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Summary of Data from the Offshore Canadian Commercial Fishery for Greenland Halibut in Subarea 0

by

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Abstract

This document updates information from the commercial fishery for Greenland halibut in Subarea 0 with a focus on the Canadian commercial fishery in 2002. There is a description of the fishery catch trends and sampling data, including comments on mesh and hook size regulations and processed to whole weight conversion factors used in the Div. 0A fishery. Catches in the Div. 0A otter trawl fishery were almost equally divided between males and females while females were more common in the Div. 0A and Div. 0B long line catches. In 2002 the long line fishery in Div. 0A had 21.3% of fish less than 46 cm, similar to the 20.7% in the Div. 0B otter trawl catch with both much lower than the 38.3% found in the Div. 0A fishery. Catch at age showed a slight shift toward younger fish after 1993, with a peak at age 7 in each year since then. As in previous years, length frequency distributions and catch at age from 2002 indicate larger fish in the fixed gear catches compared to the mobile gears. There were no major trends in weight at age during the period 1990 to 2002. Due to the frequency of fleet changes in this fishery, and the lack of continuity among vessels within fleets, a standardized index of CPUE for Subarea 0 alone is not considered to be a reliable indicator of overall stock abundance. CPUE data for 2000 and 2001 are incomplete and not updated here. Twin trawls were present in the Greenland halibut fishery in Subarea 0 beginning in 2000 but complete data were not available from this fleet component.

Description of Data

Mesh Size and Hook Size Regulations

In 1996 the codend mesh size for the Subarea 0 Greenland halibut fishery was increased from 135 mm diamond to 145 mm diamond or 155 mm square. In the Div. 0A fishery mesh size varied from 145 mm to 152 mm diamond between 1996 and 2001. In 2002 both 145 mm diamond and 156 and 158 mm square mesh was used by the trawl fleet (Table 1). The mesh used in the body and wings of the trawl net has varied considerably between vessels within and between years. The 100 mm mesh was first used in 2001. Trawls rigged with this small mesh in the body and wings have been tested in Greenland halibut fisheries in Div. 0B (Aquaprojects Inc., 2002). The small mesh was found to be effective in reducing the amount of fish caught or “meshed” in the body and wings with vessel operators reporting improved quality of the catch while the proportion of small fish remained relatively unchanged.

Hook size for long line gear is also regulated and set at size 14/0. All vessels fishing long line in Div. 0A used 14/0 hooks or equivalent.

Conversion Factors

Standard conversion factors have been published by Fisheries and Oceans Canada Statistical Coordinating Committee for the Atlantic Coast in STACAC Document #2, which were subsequently revised in June of 1984. A conversion factor of 1.4 is listed for Greenland halibut, gutted, head off. The type of cut used to remove the head (single or double) explained most of the variation in conversion factors examined by Kulka (1985). However, both single and double head cuts resulted in conversion factors greater than the 1.4 used by some vessel captains in 2001 and 2002 (Table 2).

The FAO compiles conversion factors used by various countries for a number of species and product types. For Greenland halibut, gutted, head off, frozen they list 1.43 (Poland) and 1.5 (Greenland) and for gutted, tail off, head off, frozen they list 1.44 (Germany) (FAO, 2000). Observers have conducted experiments during the course of their sampling in Div. 0A and have indicated an appropriate conversion factor would be in the order of 1.44-1.55 for the type of product currently produced in Div. 0A (Table 2). Canadian observers will be implementing a CF of 1.49 for Greenland halibut, product code 120 (gutted, tail off, head off, collar bone out) in Div. 0A (Joe Firth, DFO St. John's, pers. comm.).

Sampling from the 2002 fisheries

The otter trawl fisheries during 2002 in Div 0A and 0B, as well as the longline fisheries in Div. 0A, were well sampled with respect to length compositions. In Div. 0A, length samples were collected from the Latvian, Russian, and Norwegian vessels fishing Canadian quotas under charter arrangements. In Div 0A and 0B, length data were collected from Canadian-flagged vessels as well, although there were no length or otolith samples from the fixed gear (longline, gillnet) fisheries in Div. 0B in 2002. There were 91 978 length measurements collected in Div. 0A in 2002, compared with 19 704 in Div. 0B. Catches in each area in 2002 were within 4% of each other. This discrepancy in length sampling between the two Divisions can be explained by the fact that Div. 0A has 100% observer coverage on all fleets whereas observer coverage in Div. 0B is 100% for the mobile fleet but only 20% on the fixed gear fleet. Also, in 2002 some of the observers in Div. 0A were specifically requested to take additional length measurements in order to determine the level of small fish (≤ 45 cm) in the catches (Joe Firth, DFO St John's, pers. comm.). In addition, there was extensive sampling of longline catches in 0A, but no sampling of the longline or gillnet catches (total 2 127 tons) in Div. 0B. To allow estimation of the fixed gear catch at age from Div 0B, selected longline length frequencies from Div 0A were used. These 0A frequencies had the largest mean lengths, given that fixed gear catches in 0B in previous years contained a high proportion of larger, older fish when compared with otter trawl age compositions.

Otoliths collected from catches in Div. 0A have not yet been aged, so 538 otoliths collected in 2002 in Div. 0B were used with the length data from both Divisions. Because some length frequencies contained lengths which were greater than the largest fish in the age-length keys, 61 otoliths from 2000 and 2001 at these lengths (>85 cm) were added to the 2002 keys where necessary. The number of otoliths collected from Div 0B in 2002 continued a declining trend in recent years, from 1 421 in 1999 to 1 115 in 2000 to 720 in 2001. Additional otoliths were collected in 2001 from Div. 0B, but have not been analyzed for inclusion here. In addition, otoliths from Div 0A collected in 2001 and 2002 could be used in updated calculations after they have been aged, should substantial differences exist between growth rates in Div. 0A and 0B.

