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Analysis of Data from the 2001 Trawl Survey in NAFO Subarea 0

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Abstract

Two stratified random otter trawl surveys covering depths of 400 m to 1500 m and targeting Greenland halibut (*Reinhardtius hippoglossoides)* were conducted in NAFO Subarea 0, Division 0A from September 16 to 23 and Division 0B from October 19 to 26, 2001. This was a collaborative effort between Fisheries and Oceans Canada, the Nunavut Wildlife Management Board, and the Greenland Institute of Natural Resources. Survey coverage was the same as in previous years (1 set per 750 km^2 for Div. 0A and 1 set per 1030 km^2 for Div. 0B) with a minimum of two tows per stratum. However, both trips experienced difficulties in completing the survey in the time available and some strata were missed. In Div. 0A 48 of 92 tows were completed while in Div. 0B 36 of 76 tows were completed. Greenland halibut were present in all tows with the greatest densities at 751-1000 m in Div. 0A and at 1001-1250 m in Div 0B. Total estimated biomass and abundance in the Div. 0A survey area were 97,627 tons and 142.7×10^6, respectively. Estimated biomass and abundance in the Div. 0B survey area were 68,917 tons and 85.9×10^6 fish. Lengths ranged from 10 cm to 99 cm for Div. 0A with 68.1 % less than 45 cm. For Div. 0B lengths ranged from 8 cm to 97 cm with 46.8 % less than 45 cm. The distributions both had a single mode, 43 cm for Div. 0A and 45 cm for Div. 0B. The age length key from the Greenland survey in Div. 1A to D was used to determine age distribution of the population in SA0. Ages for males and females combined ranged from 0 to 19 years in Div. 0A and 0 to 18 years in Div. 0B. The 1996 year-class was most abundant in Div. 0A and the 1995 year class was most abundant in Div. 0B in 2001. The catch of other commercially important species was minimal. However, some data on these and other non-commercial species are also presented.

Introduction

A stratified random survey in the North West Atlantic Fisheries Organization (NAFO) Div. 0A was conducted from September 16 to 23, 2001. A second survey was conducted in Div. 0B from October 19 to 26, 2001. The Department of Fisheries and Oceans, Nunavut Wildlife Management Board, and the Greenland Institute of Natural Resources were collaborators on this project. The Greenlandic research vessel *Paamiut* was used to carry out the surveys. The science crew was comprised of six Canadians and one scientist from Greenland. The survey in Div. 0A was conducted first followed by a survey in Div. 1AB then the Div. 0B survey, followed by Div. 1BCD. The objectives were: (1) to fish at randomly-selected fishing stations to determine the distribution and abundance of various groundfish species, (2) to collect biological samples from Greenland halibut, and (3) to collect oceanographic data at each fishing station. Div. 0A was surveyed in 1999 (Treble *et al*., 2000), and Div. 0B was surveyed in 2000 (Treble *et al*., 2001). A comparison of survey results between SA0 and SA1 is made easier through the use of the same vessel, fishing gear and crew. This should assist in the overall assessment of the stock complex in Subarea 0+1.

Materials and Methods

Stratification and Set Selection

Table 1 and 2 list the strata (401-1500 m) used for the surveys in Div. 0A and 0B, respectively. These stratification schemes are also shown in Fig. 2 and Fig. 3. The total area between 401 m and 1500 m encompassed by the strata in Div. 0A (to 72° N) is 61,747 km^2 (18,002 nm^2) and in Div. 0B it is 74,483 km^2 (21,715 nm^2). Survey coverage was intended to be approximately 1 set per 750 km^2 (220 nm^2) for 0A and 1030 km^2 (300 nm^2) for Div. 0B with a minimum of 2 sets per stratum. Sets were allocated proportionally to stratum size. This coverage level is the same as that achieved in the 1999 survey in Div. 0A and 2000 survey in Div. 0B. A total of 92 sets (Div. 0A) and 76 sets (Div. 0B) were randomly selected from numbered units within each stratum, along with an additional 2 sets per stratum to be used as alternate fishing stations as necessary.

Vessel and Gear

The same fishing gear and protocols as used by the Greenland Institute during their groundfish surveys of Subarea 1 on the *Paamiut* were employed in both the 0A and 0B surveys in 1999-2001. The MV Paamiut is a 722 GRT stern trawler measuring 53 m in length. An Alfredo III bottom otter trawl with rock hopper ground gear was used for the survey. Mesh size was 140 mm with a 30 mm mesh liner in the cod end. Trawl doors were Greenland Perfect (370 cm x 250 cm) weighing 2400 kg mounted with an extra 20 kg. Jørgensen (1998) contains more information about the trawl and gear. A Furuno based system mounted on the head rope measured net height and was used to determine bottom contact and the start/finish of each tow. 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 (m) x 0.142. This relationship was based on flume tank measurements of the trawl and rigging (Jørgensen, 1998).

For some tows the distance between the otter boards could not be measured at depths >800 m because of defective Scanmar sounders. In these cases the distance was then estimated using a linear regression based on previous hauls at depths >800 m at both West- and East Greenland: distance between otter boards = 114.4 + fishing depth (m) *0.01.

A temperature sensor on the trawl eye was used to measure near bottom temperature. A Seamon temperature sensor (sensitive to within ±0.1° C) was mounted on one of the trawl doors for most sets and was used to confirm the bridge reading.

Trawling Procedure

The targeted tow duration was 30 minutes, however, tows down to 15 minutes in length were considered acceptable. Average towing speed was approximately 3 knots (e.g. 3.2 kn during the Div. 0A survey). The towing speed used in the calculations for abundance and biomass was estimated from the start and end positions of the tow, or in a few cases from GPS observations (mean of records made every 5 minutes during the tow). Trawling took place throughout a 24 hr period in order to maximize the ships time and complete the necessary tows.

Biological Data Collection and Analysis

Numbers and total weight caught were recorded on a set-by-set basis for each species. Total weight of invertebrates and the % composition of major invertebrate species were recorded during the Div. 0B survey. Detailed sampling was carried out on Greenland halibut, as outlined below. For other commercial species (gadoids, flatfish, redfish, grenadiers, skates) sexed length measurements were collected. Lengths were measured to the nearest 1 cm total length (0.5 cm pre anal fin length for grenadiers). A standard meter board was used during the Div. 0A survey. Measuring boards using an offset of 0.5 cm were used during the Div. 0B survey, for example any fish between 24.50 cm and 25.49 would be measured as 25 cm. Three large catches of Greenland halibut were sub-sampled during the 0A survey (50%, 25% and 50% of the catch sampled in each case) and one set was sub-sampled during the 0B survey (64% was sampled). Adjustments were made during analysis to estimate total number caught in each case.

Greenland halibut was the targeted species and was therefore sampled in more detail. During the Div. 0B survey a maturity assessment for all individuals was done visually, based on maturity stages described in Templeman et al. (1978). Fish less than 14 cm were recorded as unsexed. For each sampled fish >=14 cm the whole weight was recorded at sea using an electronic balance. Otoliths for age determination were collected, 10 per 1 cm length group per sex for fish >=14 cm. For fish <14 cm (unsexed), 6 per 1cm group were collected. Stomachs were collected and frozen for more detailed analysis later, three per 5 cm length group per set.

Various species from the catch were collected or had tissue samples taken for use by other researchers within DFO, the University of Manitoba, Møre Research in Norway and Institut fur Seefischerei in Germany.

Biomass and Abundance Indices

The swept area method was used in the estimation of biomass and abundance: Swept area = wingspread (m) x trawl time (min) x trawl speed (kn/hr) x $1.852/6x10^4$. Abundance and biomass were calculated for each set and standardized to 1 sq km:

Abundance (no./sq. km)=catch (no.)/swept area (sq km)
Biomass (tons/sq km)=catch (kgs)/swept area (sq km)/1000.

Mean and standard error for abundance and biomass were calculated for each depth stratum. An estimate of total abundance and biomass was then calculated for each depth stratum (mean x stratum area surveyed (sq km)) as well as over all strata. Standard error values were also calculated for the overall total.

Abundance at length was calculated for each strata, and a total abundance at each length, weighted by the strata area, was calculated (mean number/sq. km. x stratum area surveyed (sq km)). The sum across all lengths and strata was calculated and compared to the overall abundance value determined above to ensure they were equal. Weight at length was estimated using an average from Subarea 2+3: weight (kg)=length (cm) x $(4.03x10^{-6})^{3.1935}$ (Gundersen and Brodie, 1999).

Central and Arctic Region is still developing the expertise to age Greenland halibut otoliths. In the meantime an age-length key from the GINR age determination lab was used to develop the age distribution for Div. 0A and 0B. This key is based on 1010 samples collected during the surveys of Div. 1ABCD in 2001.

Results and Discussion

Survey Area

Near bottom temperatures ranged from a high of 3.7 °C in 0B (751-1000 m) to a low of 0.21 °C in 0A (1251-1500 m) (Table 3, Fig. 1). The majority of tows (95.6%) in 0A had temperatures less than or equal to 1.0 °C. All the tows conducted in Div. 0B had temperatures greater than 1.5 °C. Mean temperatures by depth stratum for Div. 0A increased from 0.70 °C at 401-500 m to 1.46 °C at 501-750 m and then decreased to 0.21 at 1251-1500 m (Table 3). Mean temperature of depth strata in Div. 0B increased from 2.63 °C at 401-500 m to 3.69 °C at 751-1000 m and then decreased slightly to approximately 3.4 °C for 1001 to 1500 m.

The stratified areas within Div. 0A are shown in Figure 2 (Table 1 and 4) and for Div. 0B in Fig. 3 (Table 2 and 4). In Div. 0A only 48 of 92 planned tows were completed (Table 4) and the actual survey area was 48,881 sq km. Stratum numbers that were missed were 24, 34, 44, 53, 54, 55, 57 and 61. Four were in depths 401-500, 2 in depths 501-750 and 1 in 1251-1500. Four stratums had only 1 tow, 42, 43, 51 and 59. In Div. 0B 39 of 76 tows were completed (Table 4) with 3 considered unsuccessful. The actual area surveyed in 0B was 62,207 sq km. The strata missed were 24 and 25, two shallow strata in Davis Strait (Fig. 3).

Table 5 contains set-by-set information on stratum, swept area, mean depth, near bottom temperature and catch for Greenland halibut, roundnose grenadier (*Coryphaenoides rupestris*), roughhead grenadier (*Macrourus berglax*), deep sea redfish (*Sebastes mentella*) and American plaice (*Hippoglossoides platessoides*). There were 49 species or groups of species caught during the Div. 0A survey (Appendix 1) and 73 during the Div. 0B survey (Appendix 2).

Greenland Halibut

Greenland halibut were distributed throughout the survey area and were present in all completed tows (Fig. 4 and 5). In 2001 0A catches varied from 0.40 kg (n=1, 408 m) to 648.7 kg (n=841, 920 m), however, the largest catch in numbers was 1099, weighing 456.5 kg (Table 5a). In 0B catches varied from 3.3 kg (n = 5, 558 m) to 341.6 kg (n=364, 1122 m) (Table 5b).

Total biomass for Division 0A was estimated at 97,628 tons (S.E. 14,069) in 2001 (Table 6), although this is likely underestimated by approximately 13,000 tons due to the reduced coverage (see below). Densities were highest at 3.3 t/sq km within the 751 to 1000 m depth strata (Table 6). The 1999 survey estimate was 83,340 tons (S.E. 11,390 (not weighted by area of depth stratum surveyed)). Of the eight strata missed in the 2001 survey, four of the shallow strata were also omitted during the 1999 survey and three of the remaining four accounted for less than 2,000 tons in 1999. Therefore, only 1 of the 8 strata missed in 2001 likely contained substantial biomass (stratum 61, 1251-1500 contained 11,339 tons in 1999).

