1 |
| | 1201-1400 | 6195 | 16 | 2.0662 | 12799.8 | 1224.9 |
| | 1401-1500 | 3091 | 7 | 1.8292 | 5654 | 1138.9 |
| All | | | | 1.5957 | 83465.4 | 5456.3 |

Table 3. Abundance of Greenland halibut by Division and depth stratum, 2008.

| Division | Depth (m) | Area | Hauls | Mean sq/km | Abundance | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 160.4 | 540032 | 197749 |
| | 601-800 | 16120 | 5 | 532.4 | 8582135 | 2085223 |
| | 801-1000 | 6066 | 11 | 2005.6 | 12166107 | 3496779 |
| | 1001-1200 | 611 | 2 | 3273 | 1999776 | 966658 |
| 1D | 401-600 | 903 | 2 | 51.2 | 46226 | 22185 |
| | 601-800 | 1940 | 2 | 447.8 | 868655 | 540864 |
| | 801-1000 | 3874 | 4 | 2014.8 | 7805346 | 685898 |
| | 1001-1200 | 10140 | 18 | 2617.8 | 26544412 | 2341037 |
| | 1201-1400 | 6195 | 16 | 1613.8 | 9997198 | 939532 |
| | 1401-1500 | 3091 | 7 | 1375.1 | 4250529 | 812072 |
| All | | | | 1391.8 | 72800415 | 5033415 |

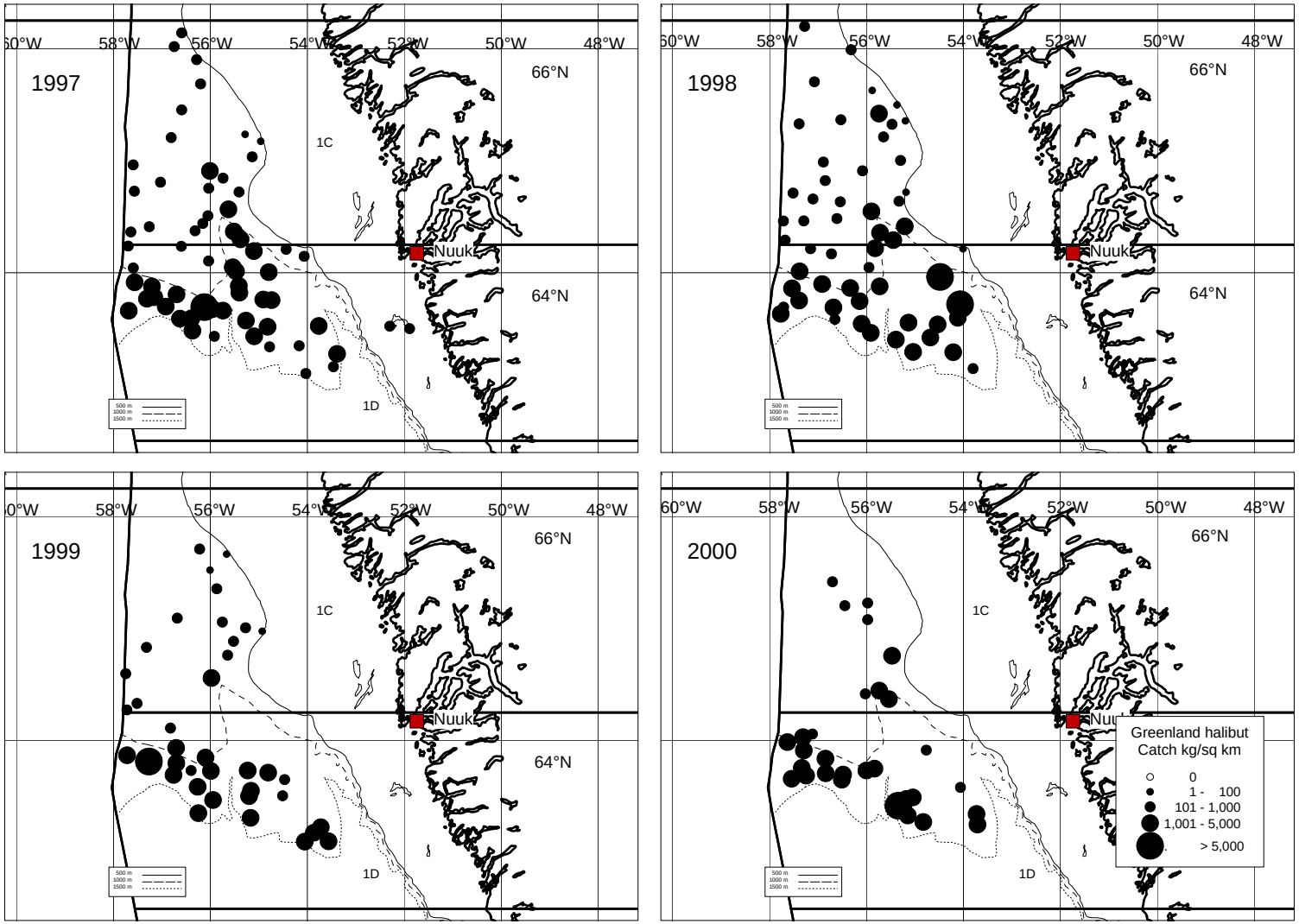


Fig. 1 Distribution of catches of Greenland halibut during 1997-2000 in kg km$^{-2}$.

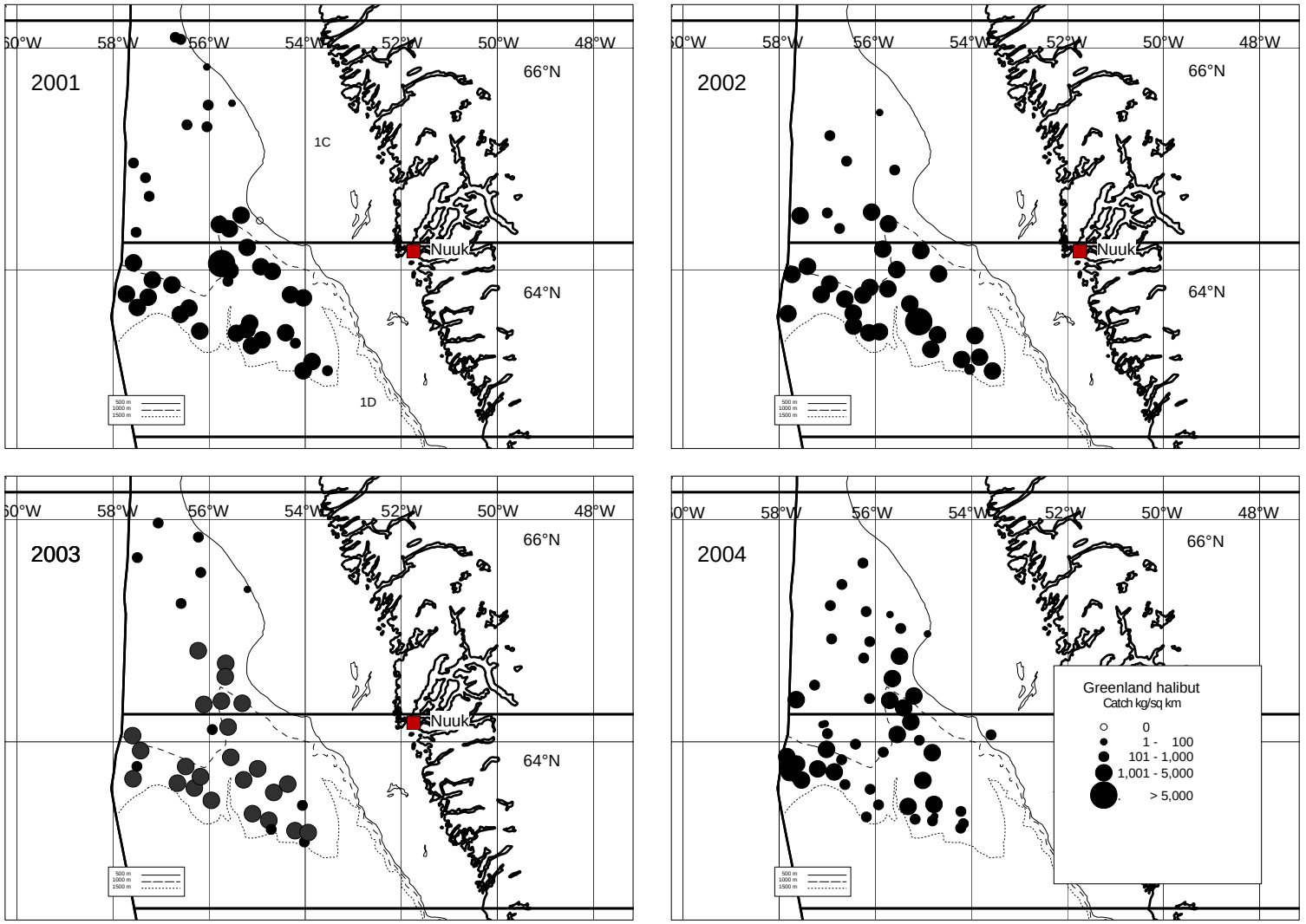


Fig. 1 (cont). Distribution of catches of Greenland halibut in 2001 - 2004 in kg km$^{-2}$