There are no data on by-catch from the shrimp fishery in Subarea 0 included in this paper, or from catches in the inshore fixed-gear fishery in Cumberland Sound. Catches from these fisheries are relatively small and have generally been dealt with elsewhere.

Catch Data

It should be noted that there are considerable uncertainties with the catch data for Greenland halibut in Subarea 0. In the data for the early-1990s, the use of charter vessels from non-Canadian countries to fish Canadian quotas resulted in some double counting of catch data. Although this problem has been resolved for some time for the Div. 0B catches, the introduction of non-Canadian charters in the Div. 0A fishery has resulted in similar

problems with the 2001 and 2002 STATLANT 21A and B catch data. Logbook data for catches in 2000 by some Newfoundland-based vessels were not available and these catches were summarized from quota reports, resulting in incomplete data for month fished. As well, it is likely that some data for vessels fishing with licenses issued for Nunavut-based companies may not have been tabulated for the years 1997-99, although the full extent of this is not known at present. This may explain some of the apparent shortfall of reported catches by Canada of about 1 000 tons against the 5 500 tons quotas in 1998 and 1999. NAFO Scientific Council members have used national and observer databases to compile the catch statistics presented in this report and used in the assessment of the Subarea 0+1 stock.

The introduction of twin trawls to the fishery in 2000 has resulted in a new gear type. There is some question as to whether this new twin trawl gear has been coded differently from single trawls in data from some vessels or fleets operating in Div. 0B. Further examination of logbooks and observer data will be required to see the extent of this problem and whether or not it can be resolved. In the meantime, it is not possible to fully update the Subarea 0 CPUE series until this has been clarified. A non-standardized CPUE series for the Div. 0A fishery is presented.

Results and Discussion

Catch Trends

Catches of Greenland halibut in Subarea 0 increased from less than 1 000 annually in the late-1980s to an average of about 10,000 tons per year in 1990-92 (Jorgensen 2002). A new management unit was introduced in 1995, which excluded the inshore waters of Div. 1A in Greenland from the TAC for Subareas 0+1. As a result, the TAC for Subarea 0+1 offshore was decreased from 25 000 to 11 000 tons split equally between SA 0 and SA 1. Subsequently, catches in Subarea 0 were reduced to between 5 300 and 6 700 tons per year in 1995 to 1997. A further reduction to about 4 400 tons occurred in 1998. In 1999 catches in Div. 0B totaled about 4 050 tons, with 310 tons being taken in Div. 0A, for a total of 4 360 tons from Subarea 0. With the exception of a relatively small inshore fishery in Cumberland Sound, and some exploratory fishing in Subarea 0 beginning in 1996, virtually all the catch in Subarea 0 prior to 1999 occurred offshore in Div. 0B. Table 3 contains catch estimates for the Div. 0A fishery from 1996 to 2002.

In 2001, a new quota of 4 000 tons was introduced for Div. 0A and 1A offshore, separate from the 11 000 tons in Div. 0B + 1B-F offshore. Catches in Div. 0A in 2001 were 2 625 tons and data from that fishery are presented in Treble and Bowering (2002). The fishery in 2001 in Div. 0B caught almost 4 900 tons, similar to the catch in Div. 0B in 2000. In 2002 the catch in Div. 0B was 3 968 tons, (including 106 tons from the inshore fishery in Cumberland Sound). In 2002 an additional 4 000 tons was added to the quota for Div. 0A and 1A offshore. Catches in Div. 0A in 2002 were 3 561 tons (3 800 tons observer estimated) an increase of approx. 1 000 tons over 2001. The decline in the Div. 0B catch from 2001 to 2002 may be related to the increased quota in Div. 0A. At least one and possibly more vessels were licensed to fish in both Divisions and the catch rates were quite good in Div. 0A in 2002 so some effort may have been redirected from Div. 0B to Div. 0A.

Ice conditions in Subarea 0 continue to limit the fishing season to between April and December (Table 4). In Division 0B catches have been taken mainly by otter trawl, although catches by gillnet are becoming more important (over 1 900 tons between 1999 and 2001, 1 572 tons in 2002 (Table 4)). Longline catches also increased in recent years, from 400 tons in 1999, to almost 800 in 2001 but have dropped to 449 tons in offshore Div. 0B in 2002 (Table 4). In 1997, about 70% of the catch of 5 740 tons was taken by otter trawl, but this percentage declined to about 40% in 1999 (Brodie, 2000). In 2000, just over 50% of the catch came from otter trawls, about half of which was taken by twin trawls. In 2001 and 2002, the percentage of otter trawl catch was 40% and 46%, respectively, although no breakdown of twin vs. single trawl was available. Vessels from Canada, Japan, Faroe Islands, Russia, and Norway were the main participants in the fishery since the late-1980s, although there have been many changes to fleet compositions over time. During the 1990s, much of the Canadian quota in this fishery was caught under charter agreements with vessels from most of the nations listed above, although there were no such arrangements with non-Canadian vessels from 1999 to 2002 in Div. 0B.