The biomass that was estimated for Div. 0B was 68,917 tons (S.E. 6,523) in 2001 (Table 6). The greatest densities were 2.5 t/sq km within 1001-1250 m depth strata (Table 6). This is an increase over that estimated for the 2000 survey, 56,212 (S.E. 10,813 (not weighted by area of depth stratum surveyed)) despite the reduced coverage. The two strata that were missed accounted for 2,705 tons in 2000.

Abundance in Div. 0A in 2001was estimated at 142.7×10^6 (S.E. 21.8×10^6) with mean abundance per sq km varying between 3,456 and 4,101 across three depth strata 501 to 1250 m (Table 7). This is a slight increase over the estimate for 1999 (140.1×10^6).

Total abundance in Div. 0B in 2001 was estimated at 85.9×10^6 (S.E. 8.7×10^6) with the highest concentration at 2,726 per sq. km. in depth strata 1001-1250 m. This is an increase over the 2000 estimate of 74.6×10^6.

Length frequency distribution by depth strata for Div. 0A and 0B in 2001 are given in Fig. 6 and 7. In both Div. 0A and 0B there appears to be a broader size distribution for depths below 750 m than is seen at greater depths. Also, the number of fish at larger length classes increases with depth. In Div. 0A depth strata 501-750 m had two modes one at 27 cm and the highest mode at 39 cm. The mode increased to 43 cm for the next two depth strata 501-750 m and 751-1000 m. The depth strata 401-500 m and 1251-1500 m were under-sampled and the observed length distributions may not reflect this portion of the stock area. In Div. 0B the modal length is similar (43-47 cm) for all but the shallowest strata where there were two modes one at 32 cm and a second at 39 cm.

The overall length distribution adjusted for survey area for Div. 0B in 2001 ranged from 8 cm to 97 cm with a mode at 45 cm (Fig. 8). The distribution for Div. 0A ranged from 10 cm to 99 cm with a mode at 43 cm (Fig. 8). The shape of the distributions for Div. 0A in 1999 and 2001 are quite different. In 1999 the distribution was broader with greater abundance in length classes 30 cm to 40 cm as compared to 2001. However, length classes 41 cm to 50 cm were more abundant in 2001 than in 1999 (Fig. 8). This may be the result of the abundant 1995 year-class moving through the population.

The percentage of fish <45 cm has decreased in both Div. 0A and 0B compared to the pervious surveys (Table 9) but it is still considerably higher in Div. 0A (68.1 %) compared to Div. 0B (46.8 %). The observed decrease may be partially attributed to the reduced coverage in the shallow water strata in 2001 and growth in the abundant 1995 year-class. These fish <45 cm accounted for 28.6 % of the biomass in Div. 0B and 48.8 % in Div. 0A (Table 8).

Ages ranged from 0 to 19 years for Div. 0A in 2001 with the highest abundance at five years (1996 year-class) for males and females combined. This compares to a range of 2-15 years and peak abundance at 4 years in 1999 (Table 10, Fig. 9). The range in ages was similar for Div. 0B in both 2000 and 2001 with the 1995 year-class being most abundant in both years.

Grenadiers

Roughhead grenadier were present in 16 of 48 tows in Div. 0A and all 36 valid tows in Div. 0B (Table 5). Biomass was estimate as 351 tons and 4,052 tons for Div. 0A and 0B, respectively (Table 11). Abundance was 1.31 x 10^6 for Div. 0A and 12.17 x 10^6 for Div. 0B (Table 12).

Roundnose grenadier were present in 20 of 36 valid tows in Div. 0B (Table 5). There were none caught in Div. 0A. Estimated biomass and abundance were 1256 tons and 7.87 x 10^6, respectively (Tables 13 and 14).

Redfish and American Plaice

Deep-sea redfish were present in 18 of 48 tows in Div. 0A and 27 of 36 valid tows in Div. 0B (Table 5). Estimated biomass and abundance were 1,226 tons and 10.29 x 10^6, respectively for Div. 0A and 15,673 tons and 130.32 x 10^6 for Div. 0B (Tables 15 and 16). American plaice were present in only 11 tows in Div. 0A and 9 tows in Div. 0B.

Elasmobranchs

There were five species of elasmobranchs caught during this survey, Black dogfish shark *(Centroscyllium fabricii*) and four species of skates were identified (Appendix 1). The dogfish shark was present in 17 of 36 valid tows in Div. 0B (Table 16). There were no dogfish caught in Div. 0A. Biomass was estimated at 2,066 tons and abundance at 3.98 x 10^6 (Tables 17 and 18).

There were no arctic skate (*Amblyraja hyperborea*) caught in Div. 0B but in 0A they were present in 26 of 48 tows with an estimated biomass of 3,925 tons and abundance of 2.78 x 10^6 (Tables 19 and 20). Round skate (*Raja fyllae*) were caught in 5 tows (26 fish) all at depths greater than 500 m. One deepwater skate (*Rajella bathyphila*) was caught in Div. 0B. Two small skates (weight <0.1 kg each) could only be identified to Genus *Raja*. Thorny skate (*Amblyraja radiata*) were present in only 5 tows (11 fish) in Div. 0A and 4 tows (4 fish) in Div. 0B.

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Table 1. Stratification of Div. OA used in the 1999 and 2001 surveys by *Paamiut*. Strata 24, 25, and 30-34 are from a previous stratification scheme (Bowering, 1987). Strata 40-61 are from a new stratification scheme developed in 1999. The area listed for the older strata corresponds to that area which lies within Div. 0A only.

Stratum	Sq. N Miles	Units	Depth Range (m)
024	457	130	401-500
025	1780	510	501-750
030	1099	310	751-1000
031	496	140	1001-1250
032	301	90	1251-1500
033	184	50	501-750
034	75	20	401-500
040	1671	480	1251-1500
041	698	200	1001-1250
042	577	160	751-1000
043	609	170	501-750
044	375	110	401-500
045	348	100	501-750
046	370	110	751-1000
047	883	250	1001-1250
048	843	240	1251-1500
049	712	200	1251-1500
050	650	190	1001-1250
051	574	160	751-1000
052	635	180	501-750
053	276	80	401-500
054	852	240	501-750
055	334	100	401-500
056	200	60	401-500
057	652	190	501-750
058	350	100	501-750
059	600	170	751-1000
060	671	190	1001-1250
061	730	210	1251-1500

Table 2. Strata used in survey of Div. 0B in 2000 and 2001 (Bowering, 1987).

Stratum	Sq. N Miles	Approx . # units	Depth (m)	SETS per 300 sq mi.	# sets planned
3	2616	748	401-500	8.72	9
4	4671	1335	501-750	15.57	16
5	2070	592	751-1000	6.90	7
6	1975	564	1001-1250	6.58	7
7	1641	469	1251-1500	5.47	6
10	1566	448	401-500	5.22	5
11	2311	661	501-750	7.70	8
12	943	270	751-1000	3.14	3
13	343	98	1001-1250	1.14	2
24	1449	414	401-500	4.83	5
25	2130	609	501-750	7.10	7
Total	21715			72.38	75

Table 3. Mean temperature and S.E. in () for NAFO Div. 0A and 0B in 2001, by depth stratum (seeTable 4 for the corresponding number of hauls (n) for each stratum).

NAFO Division	Depth Stratum (m) 401-500	501-750	751-1000	1001-1250	1251-1500
0A	0.70 (0.10)	1.46 (0.22)	0.89 (0.07)	0.73 (0.05)	0.21 (0.05)
0B	2.63 (0.24)	2.86 (0.15)	3.69 (0.04)	3.48 (0.03)	3.40 (0.00)

Table 4. Area of depth strata for NAFO Div. 0A and 0B with the number of hauls planned ( ) and conducted. A conversion factor f 3.430 was used to calculate square kilometers from square nautical miles.

NAFO Division	Depth Stratum (m)	401-500	501-750	751-1000	1001-1250	1251-1500	Total
0A	Area (sq. nm)	1717	5410	3220	3398	4257	18002
	Area (sq. km)	5889	18556	11045	11655	14602	61747
	Hauls	(12) 2	(28) 18	(16) 7	(15) 7	(21) 14	(92) 48
0B	Area (sq. nm)	5631	9112	3013	2318	1641	21715
	Area (sq. km)	19314	31254	10335	7951	5629	74483
	Hauls	(19) 9	(32) 8	(10) 8	(9) 7	(6) 4	(76) 36
Overall (SA0)	Area (sq. nm)	7348	14522	6233	5716	5898	39717
	Area (sq. km)	25203	49810	21380	19606	20231	136230
	Hauls	(31) 11	(60) 26	(26) 15	(24) 14	(27) 18	(168) 84

Table 5a. Catch weight and numbers (not standardized to kg/km^2) of Greenland halibut, roundnose grenadier and roughhead grenadier, *Sebastes mentella* and American plaice by haul for NAFO Div. 0A. Depth in m, swept area in km^2 and bottom temperature in ^oC.

								Greenland halibut		Roundnose grenadier		Roughhead grenadier		*S. mentella*		American plaice	
Set No.	Month	Day	Mean Depth (m)	Sweptarea (sq. km)	Stratum	Temp. (^oC)	Time (UTC)	Number	Kg	Number	Kg	Number	Kg	Number	Kg	Number	Kg
1	9	16	629.5	0.06574	25	1.4	1627	12	4.50	0	0	2	0.2	24	2.8	0	0
2	9	16	631.0	0.05527	25	1.8	1812	19	14.40	0	0	1	0.1	40	4.3	3	0.9
3	9	16	652.0	0.08653	25	2.1	2027	64	29.80	0	0	0	0	4	0.2	1	0.4
4	9	17	703.0	0.08543	25	1.3	225	134	54.00	0	0	0	0	0	0	0	0
5	9	17	813.0	0.06429	30	1.2	626	184.0	164.40	0	0	0	0	0	0	0	0
6	9	17	689.5	0.09081	25	1.6	952	48	31.40	0	0	0	0	0	0	0	0
7	9	17	623.5	0.07374	25	2.3	1233	96	50.60	0	0	0	0	25	3.7	0	0
8	9	17	810.0	0.10807	30	1.1	1549	216	140.40	0	0	6	2.0	0	0	0	0
9	9	17	934.0	0.11060	30	0.8	1758	90	78.90	0	0	0	0	0	0	0	0
10	9	17	1095.0	0.07705	31	0.6	2114	44	43.50	0	0	0	0	0	0	0	0
11	9	18	1287.5	0.07889	32	0.2	118	12	11.10	0	0	0	0	0	0	0	0
12	9	18	1100.0	0.10989	31	0.6	424	106	92.20	0	0	0	0	0	0	0	0
13	9	18	556.5	0.04343	33	3.8	835	18	12.30	0	0	3	0.30	105	26.4	2	0.5
14	9	18	1278.5	0.07521	32	0.1	1226	13	16.60	0	0	0	0	1	0.1	1	0.4
15	9	18	1277.5	0.06628	40	0.2	1550	62	61.70	0	0	1	<0.1	0	0	0	0
16	9	18	518.5	0.11042	33	3.4	1828	147	41.00	0	0	2	0.1	676.8	42.6	53	12.2
17	9	18	1440.5	0.08612	40	0.0	2155	25	19.60	0	0	0	0	0	0	1	0.2
18	9	19	1340.0	0.03816	40	0.3	627	12	7.60	0	0	0	0	0	0	0	0
19	9	19	1086.0	0.10049	31	0.6	815	363	314.90	0	0	1	0.3	0	0	0	0
20	9	19	1365.0	0.10425	40	0.1	1645	9	13.00	0	0	0	0	0	0	0	0
21	9	19	190.0	0.07324	40	0.3	1919	14	13.90	0	0	0	0	0	0	0	0
22	9	20	1094.5	0.07430	41	0.8	32	141	128.90	0	0	0	0	0	0	0	0
23	9	20	1056.5	0.10579	41	0.8	320	256	203.00	0	0	3	1.3	0	0	0	0
24	9	20	652.5	0.08177	43	0.9	634	1099	456.50	0	0	0	0	2	0.3	7	1.7
25	9	20	982.0	0.08137	42	0.8	907	352	262.00	0	0	3	1.4	1	0.2	0	0
26	9	20	634.5	0.07447	45	1.0	1317	700.2	397.30	0	0	1	0.6	6	1.2	2	0.4
27	9	20	1353.5	0.10096	48	0.3	1700	67	63.40	0	0	0	0	0	0	0	0
28	9	20	1365.5	0.10191	48	0.2	1900	50	44.80	0	0	0	0	0	0	0	0
29	9	20	1316.0	0.08057	48	0.2	2103	64	71.10	0	0	0	0	0	0	0	0
30	9	21	746.5	0.05915	45	0.8	140	364	195.90	0	0	2	0.5	0	0	0	0
31	9	21	1317.0	0.08932	48	0.2	528	96	96.90	0	0	0	0	0	0	0	0
32	9	21	1351.5	0.11143	48	0.0	754	14	12.80	0	0	0	0	0	0	0	0
33	9	21	694.5	0.08374	45	0.9	1207	737	360.30	0	0	3	0.7	1	0.4	2	0.7
34	9	21	651.5	0.07790	45	0.9	1425	653	310.60	0	0	1	0.1	2	0.4	0	0

Table 5a. Continued.