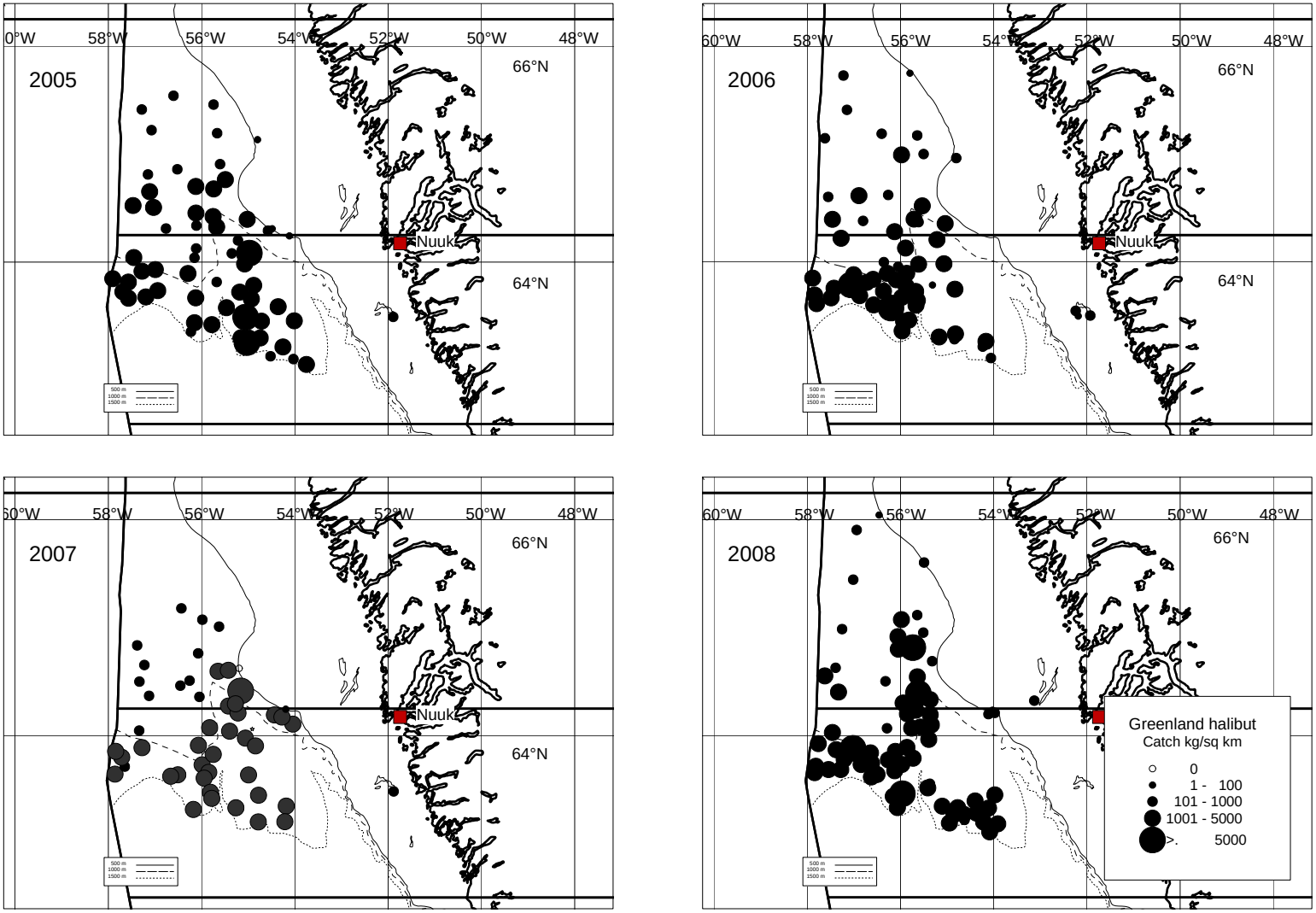


Fig. 1 (cont). Distribution of catches of Greenland halibut in 2005 - 2008 in kg km$^{-2}$

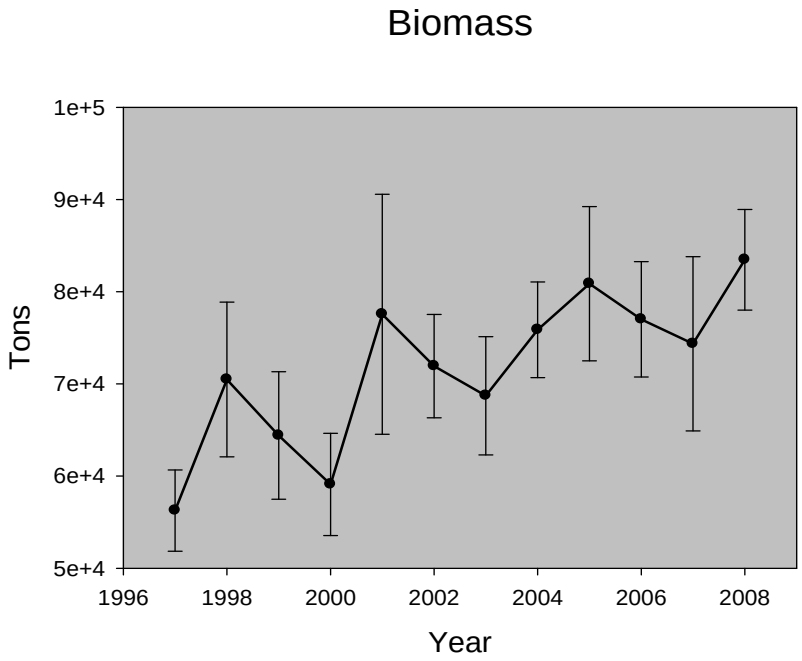


Fig. 2. Biomass (tons) of Greenland halibut by year with S.E.

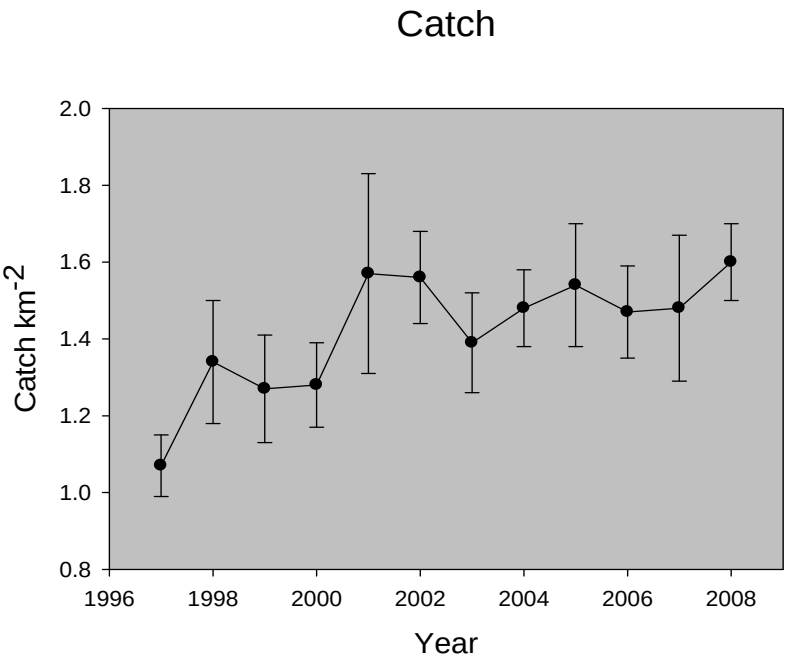


Fig. 3. Mean catch of Greenland halibut per sq. km (tons) standardized by stratum area with S.E.

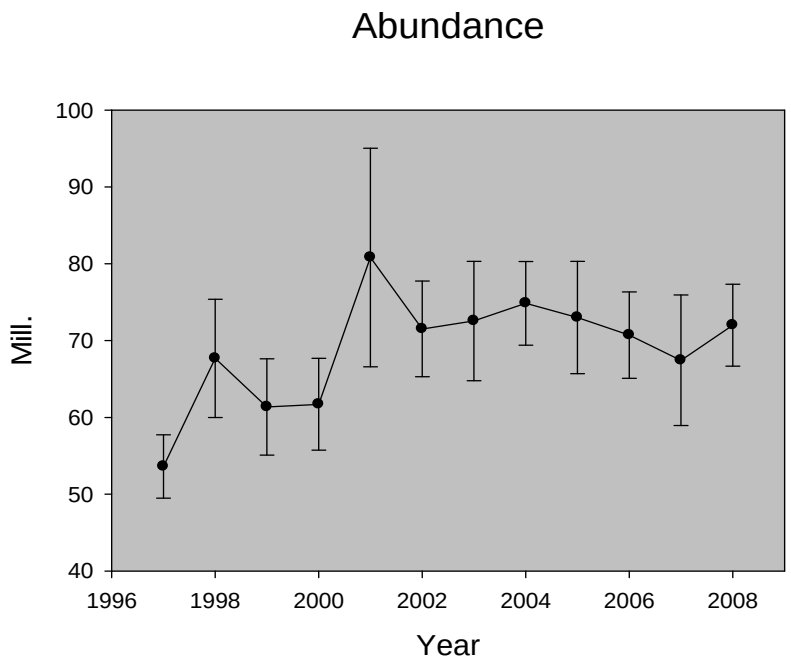


Fig. 4. Abundance (millions) of Greenland halibut by year with S.E..

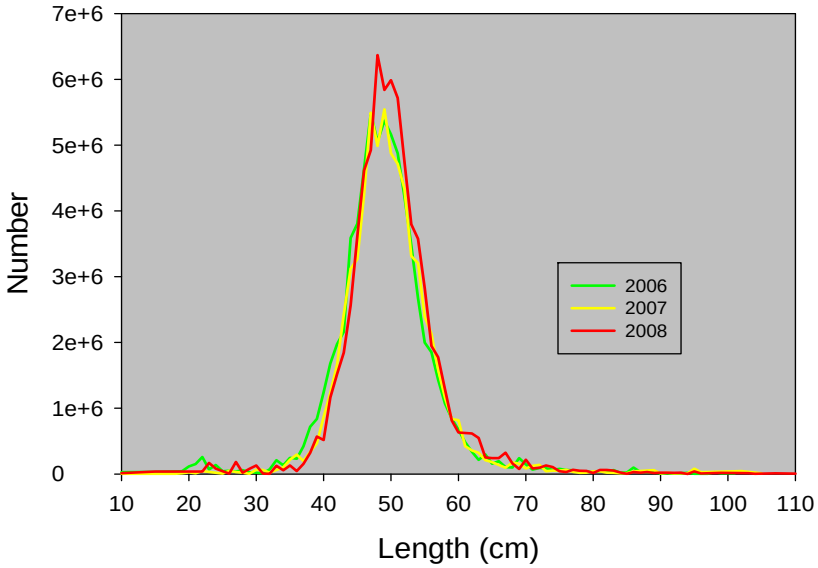


Fig. 5. Over all length distribution of Greenland halibut in numbers (weighted by stratum area) by year.