In Div. 0A catches were taken entirely by otter trawl from 1996 to 2001. Twin trawl gear was first introduced in 2000. A breakdown of catches by single and twin trawl was not available for 2000 and 2001. Longline gear was introduced in 2002 and comprised 30% of the catch. Almost 70% of the trawl catch were taken using the twin trawl gear. The Nunavut based quota holders in this fishery do not have the capacity at this time to undertake fishing operations directly so this catch has been caught under charter arrangements with Southern Canadian and foreign companies from countries that have included Faroes, Poland, Lithuania, Estonia, Latvia, Russia and Norway.

Catch Distribution

Distribution of the catch and effort for Div. 0A and 0B are shown in Fig. 1-5. In Div. 0A in 2001 trawl catches were distributed all along the shelf slope up to approx. 71° N with a few sets taken near 72° N (Fig. 1). In 2002 trawl catches extended to approx. 73° with the double trawl catch concentrated between 71° and 72° N (Fig. 2). Depths fished in 2002 were similar to previous years for the trawl fleet, ranging from 693 m to 1 310 m with the majority concentrated around 1 000 m. The long line fleet concentrated in the southeast of Div. 0A, 66° to 69° N (Fig. 3) and between 554 m and 1 250 m.

The location of the Div. 0B fishery has not differed greatly from 2000 to 2002 and is located along the shelf slope between 61° and 64° N at 900 m to approx. 1 500 m depths (Fig. 4). The otter trawl fleet concentrated between 61° and 63° N (Fig. 5).

Length Frequency

Sampling data from observers assigned to the Div. 0A vessels from 1996 to 2002 are shown in Fig. 6. These data show the proportion at length in the sampled catch for male, female and sex unknown and have not been adjusted to the overall catch. In 1996 lengths ranged from 20 cm to 95 cm with two distinct modes, one at 41 cm and another at 50 cm. In subsequent years there has been a narrowing of the distribution and a shift to a single mode, 50 cm in 1997 and 44 cm in 2001. With the inclusion of longline gear into this fishery in 2002 the length distribution has shifted slightly to the right with a modal length of 47 cm. The modal length for males and females in 2002 were similar to those seen in 2001 (approx. 45 cm) but the mean lengths increased slightly over the 2001 values (Table 5).

The minimum size of fish sampled in the 2002 Div. 0A long line catch was larger than in the Div. 0A trawl catch but the maximum size of fish sampled was similar (Table 5). The modal length for males was 47 cm and for females it was 49 cm. Mean length for males was 50 cm while females had a mean length of 55 cm.

Figures 7 and 8 show the length frequency from the 2002 observer samples raised to the total overall catch by gear and location. Catches in the Div. 0A otter trawl were almost equally divided between males and females while females were more common in the Div. 0A long line (64%) and Div. 0B otter trawl catches (70%) (Fig. 7). Length distribution for the Div. 0A longline catch was similar to that of the Div. 0B otter trawl catch (Fig. 8).

There is a small fish protocol in Canada that stipulates that there should be no more than 15% of Greenland halibut catch ≤ 45 cm in length. In some fisheries the vessels have been asked to move to new ground when they have sets that produce more than 15% small fish. However, in Subarea 0 this has been difficult to achieve given the structure of the Greenland halibut stock in this area, particularly in Div. 0A, and the selectivity of the minimum mesh size allowed in this fishery. The percentage of fish ≤ 45 cm based on the data shown in Fig. 8 is similar to that calculated from the sampled catch (Table 5). The longline fishery in Div. 0A had 21.3% of fish ≤ 45 cm, similar to the 20.7% in the Div. 0B trawl fishery with both much lower than the 38.3% found in the Div. 0A trawl fishery in 2002.

Catch at age

Brodie and Power (2002) presented catch at age and mean weight at age data from 1988-2001, including data from previous documents by Atkinson *et al.* (1994), and Brodie and Bowering (1998). These data are almost all from Div 0B, and have been incorporated in the assessments of the G. halibut stock in Subareas 0+1 (e.g. Jorgensen, 2002). Most of the sampling data used in these analyses were collected at sea by observers, although some port sampling information was also included.

Catch at age from the 2002 fisheries

The available samples were used to generate the catch at age and weights at age, by Division, for 2002. Similar procedures were used as in previous years, although in some years, a few samples contained data in which the sex of each fish could not be recorded, because of processing at sea. In these cases, the sex was assigned as female, given the large percentage of females which occurred in comparable sexed samples.

Table 6 shows the catch at age calculations for the 2002 fishery. Examination of the length frequencies from single and twin trawls revealed very little difference, so these were therefore combined to produce an otter trawl age frequency in both Divisions. Age composition in the otter trawl fishery in Div. 0B in 2002 was very similar to previous years, with ages 7 and 8 dominating (Table 6). Age 7 was also the dominant age in the otter trawl fishery in Div 0A, but there was a higher proportion of age 6 fish in Div 0A compared to 0B. Table 6 also shows a comparison of the catch at age totals from fixed gear and mobile gear from both Divisions, although the comparison in Div 0B is not particularly useful given that the longline sampling actually came from Div 0A. Longline catches in 0A were also dominated by age 7, but there were proportionally more fish at ages 8+ in longline catches compared to otter trawl. Ages 7 and 8 were dominant by number in the combined catch at age in both Divisions, in numbers and weight. There is considerable uncertainty in the Div 0B catch at age, given the absence of fixed gear samples.