Set No.	Month	Day	Mean Depth (m)	Sweptarea (sq. km)	Stratum	Temp. (°C)	Time (UTC)	Greenland halibut Number	Greenland halibut Kg	Roundnose grenadier Number	Roundnose grenadier Kg	Roughhead grenadier Number	Roughhead grenadier Kg	*S. mentella* Number	*S. mentella* Kg	American plaice Number	American plaice Kg
35	9	21	1079.0	0.09954	50	0.8	1636	824.0	493.00	0	0	4	1.5	0	0	0	0
36	9	21	1271.0	0.09816	49	0.1	1902	44	37.10	0	0	0	0	0	0	0	0
37	9	21	1380.5	0.08453	49	0.8	2158	35	30.30	0	0	0	0	0	0	0	0
38	9	22	545.0	0.10117	52	0.8	323	130	70.50	0	0	0	0	4	0.6	0	0
39	9	22	546.0	0.09209	52	0.8	621	113	71.40	0	0	0	0	9	1.4	0	0
40	9	22	1056.0	0.07904	50	0.9	1152	510	397.30	0	0	0	0	0	0	0	0
41	9	22	522.5	0.04503	52	0.9	1352	259	172.20	0	0	0	0	5	0.8	1	0.2
42	9	22	920.0	0.08295	59	0.8	2056	841	648.70	0	0	2	0.4	1	0.1	0	0
43	9	23	903.0	0.07430	59	0.8	136	352	260.90	0	0	3	1.5	0	0	0	0
44	9	23	686.5	0.10357	58	0.8	1101	395	212.80	0	0	0	0	0	0	0	0
45	9	23	843.5	0.06949	59	0.7	1331	266	289.20	0	0	0	0	0	0	0	0
46	9	23	408.5	0.09306	56	0.6	1750	1	0.40	0	0	0	0	0	0	0	0
47	9	23	635.0	0.09125	58	0.8	1931	405	99.20	0	0	0	0	1	0.3	0	0
48	9	23	465.0	0.04195	56	0.8	2125	46	30.20	0	0	0	0	1	0.3	2	0.2
Total All Sets								10502.2	6632.5	0	0	38	11	908.84	86.1	75	17.8

Table 5b. Catch weight and numbers (not standardized to kg/km^2) of Greenland halibut, roundnose grenadier and roughhead grenadier, *Sebastes mentella* and American plaice by haul for NAFO Div. 0B. Depth in m, swept area in km^2 and bottom temperature in ^oC.

			Mean	Sweptarea		Temp.	Time	Greenland halibut		Roundnose grenadier		Roughhead grenadier		*S. mentella*		American plaice	
Set No.	Month	Day	Depth (m)	(sq. km)	Stratum	(^oC)	(UTC)	Number	Kg	Number	Kg	Number	Kg	Number	Kg	Number	Kg
1	10	19	866.5	0.077789	12	3.9	1225	94	73.5	4	0.4	20	5.3	3	0.3	0	0.0
2	10	20	941.5	0.075011	12	3.7	1039	140	126.3	2	0.1	17	4.6	3	0.9	0	0.0
3	10	20	665.0	0.052469	11	2.6	1451	62	51.3	0	0.0	10	0.6	23	4.0	0	0.0
4	10	20	1093.0	0.093416	13	3.5	1916	140	118.9	2	0.2	32	15.2	0	0.0	0	0.0
5	10	20	1245.0	0.072233	13	3.3	2158	277	252.8	10	1.0	36	12.7	0	0.0	0	0.0
6	10	21	683.5	0.079262	11	2.8	200	54	34.4	0	0.0	19	3.6	185	30.7	0	0.0
7	10	21	972.5	0.088902	5	3.6	645	167	144.7	18	1.3	47	18.5	0	0.0	0	0.0
8	10	21	1100.0	0.057513	6	3.4	1040	102	91.7	4	0.4	26	11.8	0	0.0	0	0.0
9	10	21	1149.0	0.085957	6	3.5	1746	364.5	341.6	31	8.4	38	12.5	0	0.0	0	0.0
10	10	21	914.0	0.076685	5	3.5	2112	129	112.4	38	2.8	22	7.1	1	0.3	0	0.0
11	10	22	1059.0	0.077053	6	3.6	7	213	176.0	4	0.7	23	10.2	1	<0.1	0	0.0
12	10	22	1122.5	0.078661	6	3.5	420	310	270.0	38	6.5	36	13.0	0	0.0	0	0.0
13	10	22	1100.0	0.082951	7	3.5	706	200	213.7	31	10.1	14	11.7	0	0.0	0	0.0
14	10	22	1335.5	0.083346	7	3.4	1026	137	133.6	19	4.4	34	27.6	1	0.2	0	0.0
15	10	22	1441.5	0.075948	7	3.4	1315	190	184.2	34	11.3	13	7.9	0	0.0	0	0.0
16	10	22	1412.5	0.090378	7	3.4	1553	185	190.8	41	13.6	13	7.7	1	0.2	0	0.0
17	10	22	558.0	0.053995	4	3.5	2047	5	3.3	0	0.0	9	1.1	182	22.2	0	0.0
18	10	23	524.5	0.062240	4	3.4	0	15	9.7	0	0.0	1	0.5	126	13.8	1	0.4
19	10	23	471.5	0.077428	3	3.2	815	45	15.5	0	0.0	5	1.1	104	19.5	0	0.0
20	10	23	475.0	0.087305	3	3.8	1118	28	11.3	0	0.0	3	0.7	121	10.2	0	0.0
21	10	23	429.5	0.056492	3	2.9	1648	24	9.1	0	0.0	3	1.0	368.8	19.4	0	0.0
22																	
23	10	23	467.5	0.074107	3	3.4	2052	13	6.0	0	0.0	11	2.6	857.2	19.4	0	0.0
24	10	24	860.5	0.083346	5	3.7	30	223	180.6	53	2.8	16	13.8	23	6.3	1	0.5
25	10	24	695.0	0.070523	4	2.6	437	159	112.7	3	0.1	18	3.2	526.8	91.9	9	2.4
26	10	24	642.0	0.043892	4	2.7	718	19	10.6			11	1.5	436.8	72.9	1	0.4
27	10	24	847.0	0.073600	5	3.7	929	266	218.3	43	4.1	9	3.6	4	0.8	0	0.0
28	10	24	1062.5	0.075721	6	3.5	1349	102	118.2	8	1.8	16	11.4	0	0.0	0	0.0
29																	
30	10	24	696.5	0.081373	4	3	1912	152	103.5	0	0.0	20	3.0	81.7	20.7	0	0.0
31	10	24	444.0	0.077898	3	2.2	2057	57	33.0	0	0.0	1	0.6	355.8	19.3	1	0.1
32	10	24	867.0	0.072575	5	3.6	2347	61	47.6	2	0.1	13	2.7	8	0.9	0	0.0
33	10	25	820.5	0.073600	5	3.8	429	110	87.9	30	0.8	16	4.2	10	0.2	0	0.0
34	10	25	684.0	0.071891	11	2.3	737	137	87.3	0	0.0	15	2.0	42	6.6	4	1.4

Table 5b. Continued.

Set No.	Month	Day	Mean Depth (m)	Sweptarea (sq. km)	Stratum	Temp. (°C)	Time (UTC)	Greenland halibut Number	Greenland halibut Kg	Roundnose grenadier Number	Roundnose grenadier Kg	Roughhead grenadier Number	Roughhead grenadier Kg	*S. mentella* Number	*S. mentella* Kg	American plaice Number	American plaice Kg
35	10	25	465.5	0.071106	10	2.1	1059	53	26.4	0	0.0	3	0.3	281.5	12.3	2	0.5
36	10	26	471.5	0.073600	10	2.2	534	62	25.3	0	0.0	1	0.3	40	2.7	1	0.1
37																	
38	10	26	468.5	0.061713	10	2.3	1612	9	3.8	0	0.0	1	0.1	1	<0.1	0	0.0
39	10	26	459.0	0.080186	10	1.6	2046	32	13.3	0	0.0	2	0.8	7	0.4	4	0.6
Total All Sets										415	70.9	571	223.6	3784.6	375.7	20	5.8

Table 6. Biomass estimates (tons) of Greenland halibut by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum	Survey Area	No.	Mean Biomass	Biomass	SE
0A	(m)	(sq. km)	Sets	(t/sq. km)	(tons)	
	401-500	686	2	0.3621	248.4	245.4
	501-750	13397	18	1.8865	25273.2	6101.7
	751-1000	11045	7	3.3261	36736.8	9711.0
	1001-1250	11655	7	2.5958	30253.8	8075.8
	1251-1500	12098	14	0.4228	5115.5	1062.1
	Overall			1.9973	97627.7	14069.1
0B	401-500	14344	9	0.2153	3088.4	630.0
	501-750	23948	8	0.7443	17824.8	5003.8
	751-1000	10335	8	1.5881	16413.3	2655.5
	1001-1250	7951	8	2.5244	20071.3	2870.2
	1251-1500	5629	3	2.0465	11519.6	1348.6
	Overall			1.1079	68917.3	6522.5

Table 7. Abundance estimates (000's) of Greenland halibut by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum	Survey Area	No.	Mean Abundance	Abundance	SE
	(m)	(sq. km)	Sets	(No./sq. km)		
0A	401-500	686	2	553.60	3.8E+05	3.7E+05
	501-750	13397	18	3840.20	5.14E+07	1.3E+07
	751-1000	11045	7	4100.60	4.53E+07	1.2E+07
	1001-1250	11655	7	3456.60	4.03E+07	1.3E+07
	1251-1500	12098	14	439.60	5.3E+06	1.0E+06
	Overall			2919.80	1.427E+08	2.2E+07
0B	401-500	14344	9	485.20	6.96E+06	1.2E+06
	501-750	23948	8	1082.20	2.59E+07	7.1E+06
	751-1000	10335	8	1907.50	1.97E+07	3.2E+06
	1001-1250	7951	8	2726.40	2.17E+07	3.3E+06
	1251-1500	5629	3	2064.10	1.16E+07	1.4E+06
	Overall			1380.66	8.59E+07	8.7E+06

Table 8. Length distribution (3 cm groups) estimated total number (000's) and weight (tons) for Greenland halibut from NAFO SA0 survey, 2001.