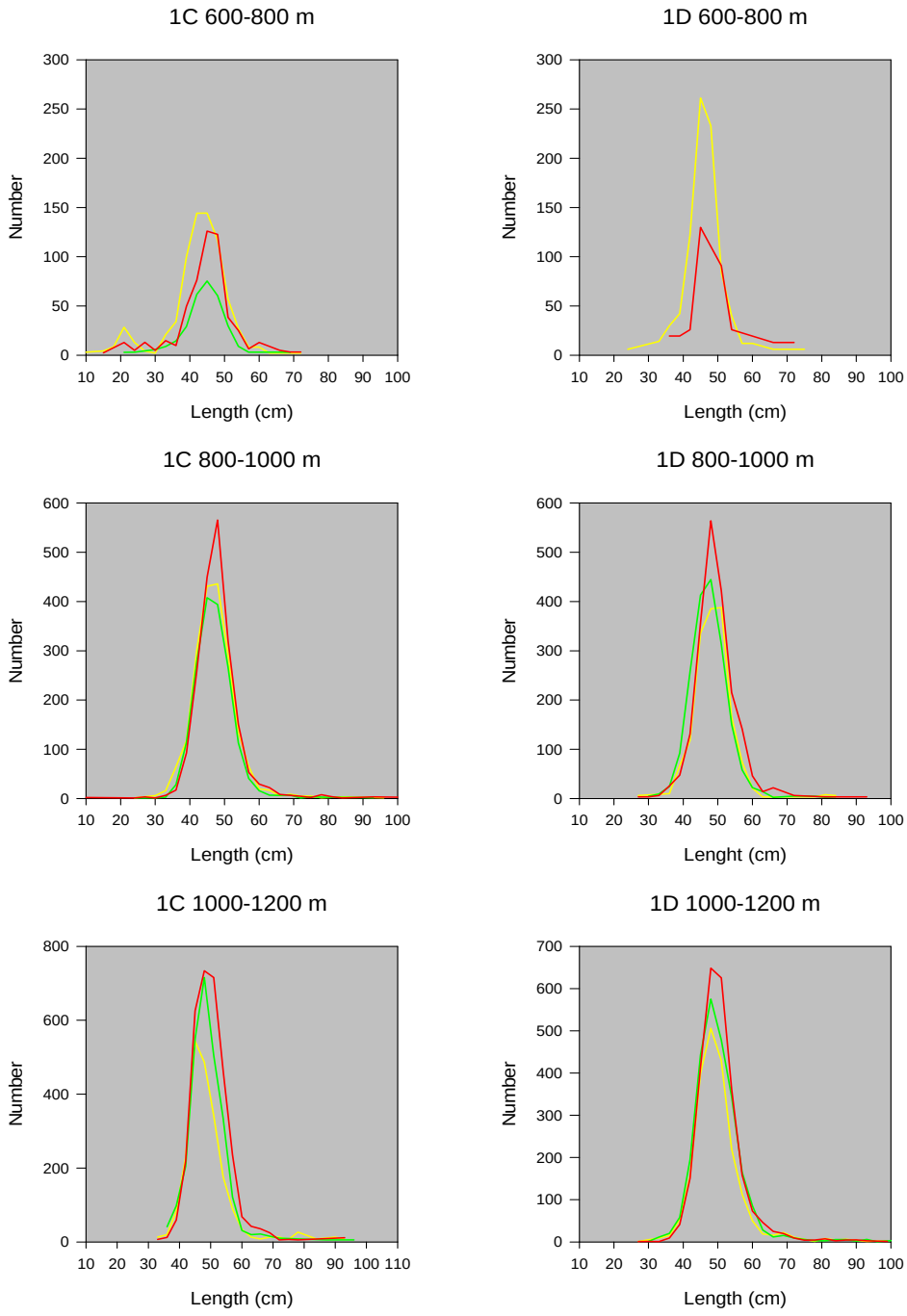


Fig. 6. Length distribution of Greenland halibut in numbers km$^{-2}$ by Division and depth stratum. Div 1CD 600-1200 m.

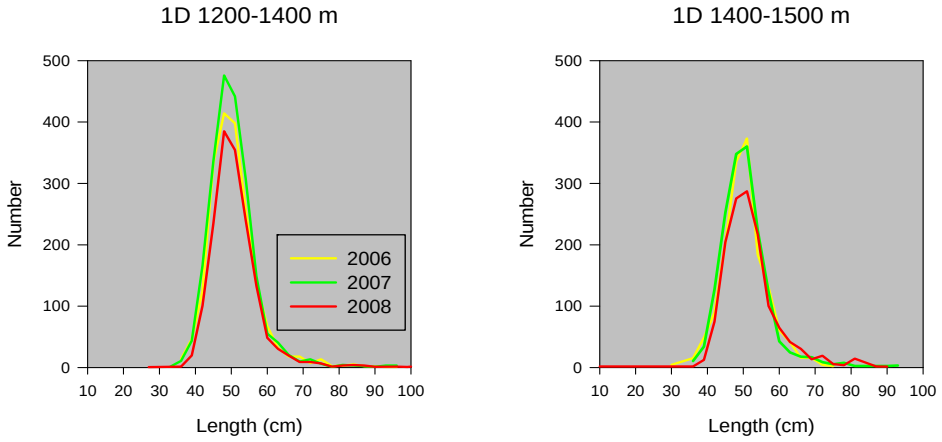


Fig. 6. cont. Length distribution of Greenland halibut in numbers km$^{-2}$ by Division and depth stratum. Div. 1D 1200-1500 m.

**Roundnose grenadier (*Coryphaenoides rupestris*)**

Roundnose grenadier was caught in most of the survey area but the catches were very low (Fig. 7, Appendix 1). The biomass has been very low for more than a decade (Table 4) and far below the level seen in the late 80'. The biomass in the 2008 survey was estimated as 546.1 tons which is a decrease from 838 tons in 2007 and the lowest on record. Most of the biomass was found in Div 1D 1201-1500 m (Table 5).

The abundance in Div. 1C-1D was estimated at 4.75 *$10^6$ which is a decrease compared to 13.162*$10^6$ in 2007 and the lowest on record and very low level compared to the early 90'ies (Table 6) and especially the late 80'ies (Jørgensen 1998a). The highest densities were found in Div. 1D 601-800 m.

Table 4. 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 |

Table 5. Biomass (tons) of roundnose grenadier by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Biomass | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 0.0000 | 0.0 | 0.0 |
| | 601-800 | 16120 | 5 | 0.0015 | 25.0 | 14.5 |
| | 801-1000 | 6066 | 11 | 0.0048 | 29.2 | 16.2 |
| | 1001-1200 | 611 | 2 | 0.0090 | 5.5 | 3.1 |
| 1D | 401-600 | 903 | 2 | 0.0033 | 3.0 | 3.0 |
| | 601-800 | 1940 | 2 | 0.0154 | 30.0 | 13.0 |
| | 801-1000 | 3874 | 4 | 0.0062 | 24.2 | 12.1 |
| | 1001-1200 | 10140 | 18 | 0.0070 | 71.5 | 14.7 |
| | 1201-1400 | 6195 | 16 | 0.0264 | 163.3 | 26.4 |
| | 1401-1500 | 3091 | 7 | 0.0629 | 194.5 | 70.0 |
| All | | | | 0.0104 | 546.1 | 81.3 |

Table 6. Abundance of roundnose grenadier by Division and depth stratum, 2008.

| Div. | Deoth (m) | Area | Hauls | Mean | Abundace | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 0.0 | 0 | 0 |
| | 601-800 | 16120 | 5 | 21.0 | 338509 | 149756 |
| | 801-1000 | 6066 | 11 | 90.6 | 549792 | 339149 |
| | 1001-1200 | 611 | 2 | 160.8 | 98233 | 49037 |
| 1D | 401-600 | 903 | 2 | 20.0 | 18031 | 18031 |
| | 601-800 | 1940 | 2 | 383.2 | 743430 | 290371 |
| | 801-1000 | 3874 | 4 | 73.0 | 282858 | 155281 |
| | 1001-1200 | 10140 | 18 | 96.8 | 981810 | 178313 |
| | 1201-1400 | 6195 | 16 | 150.0 | 928956 | 161838 |
| | 1401-1500 | 3091 | 7 | 261.2 | 807394 | 421622 |
| All | | | | 90.8 | 4749012 | 695958 |

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 6 cm as in 2006-2007 (Fig. 8).

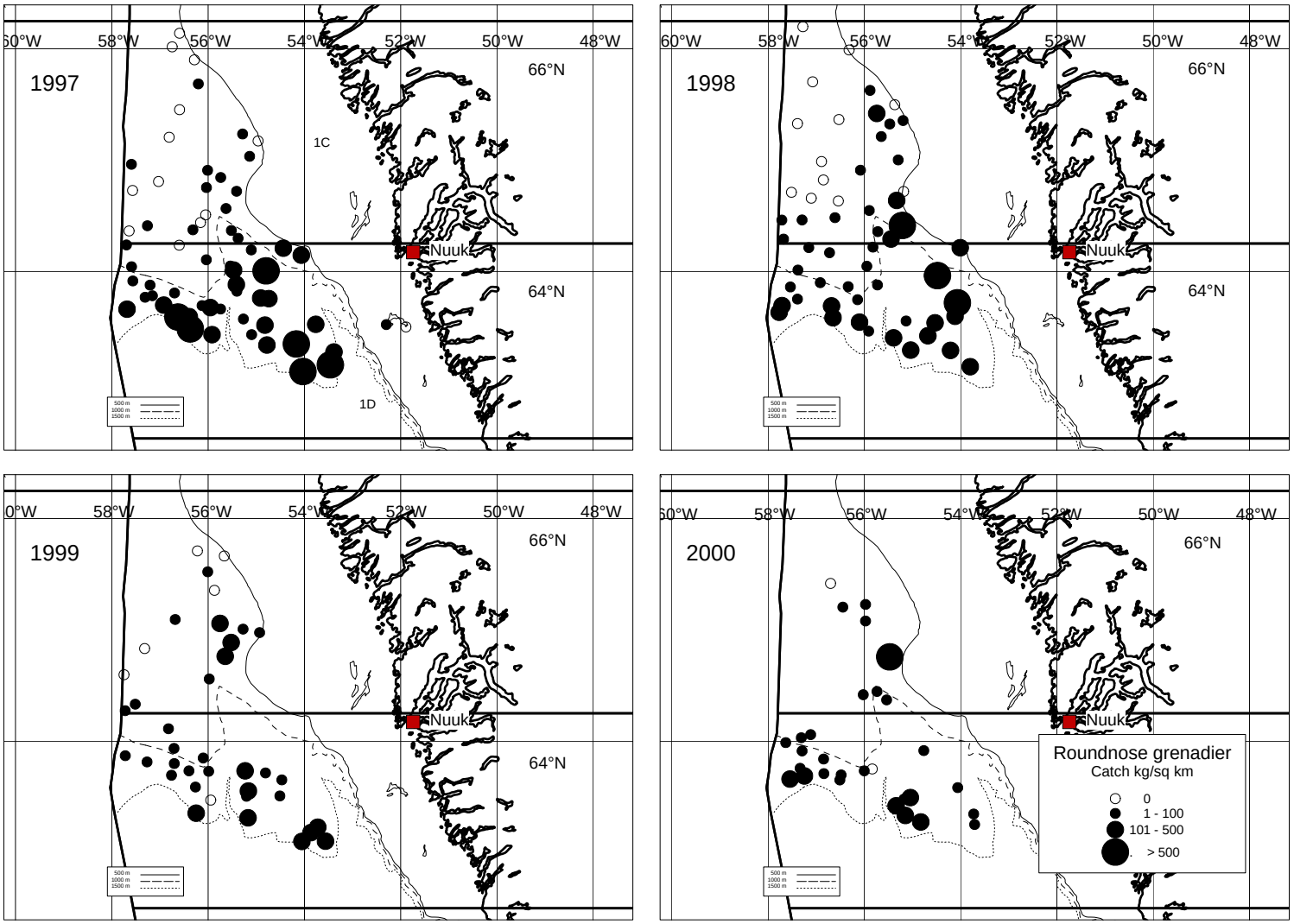


Fig. 7. Distribution of catches of roundnose grenadier in 1997-2000 in kg km$^{-}$