Table 7 (a and b) shows the catch at age and mean weights at age for 1988-2001 along with a sum-of-products (S.O.P.) check (Table 7c). These data are almost exclusively from Div 0B. The nominal catches used to derive the total catch at age values for 1988-99 were taken from Jorgensen (2000). For 2002, as in 1998-2001, mean weights at age were calculated from mean lengths at age using the length-weight relationship for NAFO Div. 2G, calculated from survey data obtained in 1997 (Gundersen and Brodie, 1999). As noted by Atkinson *et al.* (1994), there was a shift in the catch at age to younger fish with the increased otter trawl fishery in 1990 onward. In 1988-89, catches were taken mainly by longlines in deep water, and contained proportionally more old fish. From 1990-93, age 8 was predominant in catches, but from 1994-2002, the modal age in each year was 7. This may be due in part to the fishery occurring slightly later in the year in the latter period. Few fish older than 13 years appeared in the catch at age after 1990, although a few individuals as old as 16 were taken in the fishery every year.

Mean weights at most ages in 2002 were similar to those of recent years, and the weights showed little in the way of trends over time (Table 7b). The S.O.P. check (Table 7c) indicated a slight bias toward underestimating the catch weight in most years, although this bias was substantial in 2001. As noted previously, the catch at age and mean weights at age for fixed gear catches in Div 0B in 2001 and 2002 contain considerable uncertainty.

CPUE

In previous papers (Brodie, 1999; Brodie and Bowering, 1998), a standardized CPUE for Div. 0B was calculated from available data using a multiplicative model. However, it was thought that the lack of overlap of fleets throughout the time series likely caused problems in the CPUE standardization in Subarea 0. It was noted that there is not a single fleet which is present in all years of the time series, and that there was only one fleet involved in the 1999-2001 fisheries for which complete data were available. As well, the presence of twin trawls in 2000-02 has added a new gear type and has raised a question on how this gear code and effort data for twin trawls have been recorded. At least a portion of the twin trawl data in some years may not be distinguishable from single trawl data from the same vessel. An update of CPUE will be presented if/when this issue can be resolved.

Unstandardized mean catch rates have been calculated for trawl and longline vessels fishing in Div. 0A and are presented in Table 8 and Fig. 9. Single trawl mean CPUE has fluctuated around 0.5 t/h between 1996 and 2001 with an increase to approx. 0.8 t/h in 2002. The twin trawl catch rate was approx. 0.8 t/h for 2000 and 2001 and increased to approx. 1.2 t/h in 2002. However, it is important to keep in mind that as in Div. 0B there have been a number of different vessels and size classes operating in this fishery since 1996. Also, the Div. 0A fishery is still a relatively new and developing fishery. Catches increased in 2001 and 2002 from relatively low levels and in 2002 trawl effort in particular was concentrated on new grounds in the north that had only been lightly fished in previous years.

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Table 1. Mesh used in the otter trawl gear during the Div. 0A Greenland halibut fishery 1996-2001.

Year	Codend Mesh (mm)	Body Mesh (mm)
1996	147, 148	147, 149, 150
1997	145, 147, 148	153, 152, 160
1998	145	146
1999	145, 147	152, 153
2000	145	160
2001	145, 148, 150, 152	100, 135, 150, 155, 160, 200
2002	145 diamond	100, 155 diamond
	156, 158 square	155, 154 square

Table 2. Processed to round weight conversion factors used by vessel captains and observers in the Div. 0A Greenland halibut fishery.

Year	Captain	Observer	Observer's Source	Type of Product
1996	1.43	1.51	6 experiments	Gutted, head off, single cut collar bone out, tail off, frozen
1997	1.44	1.48	na	na
	1.44	1.55	twice a week tests	na
	na	1.40	na	na
1998	1.44	1.47-1.51	twice a week tests	na
1999	1.44	1.44-1.47	twice a week tests	na
2000	na	1.41	na	na
	na	1.43	na	na
2001	1.40	1.45	na	Gutted, head off, tail off, collar bone out (code 120)
	na	1.45 and 1.48	na	na
	na	1.49	3 experiments	Gutted, head off, tail off, collar bone out (code 120)
2002	1.40	1.40	list	na
	1.50	1.48	experiment, n=200 fish	Gutted, head off, double cut collar bone out, tail off, frozen
	1.40	1.49	list	Gutted, head off, tail off, collar bone out (code 120)
	1.40	1.50	experiment	Gutted, head off, tail off, collar bone out (code 120)
	1.43	1.49	list	Gutted, head off, tail off, collar bone out (code 120)
	1.49	1.49	list	Gutted, head off, tail off, collar bone out (code 120)
	1.40	1.49	observer manual	Gutted, head off, tail off, collar bone out (code 120)
	1.49	1.49	list	Gutted, head off, tail off, collar bone out (code 120)
	na	1.47	na	Gutted, head off, tail off, collar bone out (code 120)

Table 3. Greenland halibut catch in Division 0A. Catches from estimates by onboard observers as well as Fisheries and Oceans Canada statistics division are presented. Differences between the estimates are likely due to differences in conversion factors used. The Division 0A fishery has had 100% observer coverage since 1996.

Year	Observer Est.Catch (t)	National Stats (t)
1996		329
1997		241
1998		42
1999		310
2000		320
2001	2,651	2,626
2002	3,800	3,561

Table 4. Canadian catch of Greenland halibut in Subarea 0 in 2002, by division, region, month and gear. Div. 0B data from Fisheries and Oceans Statistics Branch, Div. 0A data from Observers (100% coverage). Fisheries and Oceans statistics show total catches of 3 561 tons for Div. 0A, however, a monthly breakdown was not available at this time, therefore, observer data have been substituted. OT=otter trawl, GN=gillnet and LL=longline.