Length Class (3cm)	Division 0B Number (000's)	Weight (tons)	Division 0A Number (000's)	Weight (tons)
0	0.000	0.00	0.000	0.00
3	0.000	0.00	0.000	0.00
6	67.965	0.08	0.000	0.00
9	103.906	0.47	8.805	0.04
12	0.000	0.00	20.222	0.23
15	22.414	0.51	230.433	5.29
18	199.255	8.19	219.916	9.04
21	612.353	41.19	924.135	62.17
24	1358.497	139.98	2550.180	262.77
27	1060.367	159.16	2964.298	444.93
30	1865.648	392.03	5196.989	1092.05
33	3243.666	924.09	10283.740	2929.75
36	4692.739	1765.16	19536.221	7348.48
39	9967.780	4841.37	26563.526	12901.96
42	16973.462	10445.33	28642.402	17626.30
45	20021.648	15358.15	21024.368	16127.32
48	12414.917	11702.88	12872.381	12134.11
51	6401.508	7323.40	6282.036	7186.72
54	2847.439	3909.84	2505.494	3440.31
57	1887.003	3079.39	1427.490	2329.51
60	944.613	1815.87	705.572	1356.35
63	506.754	1138.40	307.117	689.93
66	252.271	657.49	169.623	442.08
69	177.178	532.21	160.831	483.10
72	152.722	525.53	48.913	168.31
75	17.553	68.81	28.190	110.51
78	25.107	111.56	0.000	0.00
81	23.765	119.12	0.000	0.00
84	11.981	67.45	33.098	186.33
87	11.981	75.45	0.000	0.00
90	0.000	0.00	0.000	0.00
93	0.000	0.00	0.000	0.00
96	22.513	194.14	0.000	0.00
99	0.000	0.00	16.569	157.64
Total	85887.003	65397.26	142722.549	87495.24
Total <45 cm	40168.051	18717.57	97140.867	42683.00
percent <45 cm	46.768	28.621	68.063	48.783
percent <=35 cm	9.936	2.547	15.694	5.493

Table 9. Percentage of Greenland halibut less than 45 cm and less than or equal to 35 cm for the surveys in SA0, 1999-2001.

	0B 2001	0A 2001	0B 2000	0A 1999
Percent =<35 cm	9.936	15.694	16.792	37.812
Percent <45 cm	46.768	68.063	56.521	77.540

Table 10. Estimated abundance-at-age for Greenland halibut in Subarea 0A from 1999 to 2001. Age-length keys from Div. 1CD were used for 1999 and 2000, and the Div. 1AD key were used in 2001.

Age	2001 Division 0A	1999 Division 0A	2001 Division 0B	2000 Division 0B
0	20769	0	170000	249000
1	279609	0	62269	1353000
2	1854041	714000	1156727	3033200
3	7811180	25933000	3076004	3058400
4	30368534	40182000	9185420	7800000
5	47452278	34906000	21898848	22302100
6	31969559	20887000	26210904	18505900
7	16310248	12559000	16034048	11302400
8	3614055	3553000	4030089	3486800
9	1910544	674000	2371015	1950300
10	477925	655000	673991	574000
11	347030	355000	505521	376400
12	137242	224000	206391	173800
13	97794	49000	156349	200000
14	17340	13000	42384	61900
15	26397	2000	35556	137900
16	5455	0	21152	45200
17	0	0	6667	12400
18	10000	0	6667	8000
19	10000	0	0	12400
20	0	0	0	0
Sum	142720000	140706000	85850000	74643100

Table 11. Biomass estimates (tons) of Roughhead grenadier (*Macrourus berglax*) by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Biomass (t/sq. km)	Biomass (tons)	SE
0A	401-500	686	0			
	501-750	13397	8	0.0049	65.0	16.1
	751-1000	11045	4	0.0152	167.7	38.7
	1001-1250	11655	3	0.0101	117.9	42.6
	1251-1500	12098	1	0.0000	0.0	.
	Overall		16	0.0072	350.6	59.8
0B	401-500	14344	9	0.0114	163.5	48.9
	501-750	23948	8	0.0287	687.0	121.8
	751-1000	10335	8	0.0924	954.6	224.7
	1001-1250	7951	8	0.1598	1270.5	65.1
	1251-1500	5629	3	0.1735	976.4	444.9
	Overall		36	0.0651	4052.0	519.5

Table 12. Abundance estimates (000's) of Roughhead grenadier (*Macrourus berglax*) by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Abundance (sq. km)	Abundance	SE
0A	401-500	686	0			
	501-750	13397	8	29.00	3.88E+05	8.8E+04
	751-1000	11045	4	39.20	4.33E+05	7.1E+04
	1001-1250	11655	3	26.20	3.05E+05	1.0E+05
	1251-1500	12098	1	15.10	1.83E+05	.
	Overall		16	26.77	1.31E+06	4.0E+05
0B	401-500	14344	9	45.60	6.54E+05	2.0E+05
	501-750	23948	8	196.70	4.71E+06	6.7E+05
	751-1000	10335	8	251.30	2.60E+06	4.5E+05
	1001-1250	7951	8	358.90	2.85E+06	3.5E+05
	1251-1500	5629	3	241.00	1.36E+06	4.7E+05
	Overall		36	195.65	1.22E+07	1.0E+06

Table 13. Biomass estimates (tons) of Roundnose grenadier (*Coryphaenoides rupestris*) by depth stratum for NAFO Div. 0B, 2001. No Roundnose grenadier were caught in Div. 0A.

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Biomass (t/sq. km)	Biomass (tons)	SE
401-500	14344	0			
501-750	23948	1	0.0014	34.0	.
751-1000	10335	8	0.0199	205.6	72.6
1001-1250	7951	8	0.0447	355.7	134.7
1251-1500	5629	3	0.1174	660.6	181.7
Overall		20	0.0202	1255.9	246.2

Table 14. Abundance estimates (000's) of Roundnose grenadier (*Coryphaenoides rupestris*) by depth stratum for NAFO Div. 0B, 2001. No Roundnose grenadier were caught in Div. 0A.

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Abundance (sq. km)	Abundance	SE
401-500	14344	0			
501-750	23948	1	42.50	1.02E+06	.
751-1000	10335	8	303.90	3.14E+06	9.4E+05
1001-1250	7951	8	200.60	1.59E+06	5.0E+05
1251-1500	5629	3	376.40	2.12E+06	4.2E+05
Overall		20	126.57	7.87E+06	2.4E+06

Table 15. Biomass estimates (tons) of Deep-sea redfish (*Sebastes mentella*) by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Biomass (t/sq. km)	Biomass (tons)	SE
0A	401-500	686	1	0.0072	4.9	.
	501-750	13397	14	0.0885	1185.1	643.7
	751-1000	11045	2	0.0018	20.2	6.9
	1001-1250	11655	0	.	.	.
	1251-1500	12098	1	0.0013	16.1	.
	Overall		18	0.0251	1226.3	644.5
0B	401-500	14344	9	0.1596	2289.1	602.4
	501-750	23948	8	0.5508	13191.2	5036.1
	751-1000	10335	7	0.0173	179.2	101.7
	1001-1250	7951	1	0.0000	0.0	.
	1251-1500	5629	2	0.0023	13.0	0.5
	Overall		27	0.2519	15672.5	5073.1

Table 16. Abundance estimates (000's) of Deep-sea redfish (*Sebastes mentella*) by depth stratum for NAFO Subarea 0, 2001.

Division	Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Abundance (sq. km)	Abundance	SE
0A	401-500	686	1	23.80	1.64E+04	.
	501-750	13397	14	744.60	9.97E+06	6.0E+06
	751-1000	11045	2	12.20	1.34E+05	1.3E+03
	1001-1250	11655	0	.	.	.
	1251-1500	12098	1	13.30	1.61E+05	.
	Overall		18	210.44	1.03E+07	6.0E+06
0B	401-500	14344	9	3333.10	4.78E+07	1.8E+07
	501-750	23948	8	3397.10	8.14E+07	2.9E+07
	751-1000	10335	7	95.40	9.86E+05	3.5E+05
	1001-1250	7951	1	13.00	1.03E+05	.
	1251-1500	5629	2	11.50	6.49E+04	2.6E+03
	Overall		27	2094.92	1.30E+08	3.5E+07

Table 17. Biomass estimates (tons) of Black dogfish (*Centrocillium fabricii*) by depth stratum for NAFO Div. 0B, 2001. No Black dogfish were caught in Div. 0A.

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Biomass (t/sq. km)	Biomass (tons)	SE
401-500	14344	0	.	.	.
501-750	23948	3	0.0149	355.7	209.7
751-1000	10335	5	0.0874	903.7	310.6
1001-1250	7951	8	0.0709	563.8	199.1
1251-1500	5629	1	0.0432	243.1	.
Overall		17	0.0332	2066.4	627.3

Table 18. Abundance estimates (000's) of Black dogfish (*Centrocillium fabricii*) by depth stratum for NAFO Div. 0B, 2001. No Black dogfish were caught in Div. 0A.

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Abundance (sq. km)	Abundance	SE
401-500	14344	0	.	.	.
501-750	23948	3	59.10	1.42E+06	1.2E+06
751-1000	10335	5	131.20	1.36E+06	4.3E+05
1001-1250	7951	8	92.90	7.39E+05	3.4E+05
1251-1500	5629	1	84.00	4.73E+05	.
Overall		17	64.05	3.98E+06	1.6E+06

Table 19. Biomass estimates (tons) of Arctic skate (*Amblyraja hyperborea*) by depth stratum for NAFO Div. 0A, 2001. No Arctic skate were caught in Div. 0B

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Biomass (t/sq. km)	Biomass (tons)	SE
401-500	686	0			
501-750	13397	4	0.0113	151.7	72.0
751-1000	11045	2	0.0170	188.3	24.8
1001-1250	11655	6	0.0893	1040.9	500.4
1251-1500	12098	14	0.2103	2544.2	983.2
Overall		26	0.0803	3925.0	1105.9

Table 20. Abundance estimates (000's) of Arctic skate (*Amblyraja hyperborea*) by depth stratum for NAFO Div. 0A, 2001. No Arctic Skate were caught in Div. 0B.

Stratum (m)	Survey Area (sq. km)	No. Sets	Mean Abundance (sq. km)	Abundance	SE
401-500	686	0			
501-750	13397	4	23.30	3.12E+05	7.9E+04
751-1000	11045	2	34.80	3.84E+05	2.8E+05
1001-1250	11655	6	49.90	5.82E+05	2.4E+05
1251-1500	12098	14	124.30	1.5E+06	5.8E+05
Overall		26	56.92	2.783E+06	7.0E+05