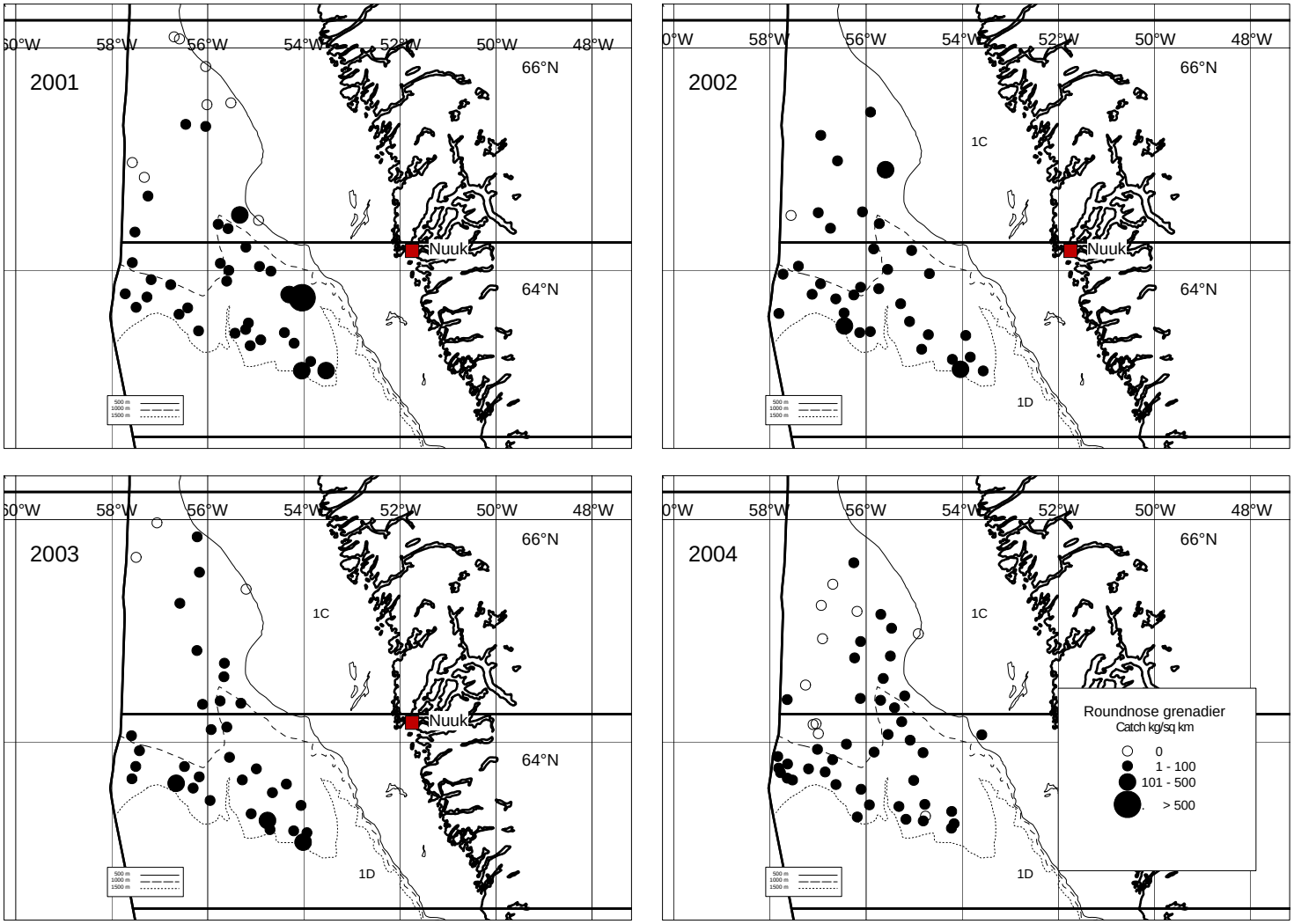


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Fig. 7 cont. Distribution of catches of roundnose grenadier during 2001-2004.

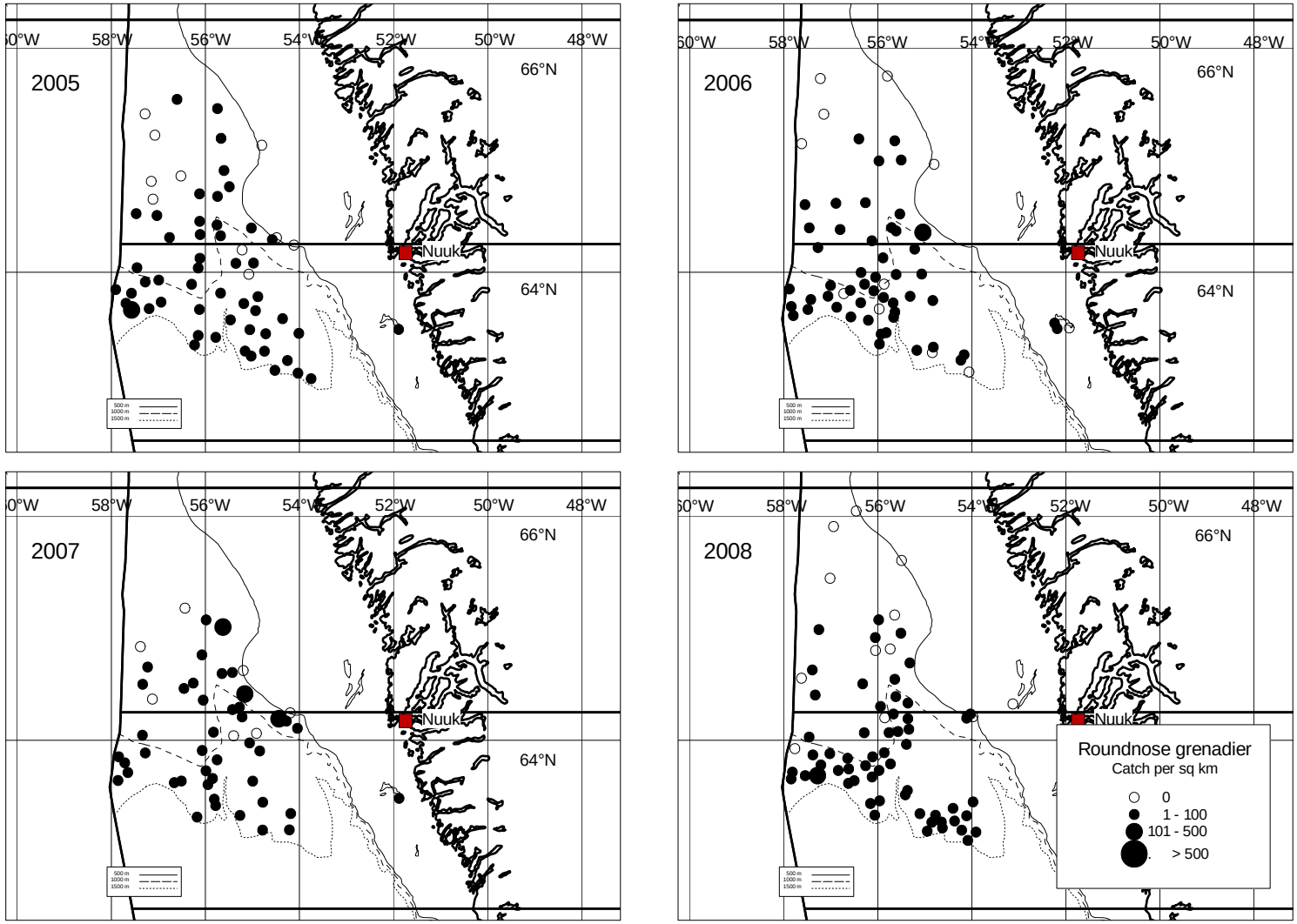


Fig. 7 cont. Distribution of catches of roundnose grenadier during 2005-2008.

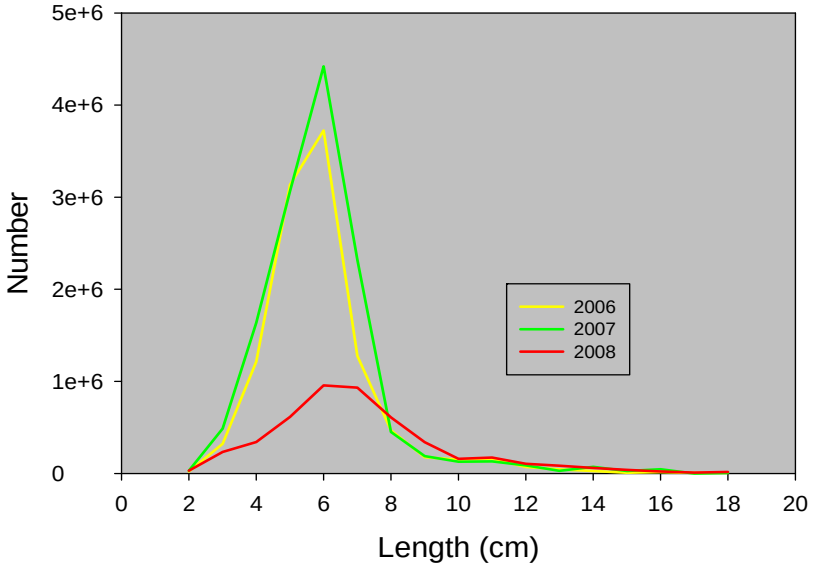


Fig. 8. Overall length distribution of roundnose grenadier (pre anal fin length) in numbers (weighted by stratum area) by year.

**Roughhead grenadier (*Macrourus berglax*)**

Roughead grenadier was caught in all hauls except two. The catches were, however, generally low (Fig. 9, Appendix 1). The biomass was estimated at 4533.7 tons which a slight increase from 3467.6 tons in 2007 but still about 500 tons below the average for the time series (Table 7).

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 8) as in 2007. The biomass increased in all strata except in Div. 1D 1001-1200 m.

Table 7. 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 |

Table 8. Biomass (tons) of roughhead grenadier by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Biomass | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 0.0109 | 36.8 | 32.6 |
| | 601-800 | 16120 | 5 | 0.0923 | 1487.1 | 935.9 |
| | 801-1000 | 6066 | 11 | 0.1210 | 733.7 | 200.9 |
| | 1001-1200 | 611 | 2 | 0.0431 | 26.3 | 6.6 |
| 1D | 401-600 | 903 | 2 | 0.0811 | 73.2 | 0.2 |
| | 601-800 | 1940 | 2 | 0.1112 | 215.7 | 10.8 |
| | 801-1000 | 3874 | 4 | 0.0442 | 171.3 | 68.9 |
| | 1001-1200 | 10140 | 18 | 0.0639 | 648.0 | 92.2 |
| | 1201-1400 | 6195 | 16 | 0.1007 | 623.9 | 78.5 |
| | 1401-1500 | 3091 | 7 | 0.1675 | 517.7 | 67.0 |
| All | | | | 0.0867 | 4533.7 | 970.2 |

Table 9. Abundance of roughhead grenadier by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Abundace | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 38.6 | 129902 | 73186 |
| | 601-800 | 16120 | 5 | 200.6 | 3233598 | 1264434 |
| | 801-1000 | 6066 | 11 | 260.0 | 1577071 | 346612 |
| | 1001-1200 | 611 | 2 | 107.3 | 65542 | 16452 |
| 1D | 401-600 | 903 | 2 | 249.6 | 225363 | 3029 |
| | 601-800 | 1940 | 2 | 298.6 | 579267 | 175833 |
| | 801-1000 | 3874 | 4 | 128.9 | 499474 | 120308 |
| | 1001-1200 | 10140 | 18 | 167.7 | 1700871 | 159790 |
| | 1201-1400 | 6195 | 16 | 175.6 | 1087898 | 113416 |
| | 1401-1500 | 3091 | 7 | 273.0 | 843888 | 156430 |
| All | | | | 190.1 | 9942874 | 1353819 |

The total abundance was estimated at $9.94*10^6$ which is a slight increase compared to $8.185*10^6$ in 2007 (Table 9) but the second lowest observed since 1997 (Table 7).