	DIVISION 0B						Total	DIVISION 0A			TOTAL	TOTAL
	Can (N)			Can (M)	Can (C&A)			Can (C&A)				
	OT	GN	LL	OT	OT	LL		Single Trawl	Double Trawl	LL		
April	11						11					11
May	429	232	75	333			1069					1069
June	51	447	235	68			801					801
July		273	123				396	1	9	49	59	455
August		242	10				252	15	924	203	1142	1394
September		95	6				101	24	695	367	1086	1187
October		181					181	133	24	418	575	756
November		102					102	686		126	812	914
December				31			31	125			125	156
Unspecified					918	106	1024					1024
Total	491	1572	449	432	918	106	3968	984	1652	1164	3800	7768

Footnotes:

- 1) In Division 0B, OT includes some twin trawl catches, based on observer reports.
- 2) In Division 0B, the Central and Arctic longline catch is from the inshore fishery in Cumberland Sound.

Table 5. Overview of length (cm) parameters from the sampled catch for the Div. 0A fishery 1996-2002.

a) Otter Trawl

Year	Length range			Modal Length			Mean Length			Percent ≤45 cm
	Male	Female	Unknown	Male	Female	Unknown	Male	Female	Unknown	
1996	22-80	20-95	30-46	49	50	40	45.5	48.3	38.9	50.6
1997	24-78	24-94		48	50, 52		47.6	50.0		32.0
1998	30-75	30-87		46	49		48.1	50.8		26.8
1999	30-81	30-99		46	47		48.0	50.2		34.3
2000	27-68	28-94		45, 48	47		44.1	47.7		39.8
2001	26-80	23-104	26-98	45	45	46	44.9	46.7	49.1	51.8
2002	17-75	12-102	25-102	45	46	46	46.1	48.4	48.0	36.5

b) Longline

Year	Length range			Modal Length			Mean Length			Percent ≤45 cm
	Male	Female	Unknown	Male	Female	Unknown	Male	Female	Unknown	
2002	33-82	32-104	34-129	47	49	46	50.0	55.3	55.1	19.2

Table 6. Catch at age (000) and mean lengths (cm) and weights (kg) at age, for Greenland halibut in the Div. 0AB fishery in 2002.

Age	Div. 0A			Mean			Div. 0B			Mean		
	LL	OT	Tot	Len	Wgt	SOP	LL+GN	OT	Tot	Len	Wgt	SOP
4		1	1	32.5	0.265	0		*	0.01	32.5	0.265	0
5	1	31	35	36.4	0.388	14		4	4	38.2	0.453	2
6	55	458	560	41.9	0.611	342	2	137	139	42.6	0.647	90
7	242	1487	1889	46.7	0.875	1653	88	856	944	47.7	0.939	886
8	134	461	650	52.0	1.240	806	141	401	541	53.0	1.319	714
9	54	78	145	58.5	1.808	262	106	111	217	59.2	1.870	406
10	38	37	82	63.2	2.323	190	108	68	176	63.2	2.317	408
11	13	11	26	68.7	3.062	80	73	21	94	70.7	3.412	321
12	12	5	18	71.4	3.445	62	57	8	65	72.0	3.545	230
13	6	1	7	78.4	4.680	33	48	1	49	79.3	4.866	238
14	1	*	1	88.7	6.990	7	20	*	20	86.4	6.412	128
15	1	*	2	88.6	6.955	14	18		18	88.6	6.955	125
16	1	*	1	93.6	8.326	8	10		10	93.3	8.234	82
17 *		*	0.3	96.5	9.171	3		2	2	97.2	9.384	19
18 *		*	0.1	100.6	10.488	1		1	1	98.5	9.787	10
						3475						3659
* indicates less than 500 fish						catch=3800	catch=3968					
						91%	92%					

Table 7. A) Catch-at-Age B) mean weight-at-age C) sum of products, for Greenland Halibut in Subarea O (mainly Div. OB).

A) Catch-at-Age (000's)															
Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
4	0	0	0	0	9	1	2	0	2	6	6	1	1	0	0
5	0	0	2	14	45	30	45	18	34	58	42	25	61	13	4
6	0	0	53	208	524	332	181	189	296	355	225	145	389	202	139
7	1	2	398	1191	2078	1668	1033	1254	1726	1273	579	610	752	695	944
8	5	9	1387	1888	2738	1933	735	641	1193	1050	416	523	669	398	541
9	9	11	1186	1059	1688	891	483	388	596	478	307	346	404	291	217
10	18	13	663	447	657	474	140	245	309	216	253	199	296	303	176
11	24	14	335	175	217	156	85	168	134	173	224	119	264	228	94
12	31	30	184	122	147	89	82	168	84	90	97	104	185	138	65
13	39	32	183	96	120	50	57	62	34	67	75	104	91	45	49
14	30	34	111	50	60	22	25	29	17	15	49	57	42	20	20
15	24	20	63	30	24	13	17	16	10	9	6	33	32	4	18
16	8	8	14	4	6	4	11	5	2	7	1	18	6	0.04	10
17	1	0	2	0	1	0	2	1	1	1	0	9	1	0	2
18	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1
19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	190	173	4580	5285	8313	5663	2899	3184	4439	3798	2281	2295	3194	2337	2280
Catch(t)	1024	907	9498	8606	12358	7489	4274	5299	6721	5740	4370	4567	5393	4895	3968