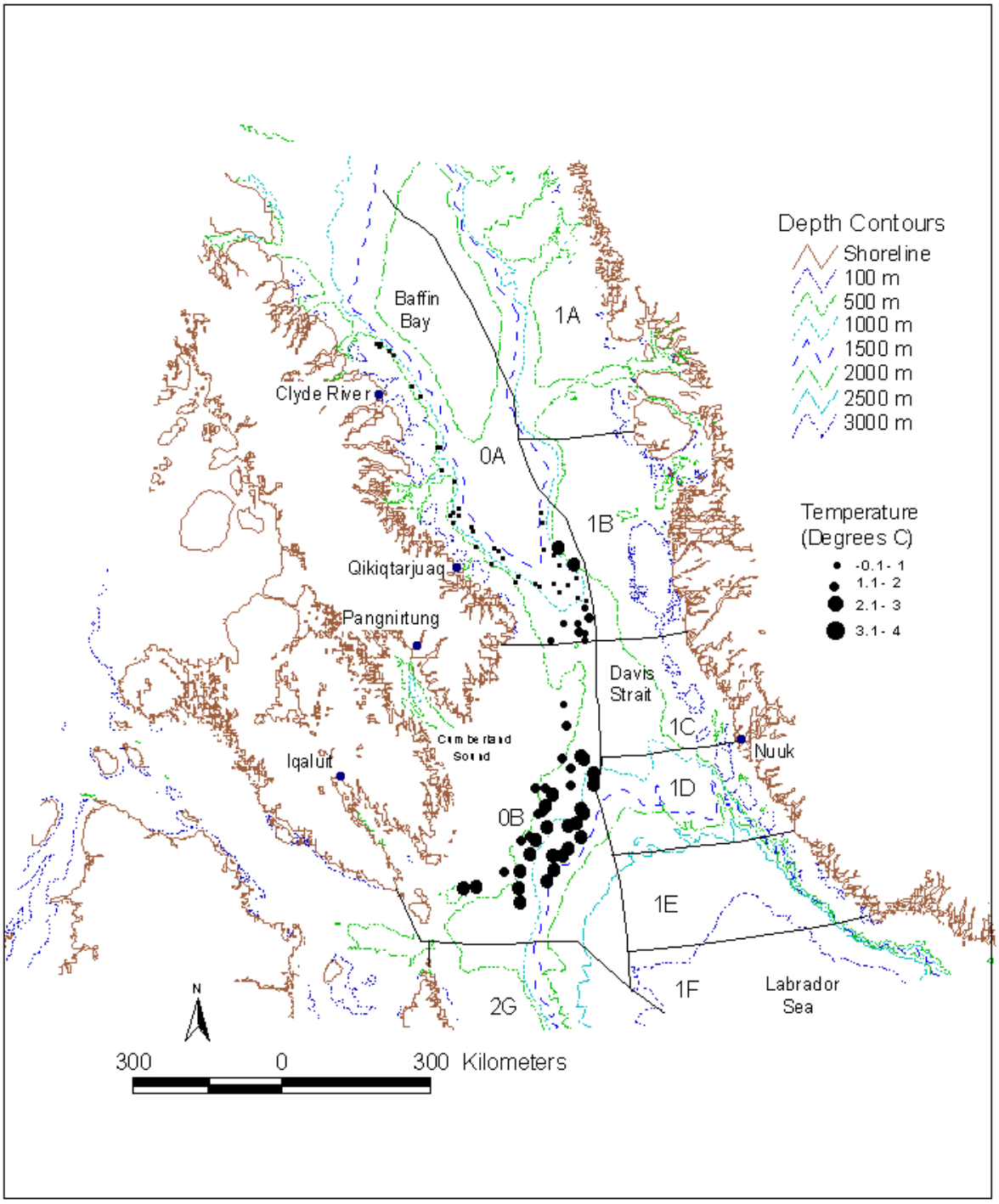


Fig. 1. Bottom temperature within NAFO Subarea 0 in 2001.

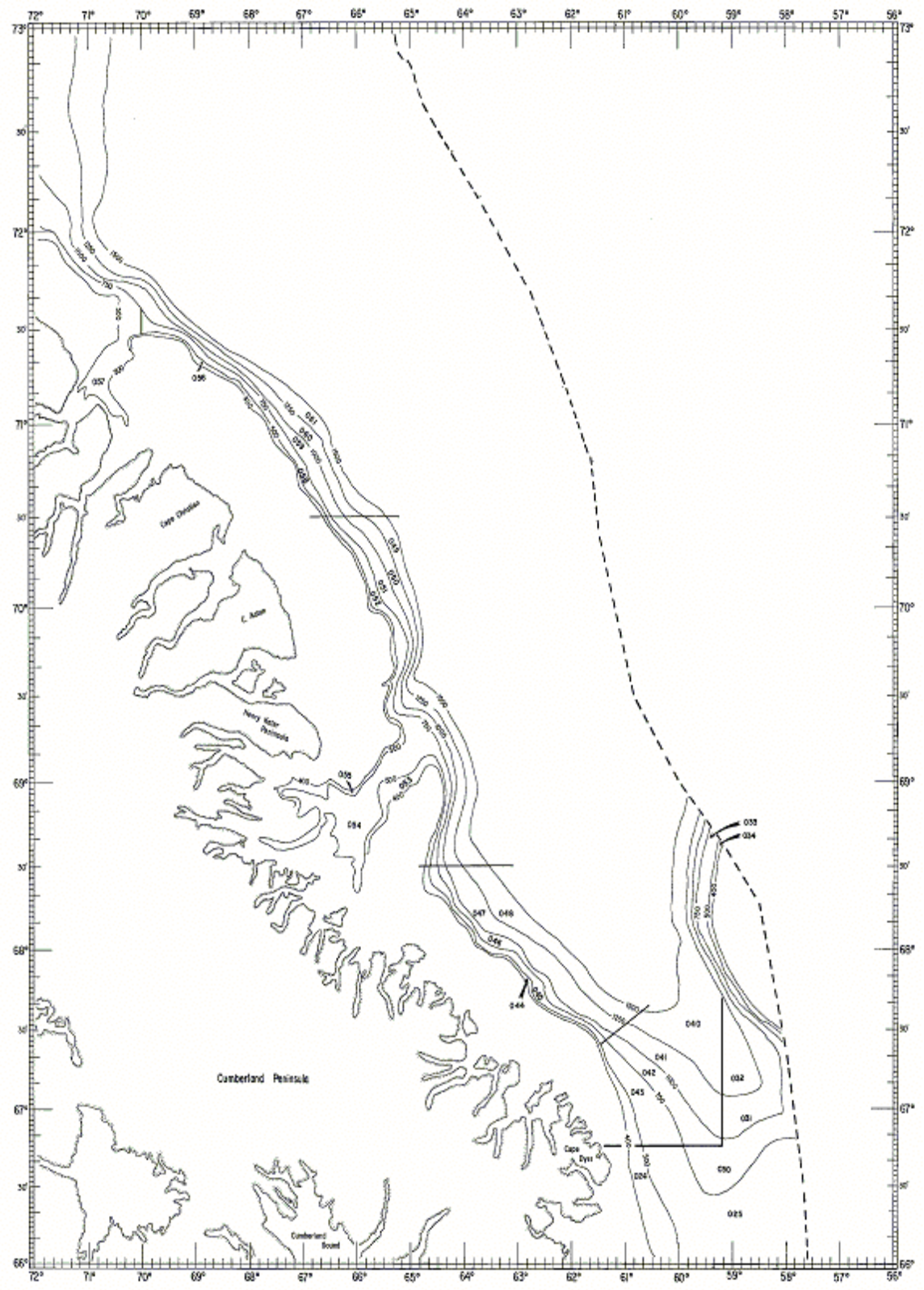


Fig. 2. Stratification scheme for North Atlantic Fisheries Organization Div. 0A.

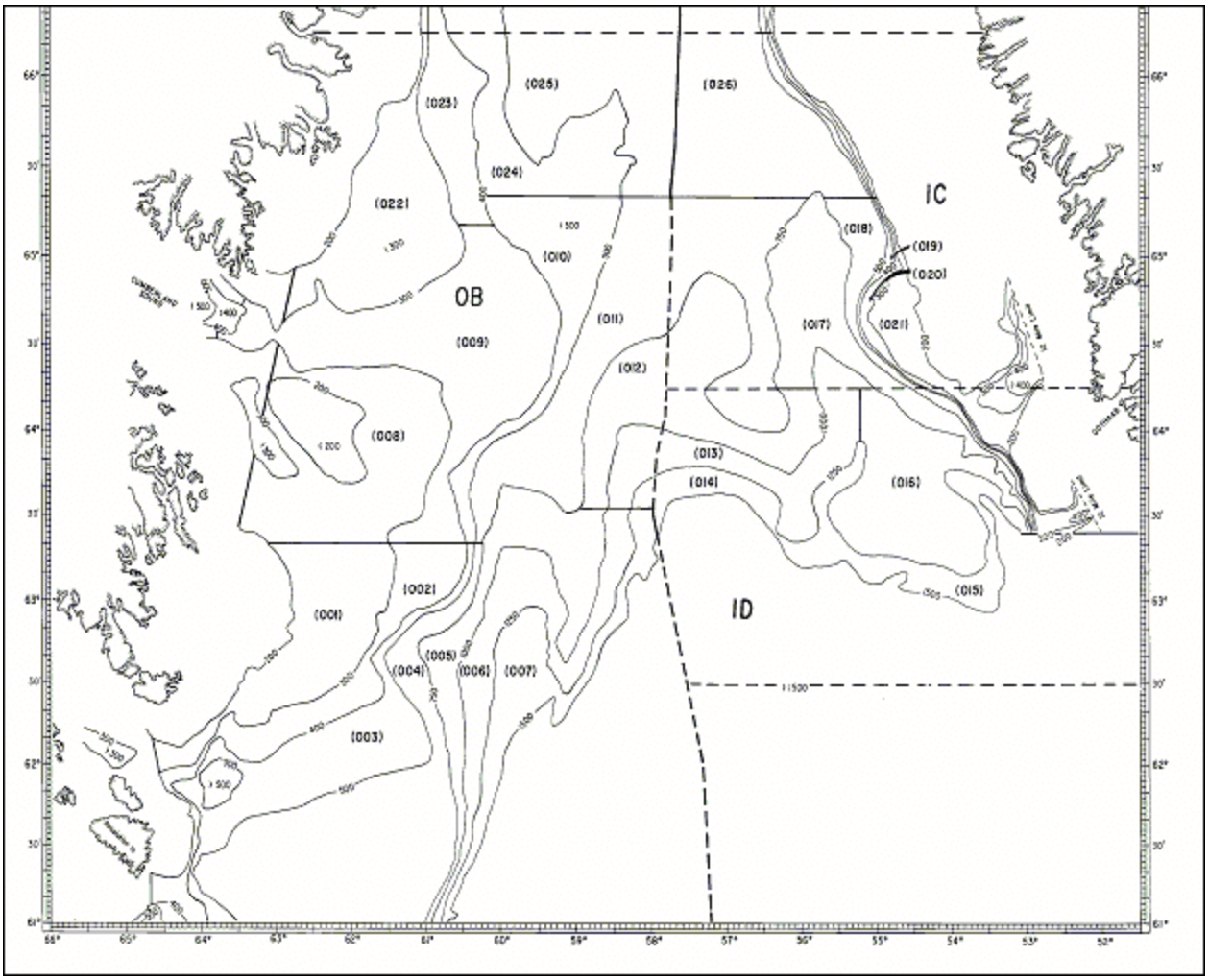


Fig. 3. Stratification scheme for North Atlantic Fisheries Organization Div. 0B.