Pre anal fin length ranged from 3 to 41 cm and the over all length distribution was dominated by a mode at 17 cm (Fig. 10).

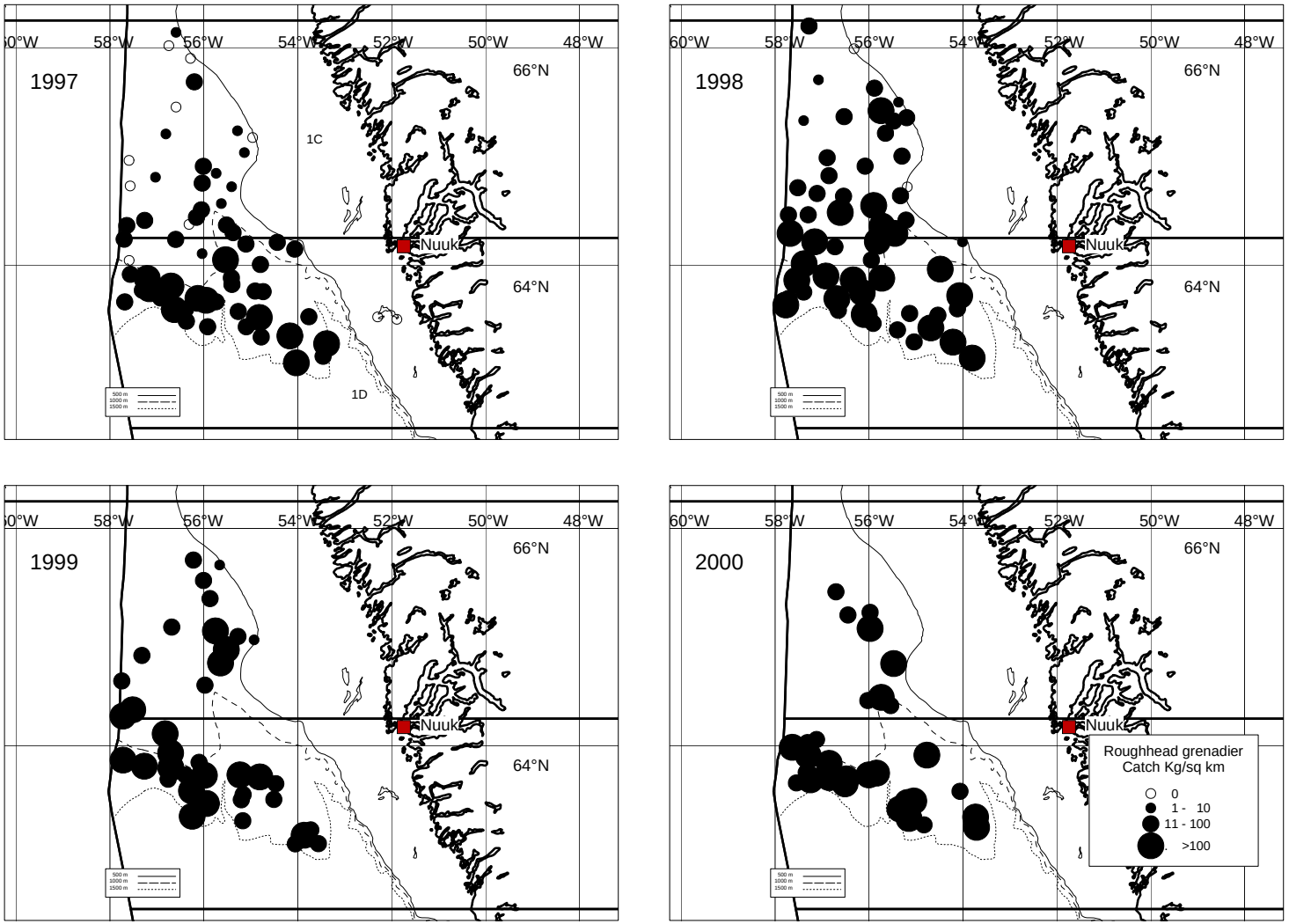


Fig. 9. Distribution of catches of roughhead grenadier in 1997-2000 in kg $km^{-2}$.