B) Weight- at Age (kg)															
Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1															
2															
3											0.173				
4					0.196	0.175	0.228		0.269	0.241	0.337	0.367	0.387		0.265
5			0.376	0.356	0.333	0.302	0.406	0.358	0.351	0.359	0.450	0.466	0.504	0.477	0.453
6			0.562	0.554	0.572	0.526	0.559	0.568	0.537	0.547	0.630	0.599	0.634	0.684	0.647
7	0.818	0.785	0.813	0.820	0.829	0.810	0.857	0.897	0.896	0.862	0.909	0.866	0.905	0.916	0.939
8	1.200	1.076	1.098	1.143	1.162	1.170	1.210	1.302	1.321	1.276	1.280	1.270	1.268	1.320	1.319
9	1.781	1.585	1.533	1.632	1.692	1.716	1.690	1.810	1.814	1.838	1.845	1.780	1.828	1.821	1.870
10	2.446	2.149	2.122	2.333	2.420	2.357	2.235	2.523	2.397	2.378	2.490	2.372	2.399	2.416	2.317
11	3.244	2.878	2.961	3.390	3.390	3.264	2.767	3.152	3.141	3.005	3.185	3.024	3.046	3.053	3.412
12	4.169	3.822	3.916	4.364	4.309	4.266	3.426	3.927	3.979	3.831	3.903	3.761	3.829	3.654	3.545
13	5.136	4.929	4.986	5.610	5.555	5.519	4.608	5.007	5.132	4.932	4.819	4.765	4.768	4.715	4.866
14	6.317	6.265	6.275	7.022	7.176	6.803	6.038	5.893	5.943	5.713	6.025	5.463	5.596	6.005	6.412
15	7.736	7.825	8.049	8.669	8.786	7.976	6.534	6.849	6.568	6.783	6.858	6.835	6.369	6.413	6.955
16	9.511	9.883	10.354	10.849	10.269	9.786	6.106	8.654	8.168	8.002	7.977	8.068	7.926	10.448	8.234
17	10.772		12.804		11.951		10.006	9.937	8.694	8.641		9.104	8.964		9.384
18							6.655					10.611	10.138		9.787
19												11.736			

Table 7. Continued.

C) Sum of products

(t)

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	1.8	0.2	0.5	0.0	0.7	1.4	2.0	0.4	0.0	0.0	0.0
5	0.0	0.0	0.7	5.0	14.9	8.9	18.5	6.4	12.0	20.8	18.9	11.5	30.7	6.2	1.8
6	0.0	0.0	29.9	115.2	299.7	174.9	101.2	107.4	158.9	194.2	141.8	86.7	246.6	138.2	89.9
7	0.8	1.6	324.0	976.8	1722.5	1351.4	885.0	1124.8	1546.1	1097.3	526.3	528.1	680.6	636.6	886.4
8	6.0	9.7	1522.9	2158.2	3181.9	2261.6	889.3	834.6	1576.5	1339.8	532.5	664.3	848.3	525.4	713.6
9	16.0	17.4	1817.8	1728.9	2856.4	1529.4	815.7	702.3	1080.2	878.6	566.4	616.2	738.5	529.9	405.8
10	44.0	27.9	1405.9	1043.2	1590.3	1117.6	313.9	618.1	741.4	513.6	630.0	472.9	710.1	732.0	407.8
11	77.9	40.3	990.9	592.1	736.2	510.5	235.4	529.5	420.8	519.9	713.4	359.8	804.1	696.1	320.7
12	129.2	114.7	719.6	533.6	631.9	377.7	281.3	659.7	334.3	344.8	378.6	391.0	708.4	504.3	230.4
13	200.3	157.7	911.5	538.9	665.4	276.9	264.4	310.4	175.0	330.4	361.4	495.4	433.9	212.2	238.4
14	189.5	213.0	698.0	349.6	433.8	147.2	149.3	170.9	101.3	85.7	295.2	310.3	235.0	120.1	128.2
15	185.7	156.5	506.0	257.4	206.6	102.0	109.9	109.6	64.0	61.0	41.1	227.1	203.8	25.7	125.2
16	76.1	79.1	140.2	47.4	57.5	38.5	66.4	43.3	19.9	56.0	8.0	147.0	47.6	0.4	82.3
17	10.8	0.0	24.8	0.0	13.4	0.0	19.8	9.9	10.6	8.6	0.0	78.1	9.0	0.0	18.8
18	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	11.4	1.0	0.0	9.8
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7	0.0	0.0	0.0
SOP	936.3	817.9	9092.2	8346.3	12412.1	7896.7	4157.0	5227.0	6241.8	5452.3	4215.8	4400.1	5697.6	4127.0	3659.2
SOP/ catch	0.91	0.90	0.96	0.97	1.00	1.05	0.97	0.99	0.93	0.95	0.96	0.96	1.06	0.84	0.92

Table 8 a). Trawl CPUE (kg/h) in Div. 0A, non-standardized mean for all vessels combined, (no net damage or loss of fish, tow duration ≥ 2 hrs.).

Year	Single Trawl Mean CPUE (kg/h)	s.d.	# tows	Twin Trawl Mean CPUE (kg/h)	s.d.	# tows
1996	641	366	106			
1997	336	277	91	498	430	38
1998	619	302	12			
1999	628	217	84			
2000	339	178	10	863	454	47
2001	494	228	369	882	557	256
2002	842	565	215	1224	624	217

b). Longline CPUE (kg/1000 hooks) in Div. 0A, non-standardized mean for five vessels.