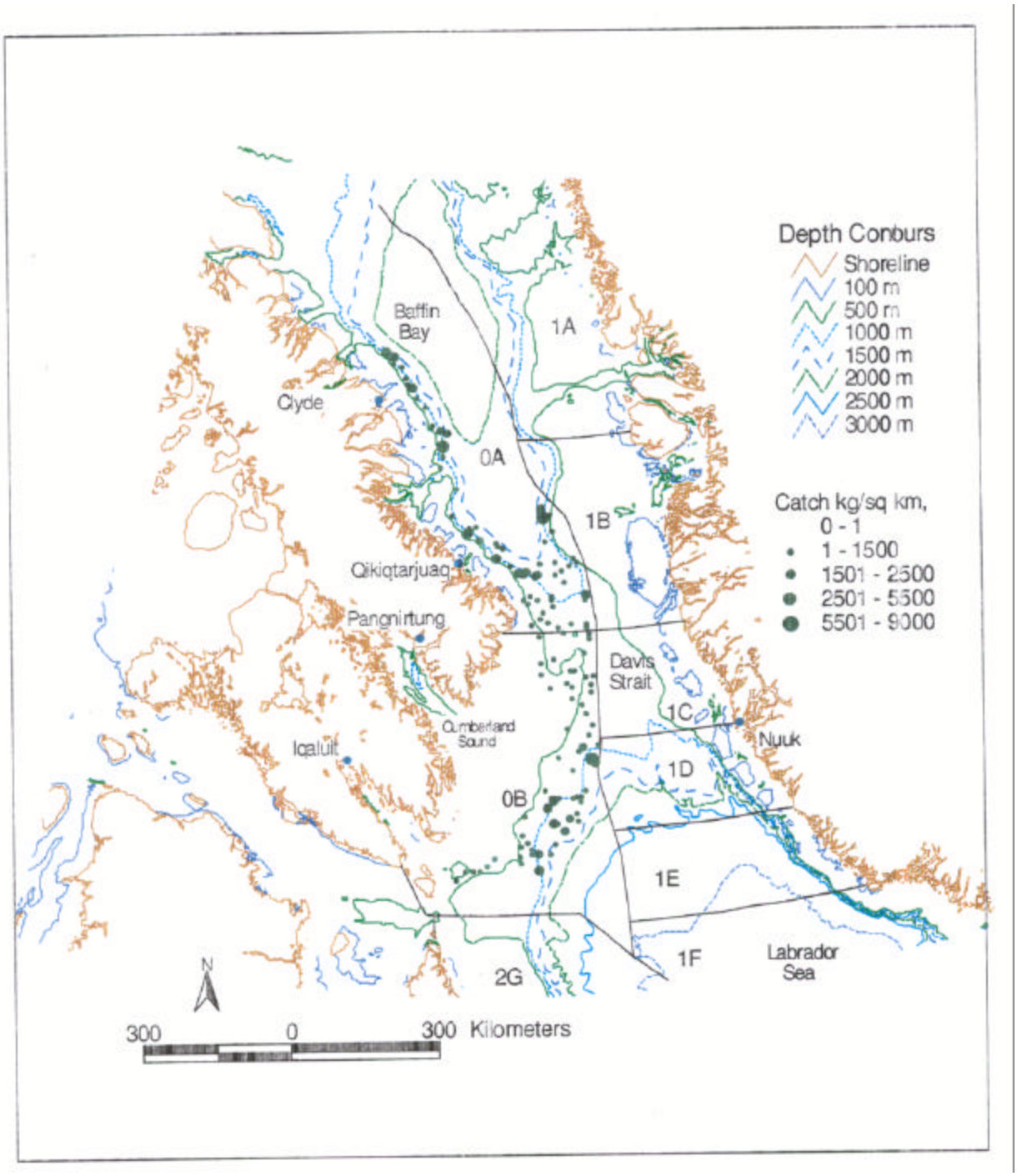
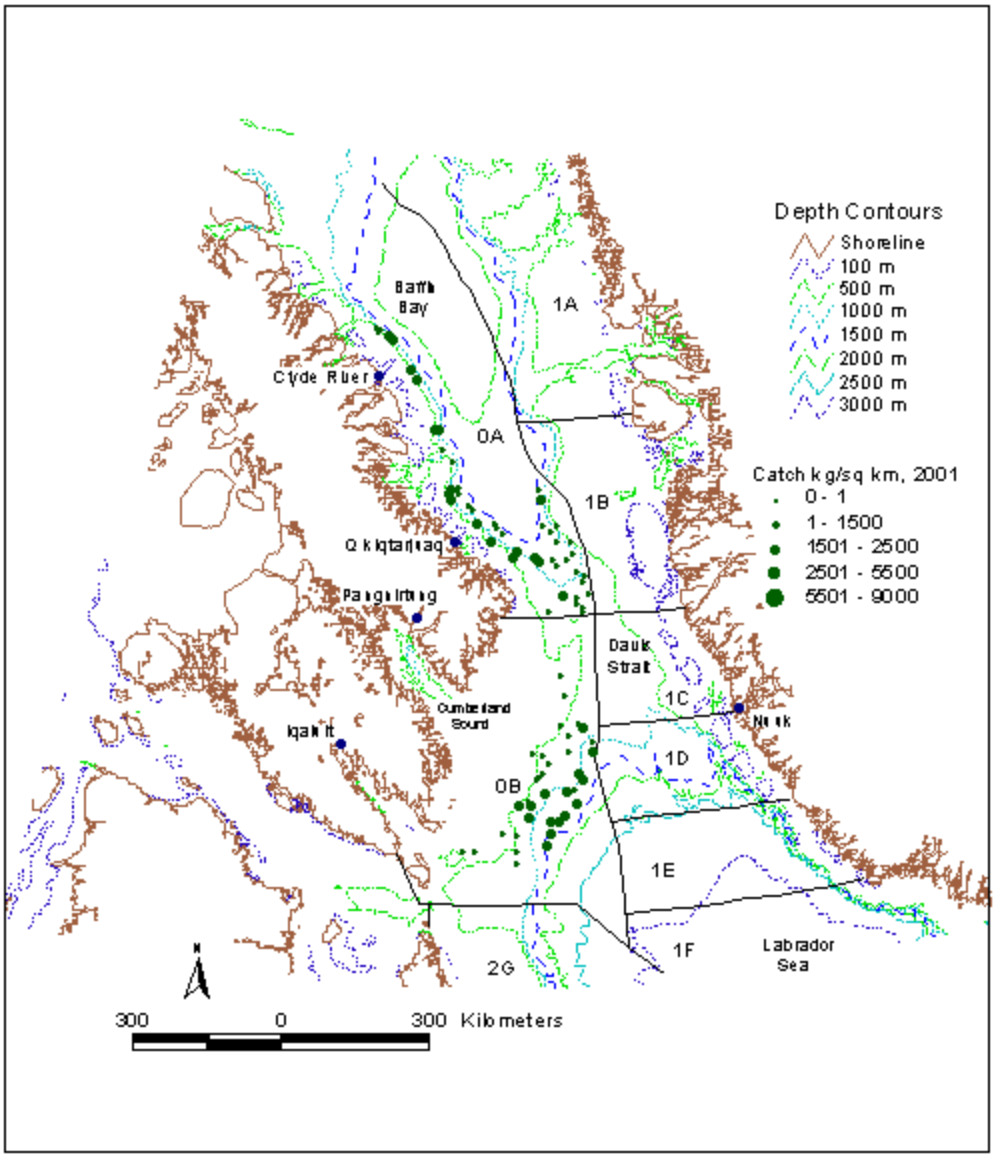


Fig. 4. Greenland halibut (kg.sq. km.) for NAFO 0A (1999) and 0B (2000)


Depth Contours
Shoreline
100 m
500 m
1000 m
1500 m
2000 m
2500 m
3000 m
Catch kg/sq km, 2001
0 - 1
1 - 1500
1501 - 2500
2501 - 5500
5501 - 9000
Baffin Bay
Clyde River
Qikiqtarjuaq
Pangnirtung
Cumberland Sound
Iqaluit
Dauer Strait
Nuuk
1A
1B
1C
1D
1E
1F
0A
0B
2G
Labrador Sea
300 0 300 Kilometers

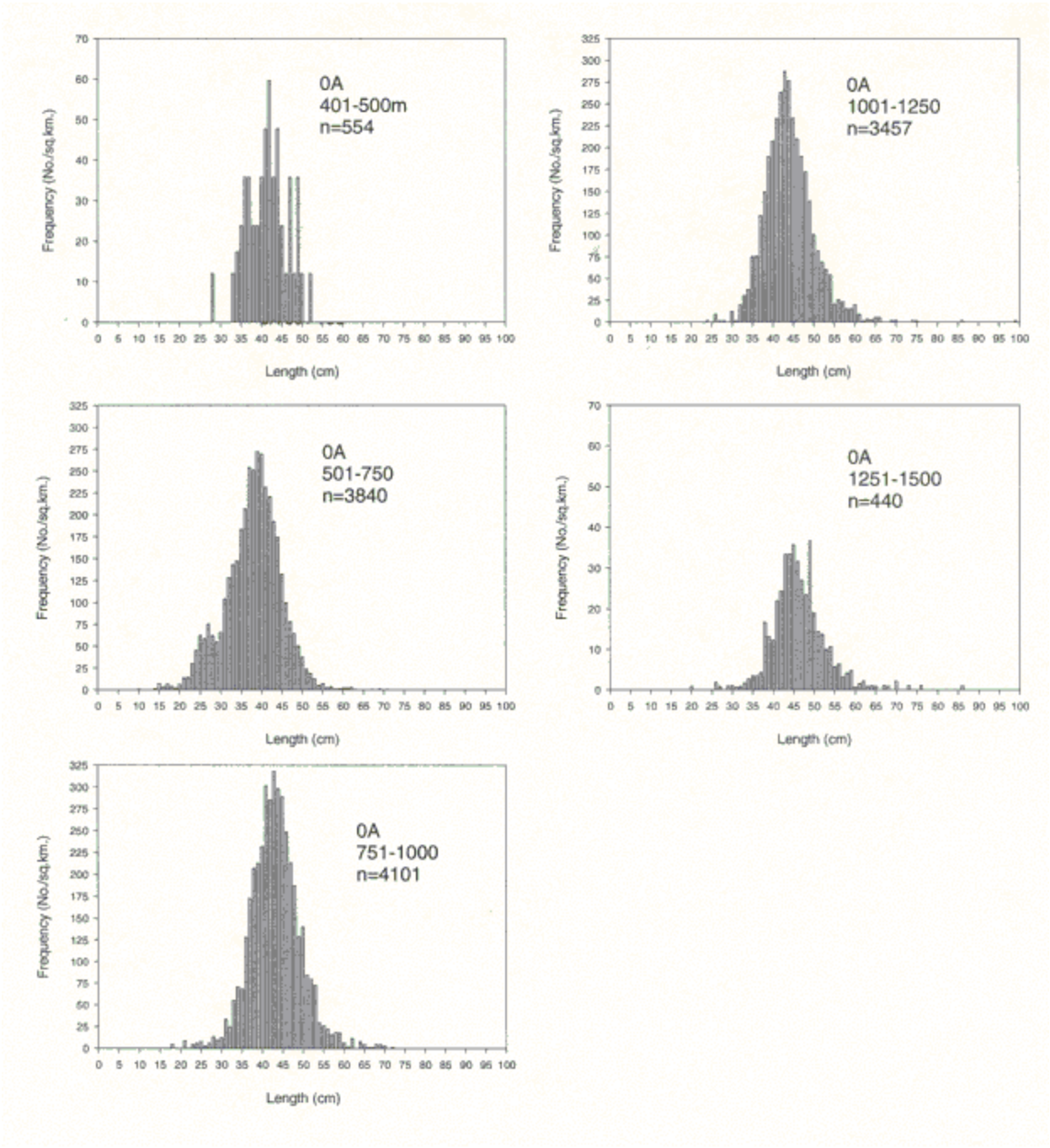


Fig. 6. Length distribution for Greenland halibut from Div. 0A, standardized to numbers/km^2 for the 2001 survey. Sample sizes (n) used in the calculation are also given.