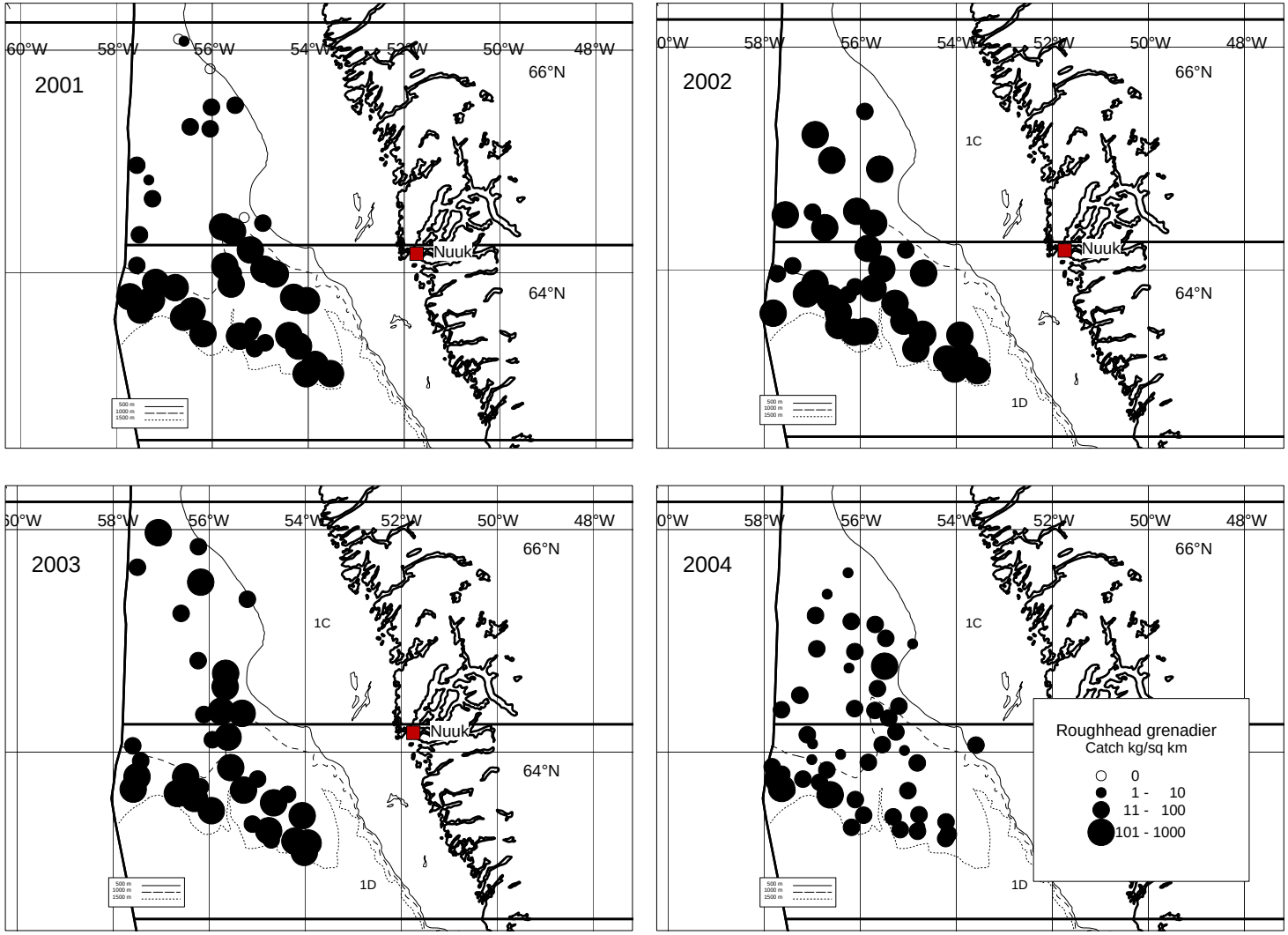


Fig. 9 cont.. Distribution of catches of roughhead grenadier during 2001-2004

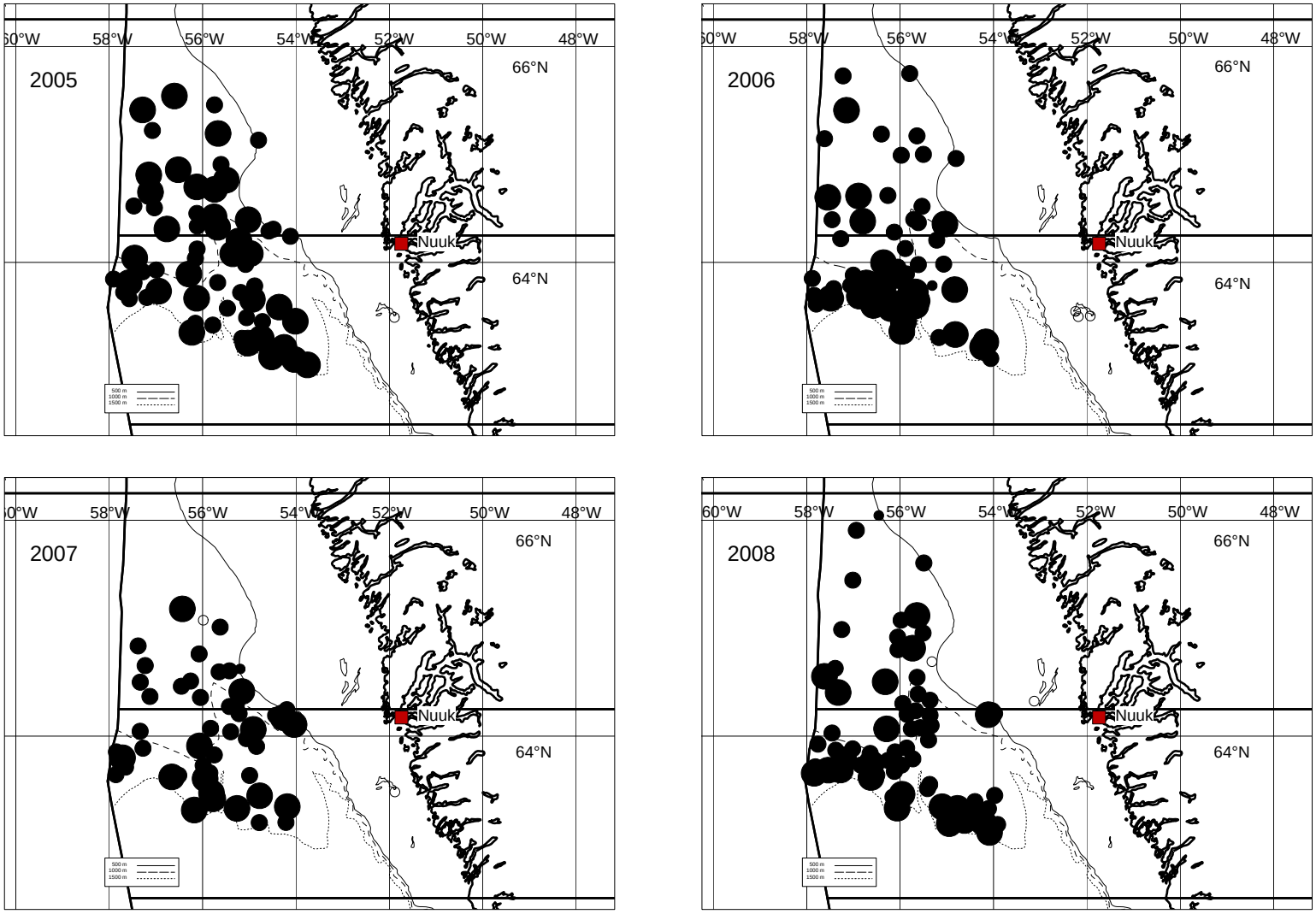


Fig. 9 cont.. Distribution of catches of roughhead grenadier during 2005-2008

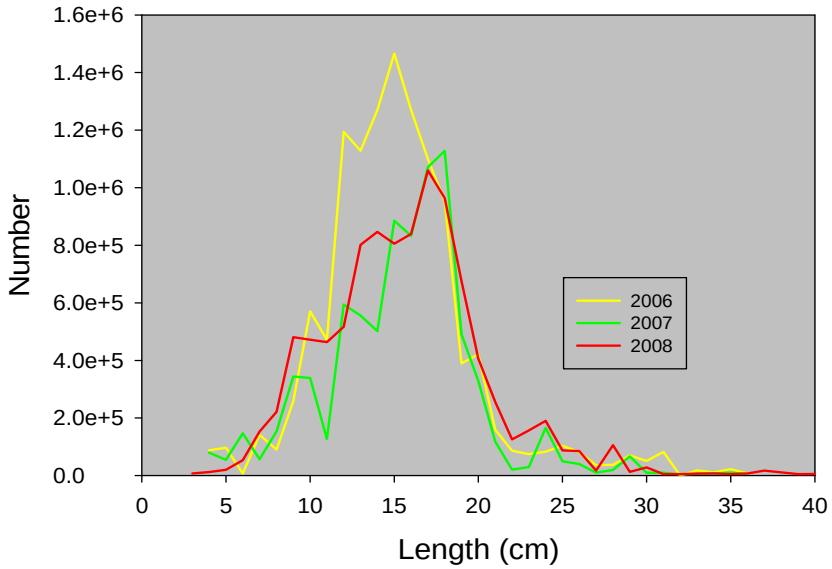


Fig. 10. Overall length distribution (pre anal fin length) of roughhead grenadier in numbers (weighted by stratum area) by year.

**Deep-sea redfish (*Sebastes mentella*)**

Deep-sea redfish + *Sebastes* sp. was caught in 26 of the 70 valid hauls. The biomass was estimated at 13199.0 tons compared to only 574.2 tons in 2007 where the coverage of relevant depths, however, was poor (Table 10). The Biomass estimate is to a large extend driven by a few large catches (Appendix1). Almost all the biomass was found at depths < 800 m and more than half of the biomass was found in Div. 1C 601-800 m, while the highest density was found in Div. 1D 4001-600 m. (Table 11)

The abundance was estimated at $52.94*10^6$ which is the highest in the time series. Allmost all the abundance was found in Div. 1C < 800 m with the highest density in at 401-600 m (Table 12).

The length ranged from 15 to 46 cm with a clear mode at 18 cm and a number of minor modes. The deep-sea redfish have not been aged, but the 18 cm mode probably represents age 2, but there were no sign of them as age one in 2007, further there are a number of old fish in 2008 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. 11).

Table 10. 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 | 6482.9 | 52.94 | 17.70 |

[1)]. Poor coverage of relevant depths.

Table 11. Biomass (tons) of Deep Sea Redfish by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Biomass | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 0.6753 | 2273.1 | 912.7 |
| | 601-800 | 16120 | 5 | 0.5064 | 8162.4 | 6335.1 |
| | 801-1000 | 6066 | 11 | 0.0027 | 16.1 | 8.4 |
| | 1001-1200 | 611 | 2 | 0 | 0.0 | 0.0 |
| 1D | 401-600 | 903 | 2 | 1.2646 | 1142.0 | 1029.2 |
| | 601-800 | 1940 | 2 | 0.8158 | 1582.7 | 48.4 |
| | 801-1000 | 3874 | 4 | 0.0012 | 4.5 | 4.5 |
| | 1001-1200 | 10140 | 18 | 0.0006 | 5.7 | 2.8 |
| | 1201-1400 | 6195 | 16 | 0.0014 | 8.4 | 4.0 |
| | 1401-1500 | 3091 | 7 | 0.0013 | 4.1 | 4.1 |
| All | | | | 0.2523 | 13199.0 | 6482.9 |

Table 12. Abundance of Deep Sea Redfish. by Division and depth stratum, 2008.

| Div. | Depth (m) | Area | Hauls | Mean | Abundace | SE |
|---|---|---|---|---|---|---|
| 1C | 401-600 | 3366 | 3 | 6486.3 | 21832939 | 9689299 |
| | 601-800 | 16120 | 5 | 1423.4 | 22944451 | 14427324 |
| | 801-1000 | 6066 | 11 | 10.0 | 60746 | 30208 |
| | 1001-1200 | 611 | 2 | 0.0 | 0 | 0 |
| 1D | 401-600 | 903 | 2 | 4424.3 | 3995122 | 3333989 |
| | 601-800 | 1940 | 2 | 2071.1 | 4018030 | 160187 |
| | 801-1000 | 3874 | 4 | 5.2 | 20168 | 20168 |
| | 1001-1200 | 10140 | 18 | 2.7 | 27642 | 12547 |
| | 1201-1400 | 6195 | 16 | 4.1 | 25513 | 12116 |
| | 1401-1500 | 3091 | 7 | 4.4 | 13656 | 13656 |
| All | | | | 1012.1 | 52938267 | 17696699 |

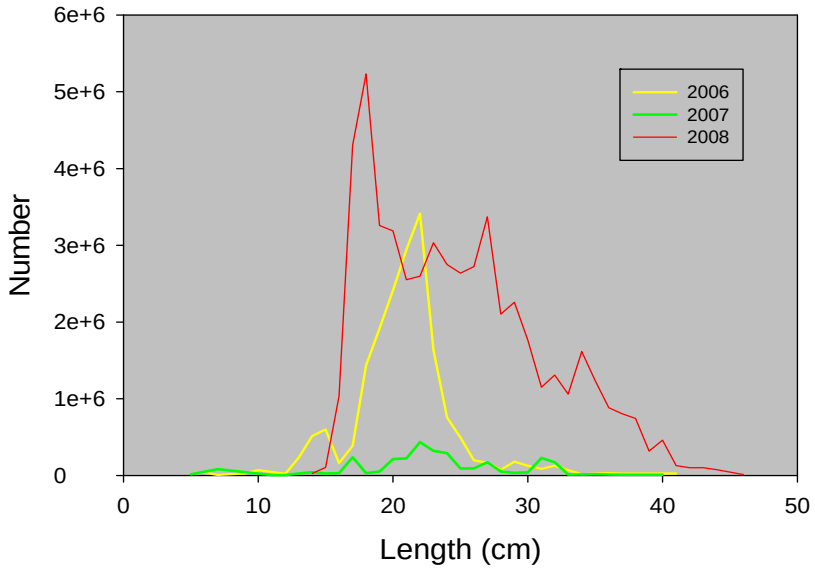


Fig. 11. Overall length distribution (pre anal fin length) of deep sea redfish in numbers (weighted by stratum area) by year.

**Temperature**

The bottom temperature ranged from 3.6°C to 5.0°C, the same range as in 2007. The over all mean temperature decreased, however, from 4.3°C to 3.8°C which is close to the level seen in previous years. The mean temperature was generally decreasing by depth (Table 13).

The mean temperatures decreased in all strata by 0.4 to 1.0 °C except in Div. 1D 401-600 m where there was an increase on 0.1 °C.

Table 13. 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 | .14 | 3 | 3.6 | .32 | 5 | 3.8 | .05 | 11 | 3.9 | .11 | 2 | | | | | | |
| 1D | 5.0 | .06 | 2 | 4.4 | .55 | 2 | 3.8 | .02 | 4 | 3.7 | .02 | 18 | 3.6 | .02 | 16 | 3.6 | .02 | 7 |

**Tagging of Greenland halibut**

Greenland halibut were caught in a fish lift and in total 1614 Greenland halibut were tagged with yellow floy-tags in Div. 1C.