Year	Mean CPUE (kg/1000 hooks)	s.d.	# sets
2002	202	108	827

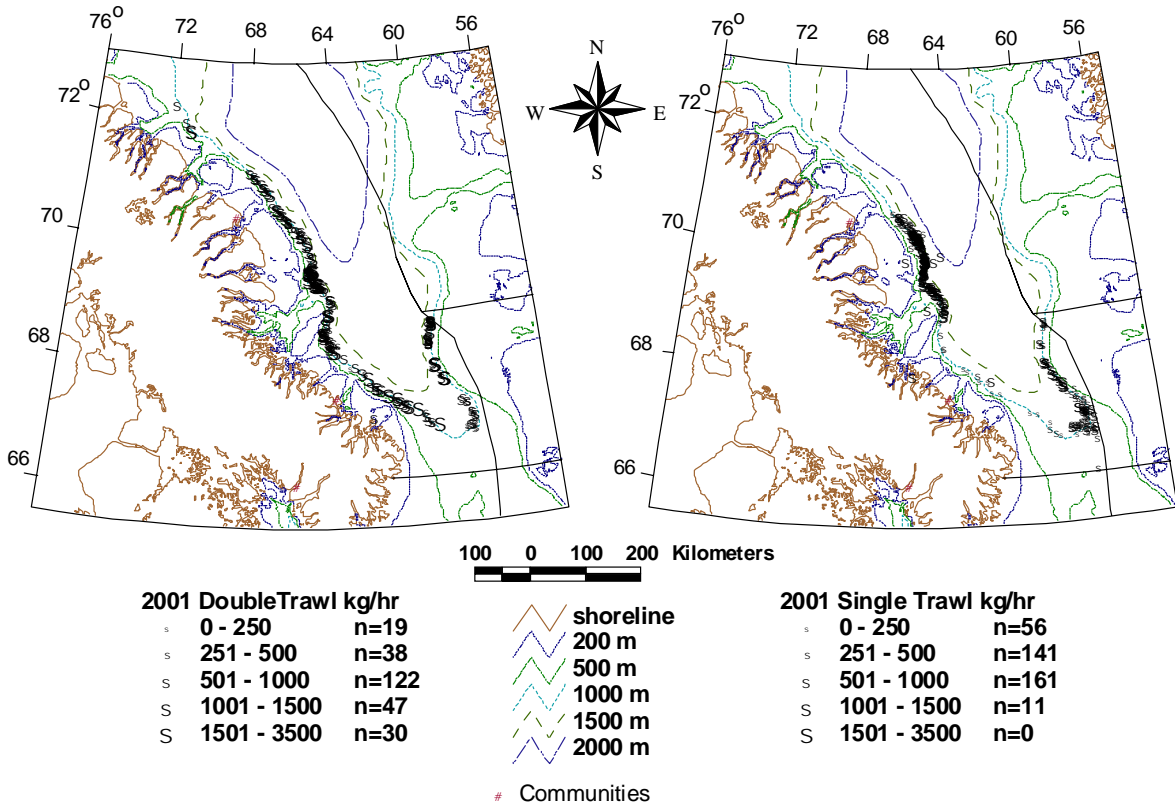


Fig. 1. Division 0A catch distribution, non-standardized CPUE (kg/h) for 2001 for both single and double trawls. Two of five vessels used both a single and a double trawl.

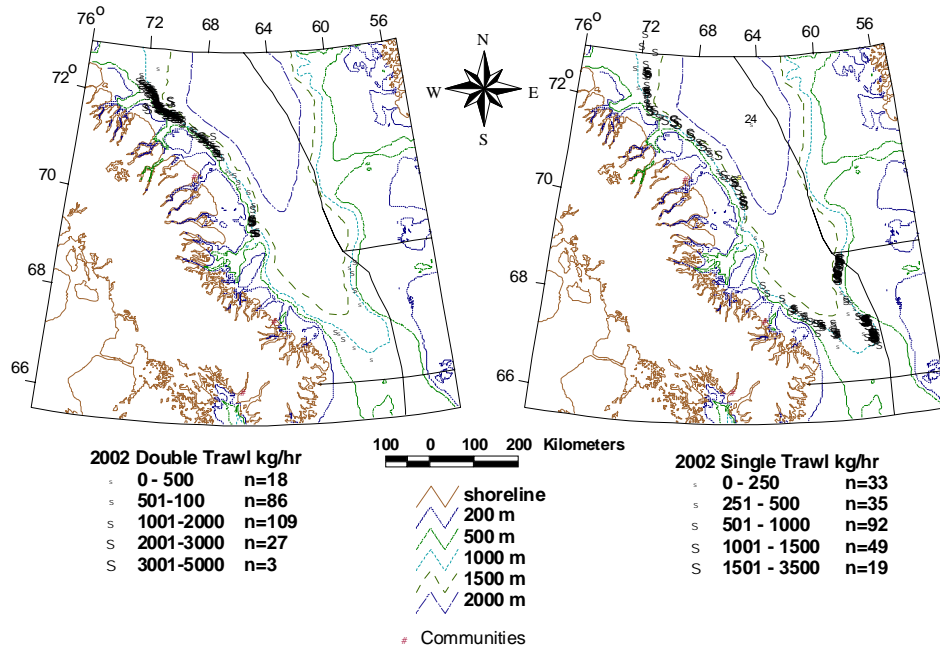


Fig. 2. Division 0A catch distribution, non-standardized CPUE (kg/h) for 2002 for both single and double trawls. Two of the four trawlers operating in this Division used both single and double trawls.