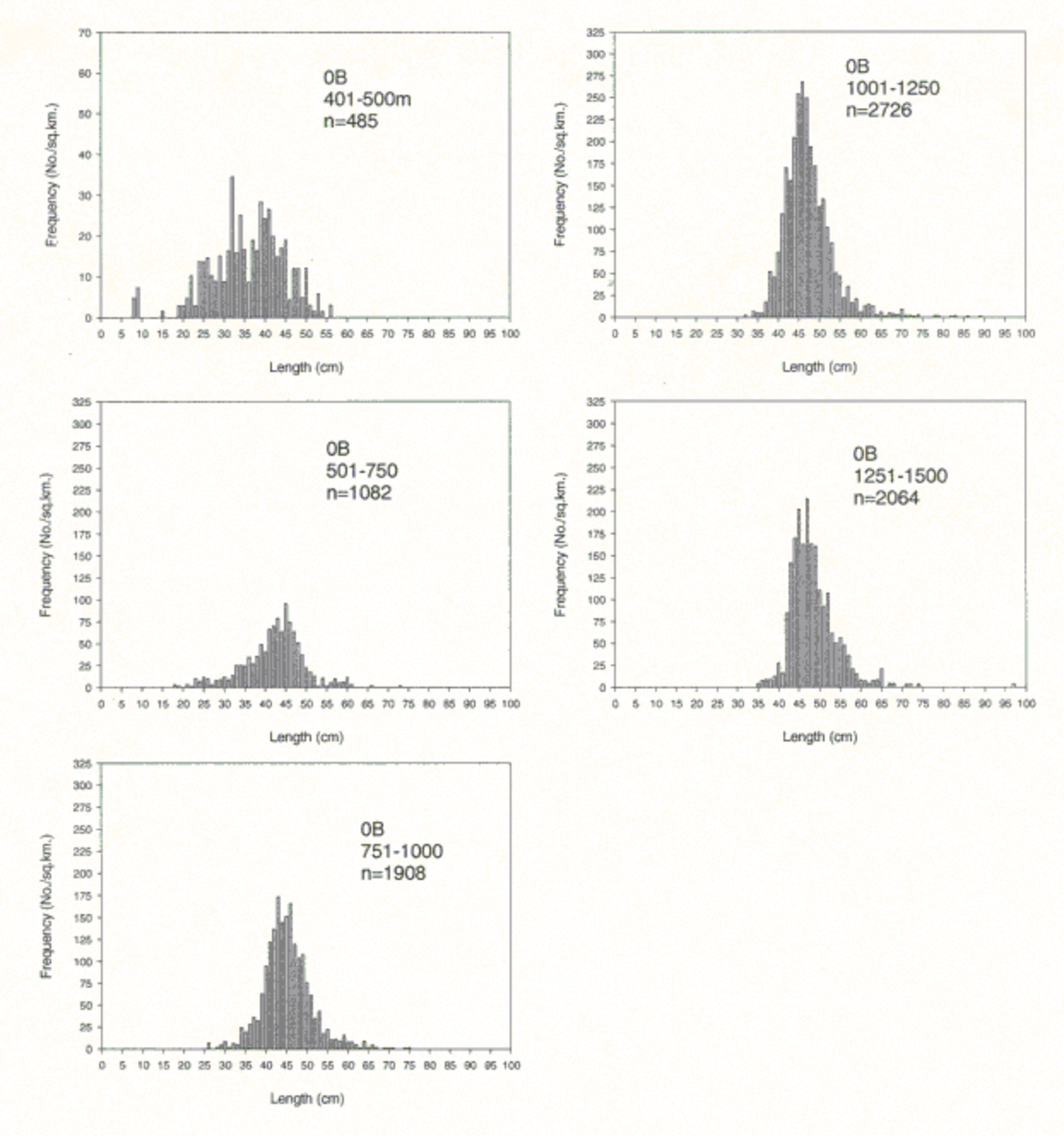


Fig. 7. Length distribution for Greenland halibut from Div. 0B, standardized to numbers/km^2 for the 2001 survey. Sample sizes (n) used in the calculation are also given.

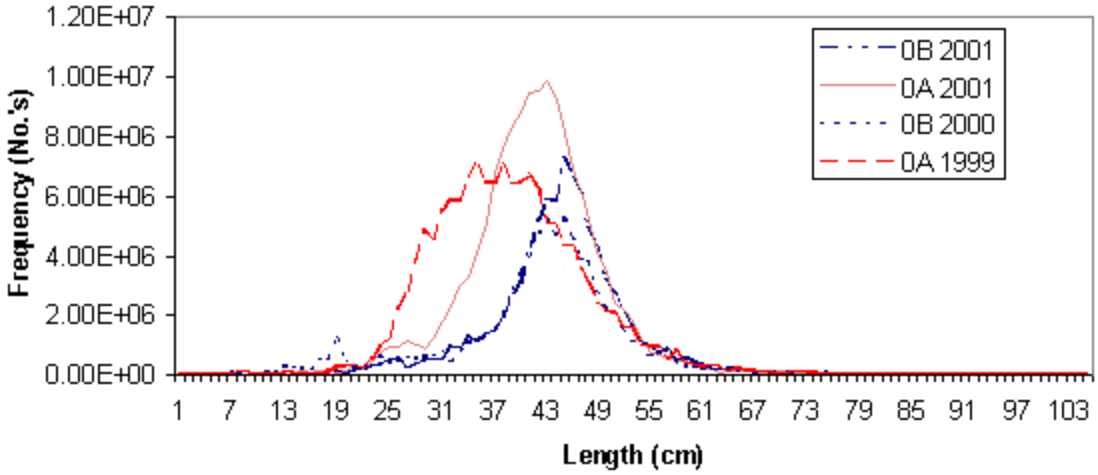


Fig. 8. Estimated abundance at length for the Greenland halibut population in NAFO Div. 0A and 0B in 1999-2001.

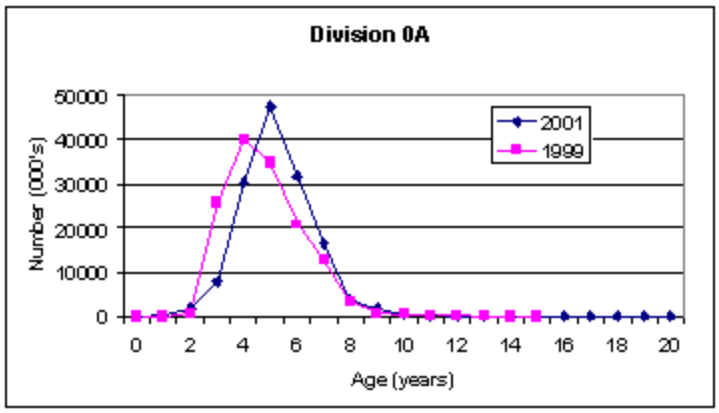


Fig. 9. Abundance at age for Greenland halibut from NAFO Div. 0A, 1999 and 2001.

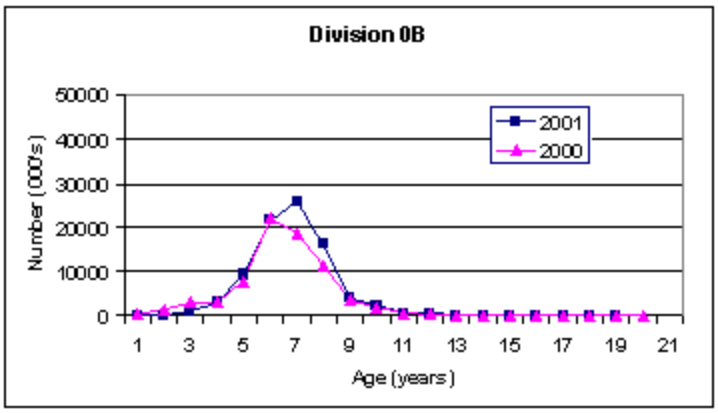


Fig. 10. Abundance at age for Greenland halibut from NAFO Div. 0B, 2000 and 2001.

Appendix 1. List of species caught during the 2001 NAFO Div. 0A survey, including minimum and maximum weight, minimum and maximum numbers per tow (not standardized to km^2 swept), minimum and maximum length, minimum and maximum depth, minimum and maximum temperature and minimum and maximum latitude.

Obs	ART	species	min wgt	max wgt	min no	max no	min length	max length	min depth	max depth	min temp	max temp
1	SAN	Ammodytes sp.	0.0	0.0	2	2	8.0	9.0	1365.0	1365.0	0.01	0.01
2	CAD	Anarhichas denticulatus	7.0	7.0	2	2	68.0	70.0	556.5	556.5	0.38	0.38
3	CAS	Anarhichas minor	0.8	3.0	1	2	45.0	57.0	518.5	556.5	0.34	0.38
4	ARZ	Arctozenius rissoi	0.1	0.1	2	2	26.0	28.0	703.0	703.0	0.13	0.13
5	ARA	Artediellus atlanticus	0.0	1.9	1	38	5.0	20.0	465.0	1365.5	0.01	0.38
6	ARU	Artediellus unicatus	0.1	0.3	1	4	17.0	20.0	545.0	546.0	0.08	0.08
7	BAT	Bathylagus euryops	0.0	0.1	1	3	8.0	17.0	556.5	1365.0	0.01	0.38
8	BSP	Bathyraja spinicauda	6.4	6.4	1	1	98.0	98.0	1086.0	1086.0	0.06	0.06
9	BEG	Benthosema glaciale	0.0	0.0	0	5	5.0	9.0	465.0	1380.5	0.00	0.23
10	POC	Boreogadus saida	0.0	14.4	1	1904	5.0	24.0	408.5	1353.5	0.01	0.23
11	CRM	Careproctus micropus	0.0	0.0	1	2	7.0	10.5	546.0	1353.5	0.02	0.08
12	CAR	Careproctus reinhardti	0.0	0.1	1	3	6.0	17.0	522.5	1100.0	0.06	0.13
13	SQU	Cephalopoda	0.0	22.1	0	7	.	.	518.5	1380.5	0.00	0.34
14	COM	Cottunculus microps	0.0	1.0	1	10	3.0	26.0	522.5	1290.0	0.02	0.38
15	COS	Cottunculus sadko	0.0	0.4	1	6	5.0	17.0	546.0	1316.0	0.01	0.12
16	CLM	Cyclothone microdon	0.0	0.0	1	1	6.0	9.0	686.5	1365.5	0.01	0.08
17	EUM	Eumicrotremus spinosus	0.1	0.2	1	2	8.0	11.0	408.5	635.0	0.06	0.08
18	PLA	Hippoglossoides platessoides	0.2	12.2	1	53	15.0	43.0	465.0	1440.5	0.00	0.38
19	LMC	Lampanyctus macdonaldi	0.0	0.0	1	1	7.5	13.0	629.5	1095.0	0.06	0.14
20	LIF	Liparis fabricii	0.1	2.7	2	128	6.0	18.0	408.5	1440.5	0.00	0.38
21	LIG	Liparis gibbus	0.5	0.5	1	1	29.0	29.0	465.0	465.0	0.08	0.08
22	LYY	Lycenchelys sp.	0.0	0.0	1	3	16.0	19.0	810.0	1340.0	0.02	0.11
23	LMA	Lycodes MacAllister	0.1	0.5	1	2	22.0	36.0	843.5	1277.5	0.02	0.08
24	LYE	Lycodes esmarki	0.3	0.3	1	1	39.0	39.0	556.5	556.5	0.38	0.38
25	LYN	Lycodes eudipleurostictus	0.1	1.0	1	9	17.0	39.0	623.5	1287.5	0.02	0.23
26	LPA	Lycodes paamiuti	0.0	0.3	1	10	12.0	25.0	518.5	1365.5	0.01	0.34
27	LYR	Lycodes reticulatus	1.3	2.6	3	5	27.0	57.0	465.0	634.5	0.08	0.10
28	LSE	Lycodes seminudus	0.1	0.1	2	2	12.0	23.0	694.5	694.5	0.09	0.09
29	ELZ	Lycodes sp.	0.0	0.3	1	6	4.0	32.0	545.0	1380.5	0.01	0.12
30	RHG	Macrourus berglax	0.0	2.0	1	6	6.5	26.0	518.5	1277.5	0.02	0.38
31	CAP	Mallotus villosus	0.0	0.0	1	1	11.0	11.0	1086.0	1086.0	0.06	0.06
32	ARJ	Natantia	0.0	0.7	0	0	.	.	408.5	1287.5	0.02	0.23
33	NOT	Notacanthus chemnitzii	0.3	1.8	1	2	53.0	85.0	629.5	1100.0	0.06	0.14
34	OCT	Octopus	0.0	25.3	0	14	.	.	556.5	1440.5	0.00	0.38
35	ONA	Onogadus argentatus	0.0	0.6	1	1	19.0	39.0	518.5	1365.5	0.02	0.34
36	ONN	Onogadus ensis	0.2	9.0	1	49	10.0	43.0	546.0	1440.5	0.00	0.23
37	PAB	Paraliparis bathybius	0.0	0.9	1	14	11.0	22.0	545.0	1380.5	0.00	0.09
38	PAC	Paraliparis copei	0.0	0.1	1	1	10.0	18.0	1287.5	1340.0	0.02	0.03
39	RFL	Rajella fyllae	0.0	6.4	1	15	10.0	38.0	518.5	1271.0	0.01	0.34
40	RHB	Amblyraja hyperborea	0.2	46.5	1	28	16.0	98.0	545.0	1440.5	0.00	0.38
41	RRD	Amblyraja radiata	0.0	4.5	1	6	10.0	46.0	518.5	1440.5	0.00	0.38
42	GHL	Reinhardtius hippoglossoides	0.4	648.7	1	1099	10.0	99.0	408.5	1440.5	0.00	0.38
43	CRA	Reptantia	0.7	0.7	0	0	.	.	629.5	629.5	0.14	0.14
44	RHO	Rhodichtlys regina	0.0	0.4	1	9	15.0	23.0	1271.0	1440.5	0.00	0.08
45	REG	Sebastes marinus	1.4	1.7	1	1	45.0	48.0	556.5	631.0	0.18	0.38
46	REB	Sebastes mentella	0.1	42.6	1	677	6.0	48.0	465.0	1278.5	0.01	0.38
47	SQT	Squit	0.0	0.4	0	5	.	.	408.5	1100.0	0.06	0.38
48	STO	Stomias boa	0.0	0.0	1	1	7.0	8.0	556.5	1277.5	0.02	0.38
49	TRN	Triglops nybelini	0.0	0.3	1	33	7.0	12.0	408.5	1353.5	0.03	0.10