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**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. | | Redfish | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St. No | S. Area | Div. | Depth | Temp. | Weight | Number | Weight | Number | Weight | Number | Weight | Number |
| 1 | 0.0528 | 1D | 545.0 | 5.0 | 5.5 | 4 | 0.0 | 0 | 4.3 | 13 | 127.0 | 429 |
| 2 | 0.0751 | 1D | 439.0 | 5.1 | 0.9 | 2 | 0.5 | 3 | 6.1 | 19 | 9.4 | 55 |
| 3 | 0.0769 | 1D | 718.0 | 4.9 | 10.2 | 13 | 1.7 | 41 | 8.1 | 16 | 60.9 | 153 |
| 5 | 0.0745 | 1C | 1063.5 | 4.0 | 155.3 | 126 | 0.3 | 6 | 4.0 | 10 | 0.0 | 0 |
| 6 | 0.0871 | 1C | 1050.0 | 3.8 | 497.7 | 423 | 1.2 | 21 | 2.8 | 7 | 0.0 | 0 |
| 7 | 0.0869 | 1C | 985.0 | 3.9 | 231.3 | 210 | 0.8 | 11 | 4.9 | 17 | 0.0 | 0 |
| 9 | 0.0422 | 1C | 696.5 | 4.6 | 6.4 | 5 | 0.2 | 2 | 0.0 | 0 | 87.0 | 202 |
| 11 | 0.0425 | 1C | 903.5 | 3.8 | 310.5 | 302 | 0.0 | 0 | 9.1 | 11 | 0.0 | 0 |
| 12 | 0.0839 | 1C | 898.5 | 3.9 | 157.8 | 205 | 0.0 | 0 | 3.9 | 13 | 0.0 | 0 |
| 13 | 0.0820 | 1C | 861.0 | 3.9 | 101.4 | 102 | 0.1 | 2 | 2.9 | 9 | 0.4 | 2 |
| 14 | 0.0584 | 1C | 836.5 | 4.0 | 52.2 | 45 | 1.7 | 37 | 5.8 | 15 | 0.6 | 1 |
| 15 | 0.0581 | 1C | 823.5 | 3.5 | 67.0 | 70 | 0.1 | 2 | 2.6 | 11 | 0.1 | 1 |
| 16 | 0.0358 | 1C | 817.5 | 3.8 | 21.1 | 18 | 0.0 | 0 | 14.3 | 27 | 0.0 | 0 |
| 17 | 0.0399 | 1C | 545.5 | 4.8 | 12.7 | 11 | 0.0 | 0 | 1.2 | 3 | 27.7 | 221 |
| 18 | 0.0247 | 1C | 560.5 | 4.4 | 2.3 | 3 | 0.0 | 0 | 0.1 | 1 | 28.0 | 293 |
| 19 | 0.0396 | 1C | 673.5 | 2.7 | 12.9 | 15 | 0.0 | 0 | 1.6 | 4 | 1.5 | 13 |
| 20 | 0.0825 | 1C | 649.0 | 3.2 | 47.2 | 68 | 0.0 | 0 | 4.6 | 18 | 27.5 | 145 |
| 21 | 0.0793 | 1C | 752.5 | 3.5 | 40.3 | 46 | 0.1 | 2 | 3.4 | 17 | 0.7 | 4 |
| 22 | 0.0824 | 1C | 809.0 | 3.9 | 35.8 | 38 | 0.1 | 3 | 4.5 | 14 | 0.0 | 0 |
| 23 | 0.0583 | 1C | 806.5 | 3.9 | 73.7 | 78 | 0.0 | 0 | 9.8 | 27 | 0.8 | 3 |
| 24 | 0.0782 | 1C | 835.0 | 3.9 | 102.0 | 97 | 0.2 | 2 | 12.0 | 14 | 0.0 | 0 |
| 25 | 0.0779 | 1D | 969.0 | 3.8 | 130.1 | 122 | 0.1 | 1 | 7.5 | 17 | 0.0 | 0 |
| 26 | 0.0828 | 1D | 1098.5 | 3.8 | 229.7 | 199 | 0.0 | 0 | 3.4 | 8 | 0.3 | 1 |
| 27 | 0.0756 | 1D | 1164.0 | 3.7 | 270.7 | 253 | 0.1 | 1 | 3.1 | 9 | 0.0 | 0 |
| 28 | 0.0816 | 1D | 1111.5 | 3.5 | 429.8 | 378 | 0.1 | 2 | 2.4 | 15 | 0.1 | 1 |
| 29 | 0.0819 | 1D | 1318.0 | 3.5 | 211.6 | 189 | 1.4 | 4 | 11.4 | 11 | 0.3 | 1 |
| 30 | 0.0860 | 1D | 1420.0 | 3.6 | 109.3 | 81 | 3.0 | 13 | 13.1 | 18 | 0.0 | 0 |
| 31 | 0.0381 | 1D | 1338.5 | 3.4 | 58.3 | 50 | 1.1 | 14 | 3.6 | 6 | 0.0 | 0 |
| 32 | 0.0767 | 1D | 1453.5 | 3.5 | 170.5 | 131 | 5.3 | 16 | 8.0 | 20 | 0.0 | 0 |
| 33 | 0.0869 | 1D | 1457.5 | 3.5 | 335.2 | 240 | 16.5 | 93 | 21.7 | 39 | 0.0 | 0 |
| 34 | 0.0740 | 1D | 1439.0 | 3.6 | 110.2 | 98 | 4.2 | 12 | 17.4 | 30 | 0.0 | 0 |
| 35 | 0.0828 | 1D | 1352.5 | 3.5 | 122.2 | 97 | 2.2 | 7 | 5.7 | 15 | 0.0 | 0 |
| 36 | 0.0796 | 1D | 1344.5 | 3.5 | 137.6 | 117 | 4.4 | 14 | 4.1 | 10 | 0.0 | 0 |
| 37 | 0.0872 | 1D | 1238.5 | 3.6 | 260.5 | 214 | 2.4 | 15 | 15.9 | 23 | 0.0 | 0 |
| 38 | 0.0786 | 1D | 1088.0 | 3.8 | 228.4 | 203 | 0.2 | 5 | 4.8 | 14 | 0.2 | 1 |
| 39 | 0.0888 | 1D | 1079.0 | 3.8 | 270.8 | 225 | 0.3 | 2 | 4.9 | 16 | 0.0 | 0 |
| 40 | 0.0838 | 1D | 1170.0 | 3.7 | 297.7 | 250 | 0.3 | 4 | 8.2 | 24 | 0.0 | 0 |
| 41 | 0.0816 | 1D | 1234.5 | 3.7 | 117.0 | 93 | 0.1 | 2 | 4.5 | 11 | 0.0 | 0 |
| 42 | 0.0781 | 1D | 1354.0 | 3.6 | 111.8 | 95 | 0.4 | 2 | 11.2 | 25 | 0.0 | 0 |
| 43 | 0.0806 | 1D | 1189.0 | 3.6 | 436.3 | 353 | 0.6 | 6 | 15.0 | 18 | 0.0 | 0 |
| 45 | 0.0503 | 1D | 1274.0 | 3.6 | 71.6 | 56 | 0.8 | 2 | 1.0 | 3 | 0.0 | 0 |
| 46 | 0.0838 | 1D | 1226.0 | 3.6 | 79.3 | 46 | 0.7 | 4 | 2.8 | 4 | 0.0 | 0 |
| 47 | 0.0825 | 1D | 1274.5 | 3.6 | 263.2 | 184 | 4.5 | 23 | 8.7 | 20 | 0.0 | 0 |
| 48 | 0.0827 | 1D | 1225.5 | 3.6 | 170.6 | 130 | 2.5 | 21 | 9.8 | 14 | 0.6 | 2 |
| 49 | 0.0641 | 1D | 1317.0 | 3.6 | 188.8 | 141 | 2.8 | 15 | 5.9 | 10 | 0.0 | 0 |
| 50 | 0.0665 | 1D | 1412.5 | 3.5 | 98.2 | 78 | 3.0 | 5 | 7.3 | 11 | 0.0 | 0 |
| 51 | 0.0786 | 1D | 1327.0 | 3.6 | 92.3 | 73 | 1.2 | 11 | 8.0 | 11 | 0.0 | 0 |
| 52 | 0.0647 | 1D | 1420.5 | 3.6 | 60.2 | 41 | 0.1 | 3 | 9.2 | 5 | 0.6 | 2 |
| 53 | 0.0785 | 1D | 1428.5 | 3.6 | 122.2 | 85 | 3.5 | 9 | 14.2 | 27 | 0.0 | 0 |
| 54 | 0.0866 | 1D | 1246.5 | 3.7 | 219.5 | 154 | 1.6 | 9 | 7.5 | 19 | 0.4 | 1 |
| 56 | 0.0730 | 1D | 1264.0 | 3.6 | 156.3 | 128 | 1.8 | 11 | 15.2 | 19 | 0.0 | 0 |
| 57 | 0.0557 | 1D | 1218.0 | 3.6 | 193.5 | 146 | 2.8 | 14 | 6.3 | 11 | 0.4 | 1 |
| 58 | 0.0347 | 1D | 1158.5 | 3.7 | 47.8 | 44 | 0.3 | 8 | 1.4 | 5 | 0.0 | 0 |
| 59 | 0.0392 | 1D | 1107.0 | 3.7 | 72.0 | 49 | 0.1 | 4 | 3.3 | 11 | 0.0 | 0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 0.0385 | 1D | 1062.0 | 3.7 | 68.8 | 61 | 0.2 | 3 | 1.5 | 5 | 0.0 | 0 |
| 63 | 0.0705 | 1D | 1084.0 | 3.8 | 256.2 | 188 | 0.9 | 10 | 3.8 | 12 | 0.0 | 0 |
| 64 | 0.0841 | 1D | 1187.0 | 3.6 | 203.1 | 169 | 0.4 | 3 | 6.8 | 9 | 0.0 | 0 |
| 65 | 0.0444 | 1D | 936.5 | 3.8 | 93.7 | 85 | 0.5 | 5 | 0.7 | 4 | 0.0 | 0 |
| 66 | 0.0839 | 1D | 1027.5 | 3.8 | 236.3 | 191 | 1.6 | 15 | 3.1 | 12 | 0.0 | 0 |
| 68 | 0.0480 | 1D | 982.0 | 3.8 | 120.0 | 106 | 0.6 | 8 | 1.2 | 4 | 0.2 | 1 |
| 69 | 0.0452 | 1D | 1138.0 | 3.7 | 182.3 | 139 | 0.2 | 3 | 4.3 | 11 | 0.0 | 0 |
| 70 | 0.0508 | 1D | 1140.0 | 3.7 | 126.8 | 98 | 0.8 | 10 | 4.8 | 13 | 0.0 | 0 |
| 71 | 0.0857 | 1D | 1053.5 | 3.8 | 346.9 | 265 | 1.4 | 15 | 3.9 | 8 | 0.0 | 0 |
| 72 | 0.0832 | 1D | 1150.0 | 3.8 | 154.4 | 124 | 0.4 | 6 | 4.3 | 10 | 0.2 | 1 |
| 73 | 0.0773 | 1D | 1058.5 | 3.7 | 356.6 | 280 | 1.3 | 17 | 1.6 | 5 | 0.0 | 0 |
| 74 | 0.0805 | 1D | 973.0 | 3.7 | 214.3 | 191 | 0.0 | 0 | 3.2 | 10 | 0.0 | 0 |
| 75 | 0.0773 | 1C | 959.0 | 3.7 | 297.9 | 258 | 0.7 | 9 | 4.5 | 10 | 0.0 | 0 |
| 76 | 0.0385 | 1D | 715.0 | 3.8 | 30.0 | 28 | 0.3 | 9 | 4.5 | 15 | 32.4 | 83 |
| 77 | 0.0618 | 1C | 764.5 | 3.8 | 50.3 | 47 | 0.1 | 2 | 19.9 | 29 | 5.6 | 12 |
| 78 | 0.0716 | 1C | 417.0 | 4.3 | 8.0 | 6 | 0.0 | 0 | 0.0 | 0 | 14.1 | 146 |