Appendix 2. List of species caught during the 2001 NAFO Div. 0B survey, including minimum and maximum weight, minimum and maximum numbers per tow (not standardized to km^2 swept), minimum and maximum length, minimum and maximum depth, minimum and maximum temperature and minimum and maximum latitude.

Obs	ART	species	min wg t	max wg t	min no	max no	min len	max len	min depth	max depth	min temp	max temp
1	ALA	Alepocephalus agassizzi	0.0	0.3	1.0	2	7.0	20.0	866.5	1335.5	0.34	0.39
2	ALB	Alepocephalus bairdii	5.4	5.4	27.0	27	.	.	1100.0	1100.0	0.35	0.35
3	ALE	Alepocephalus sp.	0.0	0.0	1.0	1	.	.	1412.5	1412.5	0.34	0.34
4	CAD	Anarhichas denticulatus	1.3	1.6	1.0	1	.	.	695.0	972.5	0.26	0.37
5	CAS	Anarhichas minor	1.0	4.3	1.0	1	47.0	47.0	468.5	471.5	0.22	0.23
6	ANT	Antimora rostrata	0.1	21.2	1.0	55	10.0	59.0	558.0	1441.5	0.23	0.39
7	APL	Apristurus laurussonii	1.2	1.2	1.0	1	62.0	62.0	1412.5	1412.5	0.34	0.34
8	ARZ	Arctozenius rissoi	0.0	0.0	1.0	1	28.0	28.0	558.0	558.0	0.35	0.35
9	AGO	Argyropelecus olfersi	0.0	0.0	1.0	1	10.0	10.0	1100.0	1100.0	0.34	0.34
10	ARA	Artediellus atlanticus	0.1	0.4	1.0	16	10.0	15.0	429.5	471.5	0.16	0.29
11	ART	Artediellus sp.	0.0	0.0	1.0	1	.	.	471.5	471.5	0.32	0.32
12	BOS	Astronesthidae	0.0	0.0	1.0	1	.	.	683.5	1122.5	0.28	0.35
13	BAT	Bathylagus euryops	0.0	2.7	1.0	54	8.0	21.0	459.0	1441.5	0.16	0.39
14	BSP	Bathyraja spinicauda	0.0	24.1	1.0	2	88.0	134.0	914.0	1441.5	0.34	0.35
15	BEG	Benthosema glaciale	0.0	0.1	1.0	38	4.0	8.0	429.5	1441.5	0.16	0.39
16	POC	Boreogadus saida	0.0	0.1	1.0	28	7.0	16.0	444.0	468.5	0.16	0.23
17	BOA	Borostomias antarctica	0.0	0.2	1.0	3	19.0	26.0	1093.0	1412.5	0.34	0.35
18	CFB	Centroscyllium fabricii	0.2	17.1	0.4	28	35.0	71.0	642.0	1335.5	0.26	0.38
19	SQU	Cephalopoda	0.0	0.3	1.0	4	.	.	459.0	1441.5	0.16	0.38
20	CHA	Chauliodus sloani	0.0	0.1	1.0	2	22.0	24.0	1093.0	1335.5	0.34	0.35
21	CHN	Chiasmodon niger	0.0	0.2	1.0	4	10.0	23.0	459.0	1335.5	0.16	0.39
22	CBB	Coryphaenoides brevibarbis	0.0	2.6	1.0	51	2.0	12.0	429.5	1441.5	0.29	0.35
23	CGR	Coryphaenoides guntheri	0.6	2.8	10.0	24	3.5	13.0	1100.0	1441.5	0.33	0.35
24	RNG	Coryphaenoides rupestris	0.1	13.6	2.0	53	2.5	18.0	695.0	1441.5	0.26	0.39
25	COM	Cottunculus microps	0.0	0.3	1.0	3	8.0	23.0	467.5	1062.5	0.23	0.39
26	COT	Cottunculus thomsonii	0.0	0.3	1.0	1	.	.	683.5	1059.0	0.28	0.38
27	LUM	Cyclopterus lumpus	0.1	1.3	1.0	1	13.0	28.0	683.5	1149.0	0.28	0.35
28	CLM	Cyclothone microdon	0.0	0.0	1.0	4	6.0	15.0	866.5	1441.5	0.34	0.39
29	EDR	Eumicrotremus derjungini	0.2	0.2	1.0	1	.	.	471.5	471.5	0.32	0.32
30	EUM	Eumicrotremus spinosus	0.2	0.2	1.0	1	12.0	12.0	444.0	444.0	0.22	0.22
31	WIT	Glyptocephalus cynoglossus	0.2	0.2	1.0	1	.	.	847.0	847.0	0.37	0.37
32	GOB	Gonostoma bathyphilum	0.1	0.1	1.0	1	.	.	820.5	820.5	0.38	0.38
33	PLA	Hippoglossoides platessoides	0.1	2.4	1.0	9	17.0	35.0	444.0	860.5	0.16	0.37
34	HAT	Hoplostethus atlanticus	0.1	0.1	1.0	1	15.0	15.0	1441.5	1441.5	0.34	0.34
35	LMC	Lampanyctus macdonaldi	0.0	2.3	1.0	118	5.0	19.0	429.5	1441.5	0.22	0.39
36	EUD	Leptagonus decagonus	0.0	0.0	1.0	2	12.0	17.0	459.0	468.5	0.16	0.23
37	LIF	Liparis fabricii	0.0	0.3	1.0	8	10.0	16.0	459.0	696.5	0.16	0.35
38	LIP	Liparis sp.	0.0	0.6	1.0	16	.	.	471.5	684.0	0.22	0.28
39	LYY	Lycenchelys sp.	0.0	0.0	1.0	1	33.0	33.0	1149.0	1149.0	0.35	0.35
40	LYE	Lycodes esmarki	0.2	0.2	2.0	2	26.0	34.0	475.0	475.0	0.38	0.38
41	LYN	Lycodes eudipleurostictus	0.0	0.3	1.0	4	18.0	30.0	444.0	665.0	0.16	0.26
42	LPA	Lycodes paamiuti	0.0	0.5	1.0	11	13.0	22.0	459.0	683.5	0.16	0.38
43	ELZ	Lycodes sp.	0.1	0.1	1.0	3	29.0	29.0	684.0	1093.0	0.23	0.35
44	LYV	Lycodes vahli	0.0	0.3	1.0	5	23.0	26.0	444.0	524.5	0.21	0.38
45	GRE	Macrouridae	0.0	0.0	1.0	1	5.5	5.5	1059.0	1149.0	0.35	0.36
46	RHG	Macrourus berglax	0.1	27.6	1.0	47	3.5	33.0	429.5	1441.5	0.16	0.39
47	MAL	Malacosteus niger	0.0	0.1	1.0	1	17.0	17.0	1059.0	1441.5	0.34	0.36
48	MYC	Myctophidae	0.0	0.1	1.0	23	.	.	471.5	847.0	0.22	0.38
49	MYX	Myxine glutinosa	0.0	0.1	1.0	1	51.0	51.0	867.0	941.5	0.36	0.37
50	ARJ	Natantia	0.0	1.2	0.0	0	.	.	429.5	1441.5	0.16	0.38
51	NEM	Nemichthys scolopaceus	0.0	0.0	1.0	1	.	.	972.5	972.5	0.36	0.36
52	NEG	Neolithodes grimaldi	0.1	3.0	1.0	3	.	.	429.5	1441.5	0.29	0.38
53	NZB	Nezumia bairdi	0.1	3.8	1.0	33	5.0	8.0	524.5	1149.0	0.26	0.39
54	NOT	Notacanthus chemnitzii	0.1	4.4	1.0	3	48.0	97.0	696.5	1441.5	0.30	0.38
55	OCT	Octopus	0.0	0.7	1.0	5	.	.	429.5	1100.0	0.21	0.38
56	ONE	Oneiroides eschrichti	0.0	0.6	1.0	1	10.0	10.0	820.5	914.0	0.35	0.38
57	ONA	Onogadus argentatus	0.0	0.2	1.0	1	15.0	30.0	465.5	1412.5	0.21	0.38
58	ONN	Onogadus ensis	0.0	4.5	1.0	13	9.0	44.0	444.0	1441.5	0.16	0.39
59	PAC	Paraliparis copei	0.0	0.0	1.0	1	11.0	13.0	1412.5	1441.5	0.34	0.34
60	POL	Polyacanthonotus rissoanus	0.1	1.5	1.0	5	47.0	54.0	1100.0	1441.5	0.33	0.35
61	POR	Poromitra crassiceps	0.0	0.0	1.0	1	.	.	1412.5	1412.5	0.34	0.34
62	RBT	Rajella bathyphila	0.0	0.0	1.0	1	102.0	102.0	1441.5	1441.5	0.34	0.34
63	RRD	Amblyraja radiata	0.0	0.9	1.0	1	18.0	18.0	471.5	1441.5	0.22	0.34
64	SKA	Raja. sp.	0.0	0.0	1.0	1	13.0	15.0	1062.5	1149.0	0.35	0.35

Appendix 2. Continued.

Obs	ART	species	min wgt	max wgt	min no	max no	min len	max len	min depth	max depth	min temp	max temp
65	GHL	Reinhardtius hippoglossoides	3.3	341.6	5.0	365	8.0	97.0	429.5	1441.5	0.16	0.39
66	SCO	Scopelosarus lepidus	0.0	0.5	1.0	3	28.0	36.0	471.5	1245.0	0.22	0.36
67	REG	Sebastes marinus	2.0	2.0	1.0	1	49.0	49.0	642.0	642.0	0.27	0.27
68	REB	Sebastes mentella	0.0	91.9	1.0	857	5.0	46.0	429.5	1412.5	0.16	0.39
69	SER	Serrivomer beani	0.0	0.4	1.0	6	48.0	66.0	914.0	1412.5	0.33	0.36
70	STO	Stomias boa	0.0	0.0	1.0	3	18.0	19.0	558.0	1245.0	0.33	0.36
71	SYN	Synapobranchus kaupi	0.1	6.1	1.0	49	23.0	64.0	665.0	1441.5	0.23	0.39
72	TRA	Trachyrynchus murrayi	0.0	0.2	1.0	1	9.5	9.5	847.0	1062.5	0.35	0.37
73	XEC	Xenodermichthys copei	0.0	0.0	1.0	1	16.0	16.0	444.0	444.0	0.22	0.2