**Appendix 2.** List of species and groups of species recorded in Div. 1C-D in 2007 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 | species | | maxwgt | maxno | mindepth | maxdepth | mintemp | maxtemp | maxpos |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ARS | Agentina silus | 5.9 | 25 | 439.0 | 545.5 | 4.8 | 5.1 | 65.6042 |
| 2 | ALA | Alepocephalus agassizzi | 48.8 | 105 | 959.0 | 1457.5 | 3.4 | 3.7 | 64.3025 |
| 3 | ALB | Alepocephalus bairdii | 1.5 | 28 | 718.0 | 718.0 | 4.9 | 4.9 | 64.1989 |
| 4 | RRD | Amblyraja radiata | 1.1 | 5 | 417.0 | 439.0 | 4.3 | 5.1 | 64.3244 |
| 5 | SAN | Ammodytes sp. | 0.0 | 1 | 649.0 | 649.0 | 3.2 | 3.2 | 65.4447 |
| 6 | CAD | Anarhichas denticulatus | 20.6 | 2 | 439.0 | 1274.0 | 3.5 | 5.1 | 64.8009 |
| 7 | ANC | Anopologaster cornuta | 0.1 | 1 | 1053.5 | 1053.5 | 3.8 | 3.8 | 64.0785 |
| 8 | ANT | Antimora rostrata | 35.4 | 93 | 715.0 | 1457.5 | 3.4 | 4.0 | 65.1173 |
| 9 | ARZ | Arctozenius rissoi | 0.1 | 1 | 417.0 | 1079.0 | 3.2 | 4.9 | 65.4447 |
| 10 | BAM | Bajacalifornia megalops | 0.4 | 1 | 1238.5 | 1264.0 | 3.6 | 3.6 | 63.7451 |
| 11 | BAT | Bathylagus euryops | 7.6 | 138 | 649.0 | 1457.5 | 2.7 | 4.0 | 65.9065 |
| 12 | BSP | Bathyraja spinicauda | 15.2 | 1 | 1027.5 | 1238.5 | 3.6 | 3.8 | 63.8901 |
| 13 | BEG | Benthosema glaciale | 0.1 | 34 | 417.0 | 1420.5 | 2.7 | 4.8 | 66.0444 |
| 14 | BOA | Borostomias antarctica | 0.4 | 12 | 696.5 | 1453.5 | 3.4 | 4.6 | 64.8009 |
| 15 | USK | Brosme Brosme | 1.3 | 1 | 439.0 | 439.0 | 5.1 | 5.1 | 64.2348 |
| 16 | CFB | Centroscyllium fabricii | 20.0 | 23 | 545.0 | 1318.0 | 3.5 | 5.0 | 65.6042 |
| 17 | CHO | Ceratias holboelli | 0.3 | 1 | 1317.0 | 1317.0 | 3.6 | 3.6 | 63.2692 |
| 18 | CHA | Chauliodus sloani | 0.1 | 2 | 752.5 | 1354.0 | 3.5 | 3.8 | 64.9873 |
| 19 | CHN | Chiasmodon niger | 0.2 | 3 | 806.5 | 1439.0 | 3.4 | 4.0 | 64.9553 |
| 20 | CBB | Coryphaenoides brevibarbis | 0.7 | 9 | 1170.0 | 1457.5 | 3.4 | 3.7 | 63.7813 |
| 21 | CGR | Coryphaenoides guntheri | 8.5 | 61 | 545.0 | 1457.5 | 3.4 | 5.0 | 64.8146 |
| 22 | RNG | Coryphaenoides rupestris | 16.5 | 93 | 439.0 | 1457.5 | 3.4 | 5.1 | 65.0749 |
| 23 | COM | Cottunculus microps | 0.3 | 2 | 649.0 | 982.0 | 3.2 | 3.9 | 65.4447 |
| 24 | COS | Cottunculus sadko | 0.0 | 1 | 673.5 | 1317.0 | 2.7 | 3.6 | 65.9065 |
| 25 | COT | Cottunculus thomsonii | 2.0 | 4 | 673.5 | 1187.0 | 2.7 | 4.0 | 65.9065 |
| 26 | CCO | Cryptosares couesi | 0.3 | 1 | 1158.5 | 1158.5 | 3.7 | 3.7 | 63.3944 |
| 27 | LUM | Cyclopterus lumpus | 1.8 | 1 | 439.0 | 936.5 | 3.8 | 5.1 | 64.2348 |
| 28 | CLM | Cyclothone microdon | 0.0 | 12 | 696.5 | 1420.5 | 3.5 | 4.6 | 64.6903 |
| 29 | EUR | Eurypharynx pelecanoides | 0.2 | 1 | 898.5 | 1225.5 | 3.6 | 3.9 | 64.8009 |
| 30 | COD | Gadus morhua | 185.4 | 439 | 417.0 | 649.0 | 3.2 | 5.1 | 65.4447 |
| 31 | ONA | Gaidropsarus argentatus | 0.4 | 4 | 649.0 | 1238.5 | 3.2 | 3.9 | 65.4447 |
| 32 | ONN | Gaidropsaurus ensis | 6.4 | 11 | 649.0 | 1457.5 | 2.7 | 3.9 | 65.9065 |
| 33 | WIT | Glyptocephalus cynoglossus | 1.0 | 2 | 752.5 | 836.5 | 3.5 | 4.0 | 65.1173 |
| 34 | GOB | Gonostoma bathyphilum | 0.0 | 1 | 752.5 | 1327.0 | 3.5 | 3.8 | 64.9873 |
| 35 | PLA | Hippoglossoides platessoides | 6.6 | 41 | 417.0 | 817.5 | 2.7 | 5.1 | 66.0444 |
| 36 | HOA | Holtbyrnia anomala | 0.3 | 4 | 1140.0 | 1453.5 | 3.5 | 3.8 | 64.1933 |
| 37 | HAT | Hoplostethus atlanticus | 0.2 | 1 | 861.0 | 861.0 | 3.9 | 3.9 | 64.9169 |
| 38 | HAF | Hydrolagus affinis | 19.1 | 3 | 1354.0 | 1453.5 | 3.5 | 3.6 | 63.6561 |
| 39 | LMC | Lampanyctus macdonaldi | 4.1 | 207 | 545.0 | 1457.5 | 2.7 | 5.0 | 65.9065 |
| 40 | LAS | Lampedena speguligera | 0.0 | 1 | 1274.0 | 1274.0 | 3.6 | 3.6 | 63.5152 |
| 41 | LAI | Lampenyctus intricarius | 0.0 | 1 | 1420.0 | 1420.0 | 3.6 | 3.6 | 63.6853 |
| 42 | LEP | Lepedion eques | 0.6 | 13 | 439.0 | 1027.5 | 3.7 | 5.1 | 65.1173 |
| 43 | LOA | Lophodoles alanthogantus | 0.0 | 1 | 1327.0 | 1327.0 | 3.6 | 3.6 | 63.2710 |
| 44 | LYN | Lycodes eudipleurostictus | 0.1 | 1 | 649.0 | 649.0 | 3.2 | 3.2 | 65.4447 |
| 45 | LPA | Lycodes paamiuti | 0.0 | 1 | 673.5 | 673.5 | 2.7 | 2.7 | 65.9065 |
| 46 | LYT | Lycodes terraenova | 0.4 | 1 | 1053.5 | 1187.0 | 3.6 | 3.8 | 64.0785 |
| 47 | LYF | Lycodonus flagellicauda | 0.0 | 1 | 1327.0 | 1327.0 | 3.6 | 3.6 | 63.2710 |
| 48 | RHG | Macrourus berglax | 21.7 | 39 | 439.0 | 1457.5 | 2.7 | 5.1 | 66.0444 |
| 49 | MAA | Magnisudis atlantica | 0.2 | 3 | 752.5 | 1225.5 | 3.5 | 3.8 | 64.9873 |
| 50 | RSP | Malacoraja spinacidermis | 0.1 | 1 | 806.5 | 806.5 | 3.9 | 3.9 | 64.5536 |
| 51 | MAL | Malacosteus niger | 0.1 | 2 | 1050.0 | 1420.0 | 3.5 | 3.8 | 64.3901 |
| 52 | MAM | Maulisa mauli | 0.1 | 1 | 836.5 | 1084.0 | 3.7 | 4.0 | 64.9553 |
| 53 | MMI | Maulisia microlepis | 0.1 | 1 | 861.0 | 1352.5 | 3.5 | 3.9 | 64.9169 |
| 54 | WHB | Micromesistius poutassou | 6.1 | 50 | 417.0 | 718.0 | 4.3 | 5.1 | 64.3244 |
| 55 | BLI | Molva dypterygia | 1.0 | 1 | 545.0 | 718.0 | 4.6 | 5.0 | 64.6903 |
| 56 | MYP | Myctophum punctatum | 0.0 | 2 | 417.0 | 1439.0 | 3.6 | 4.8 | 65.6042 |
| 57 | NZB | Nezumia bairdi | 0.8 | 6 | 715.0 | 1238.5 | 3.5 | 3.9 | 65.1173 |
| 58 | NOT | Notacanthus chemnitzii | 6.5 | 11 | 764.5 | 1457.5 | 3.4 | 4.0 | 65.0749 |
| 59 | NOK | Notoscopelus kroeyri | 0.0 | 3 | 715.0 | 1354.0 | 3.5 | 3.9 | 64.9873 |
| 60 | PAC | Paraliparis copei | 0.0 | . | 1318.0 | 1318.0 | 3.5 | 3.5 | 63.7813 |
| 61 | PSP | Paraliparis sp. | 0.1 | 2 | 673.5 | 936.5 | 2.7 | 4.0 | 65.9065 |
| 62 | PHC | Physis chesteri | 0.1 | 1 | 718.0 | 718.0 | 4.9 | 4.9 | 64.1989 |
| 63 | POL | Polyacanthonotus rissoanus | 0.6 | 6 | 752.5 | 1457.5 | 3.5 | 3.7 | 64.9873 |
| 64 | PSN | Psednos sp. | 0.0 | 1 | 1420.5 | 1420.5 | 3.6 | 3.6 | 63.2191 |
| 65 | RFL | Raja fyllae | 0.6 | 3 | 649.0 | 1274.5 | 3.2 | 4.0 | 65.4447 |
| 66 | SKA | Raja. sp. | 0.9 | 1 | 1218.0 | 1344.5 | 3.5 | 3.6 | 63.7319 |
| 67 | RBT | Rajella bathyphila | 12.3 | 1 | 1058.5 | 1453.5 | 3.5 | 3.8 | 64.2354 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 68 | GHL | Reinhardtius hippoglossoides | 497.7 | 423 | 417.0 | 1457.5 | 2.7 | 5.1 | 66.0444 |
| 69 | ROS | Rossia sp. | 0.0 | 1 | 673.5 | 1058.5 | 2.7 | 3.7 | 65.9065 |
| 70 | SAC | Sccopharynx ampullaceus | 0.0 | 1 | 1453.5 | 1453.5 | 3.5 | 3.5 | 63.6561 |
| 71 | SCO | Scopelosarus lepidus | 4.0 | 25 | 764.5 | 1457.5 | 3.4 | 4.0 | 64.8009 |
| 72 | REG | Sebastes marinus | 3.6 | 2 | 439.0 | 1164.0 | 3.7 | 5.1 | 65.6042 |
| 73 | REB | Sebastes mentella | 127.0 | 429 | 417.0 | 1420.5 | 2.7 | 5.1 | 66.0444 |
| 74 | RED | Sebastes sp. | 0.0 | 1 | 1439.0 | 1439.0 | 3.6 | 3.6 | 63.6173 |
| 75 | SER | Serrivomer beani | 0.4 | 5 | 752.5 | 1457.5 | 3.4 | 4.0 | 64.9873 |
| 76 | STO | Stomias boa | 0.1 | 11 | 545.5 | 1457.5 | 3.5 | 4.8 | 66.0444 |
| 77 | SYN | Synapobranchus kaupi | 6.1 | 40 | 649.0 | 1457.5 | 3.2 | 4.9 | 65.4447 |
| 78 | TEM | Teuhovenia megalops | 0.1 | 1 | 1225.5 | 1225.5 | 3.6 | 3.6 | 63.3318 |
| 79 | TRA | Trachyrynchus murrayi | 0.4 | 3 | 835.0 | 1264.0 | 3.5 | 3.9 | 64.4040 |
| 80 | TRM | Triglops murray | 0.0 | 1 | 545.5 | 545.5 | 4.8 | 4.8 | 65.6042 |
| 81 | XEC | Xenodermichthys copei | 0.1 | 2 | 649.0 | 1420.5 | 3.2 | 4.9 | 65.4447 |