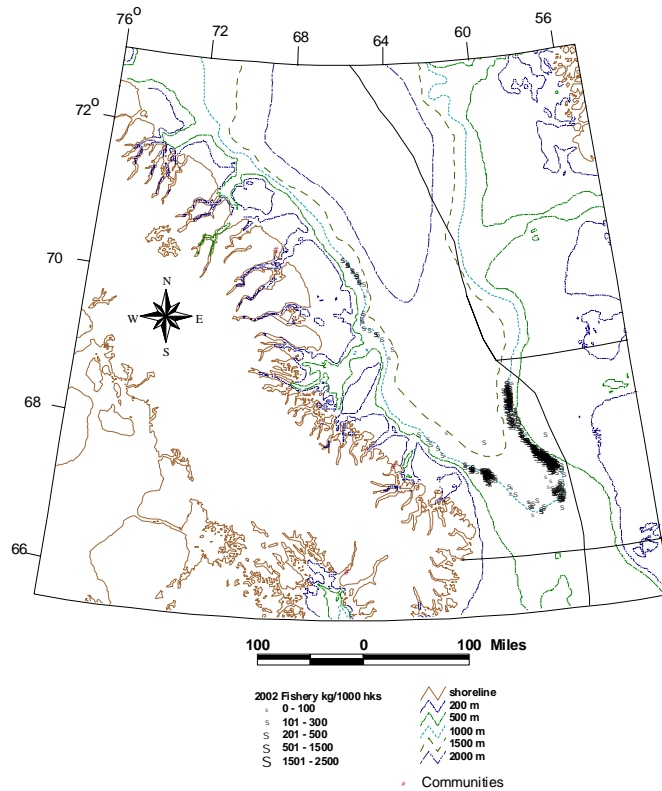


Fig. 3. Catch distribution for five long-line vessels operating in Div. 0A in 2002, CPUE (kg/1000 hks).

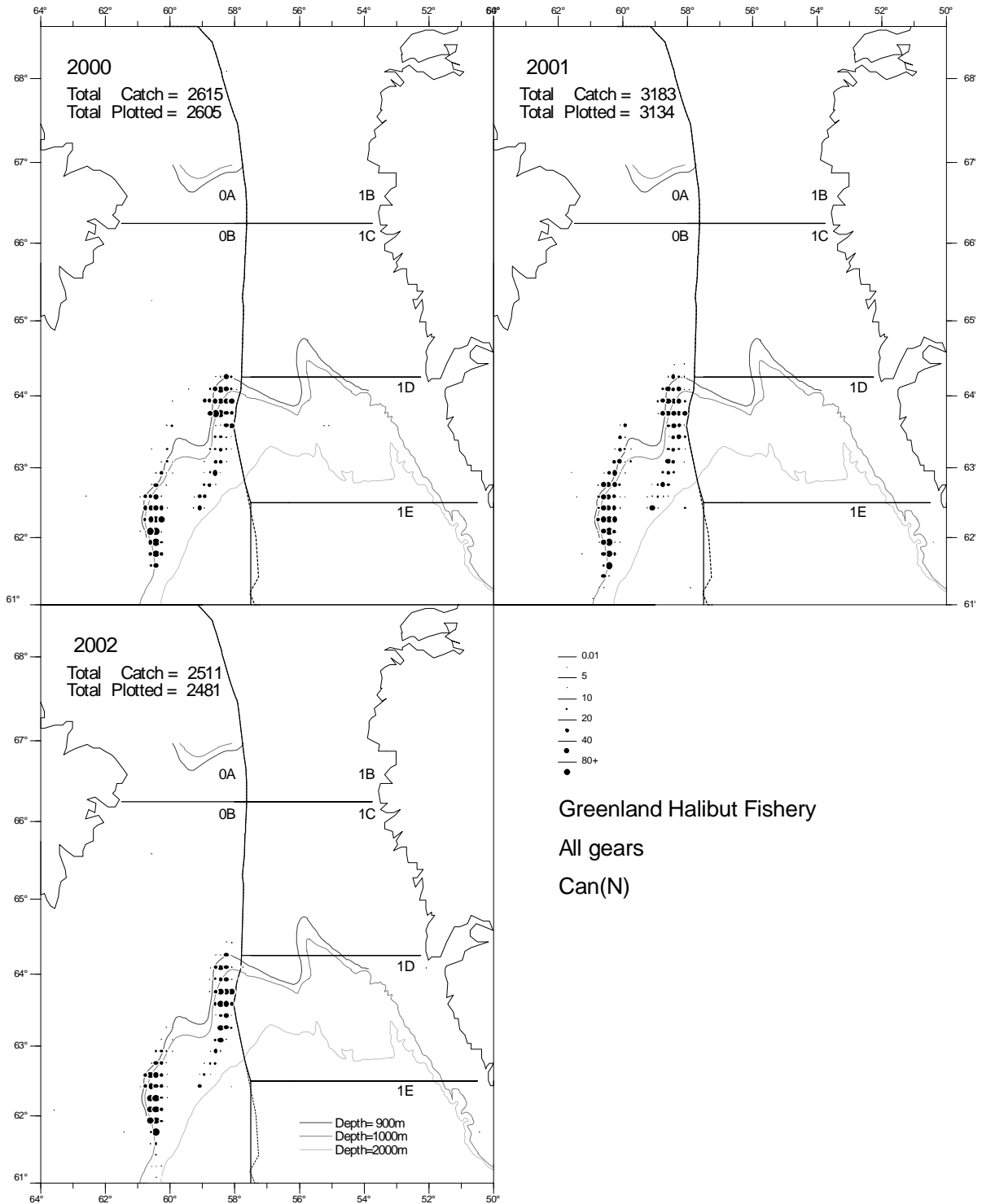


Fig. 4. Distribution of Can (N) Greenland halibut catch (tons) from the 2002 commercial fishery in Subarea 0. Represented is gillnet, longline and otter trawl from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square where position was recorded on the logbook.

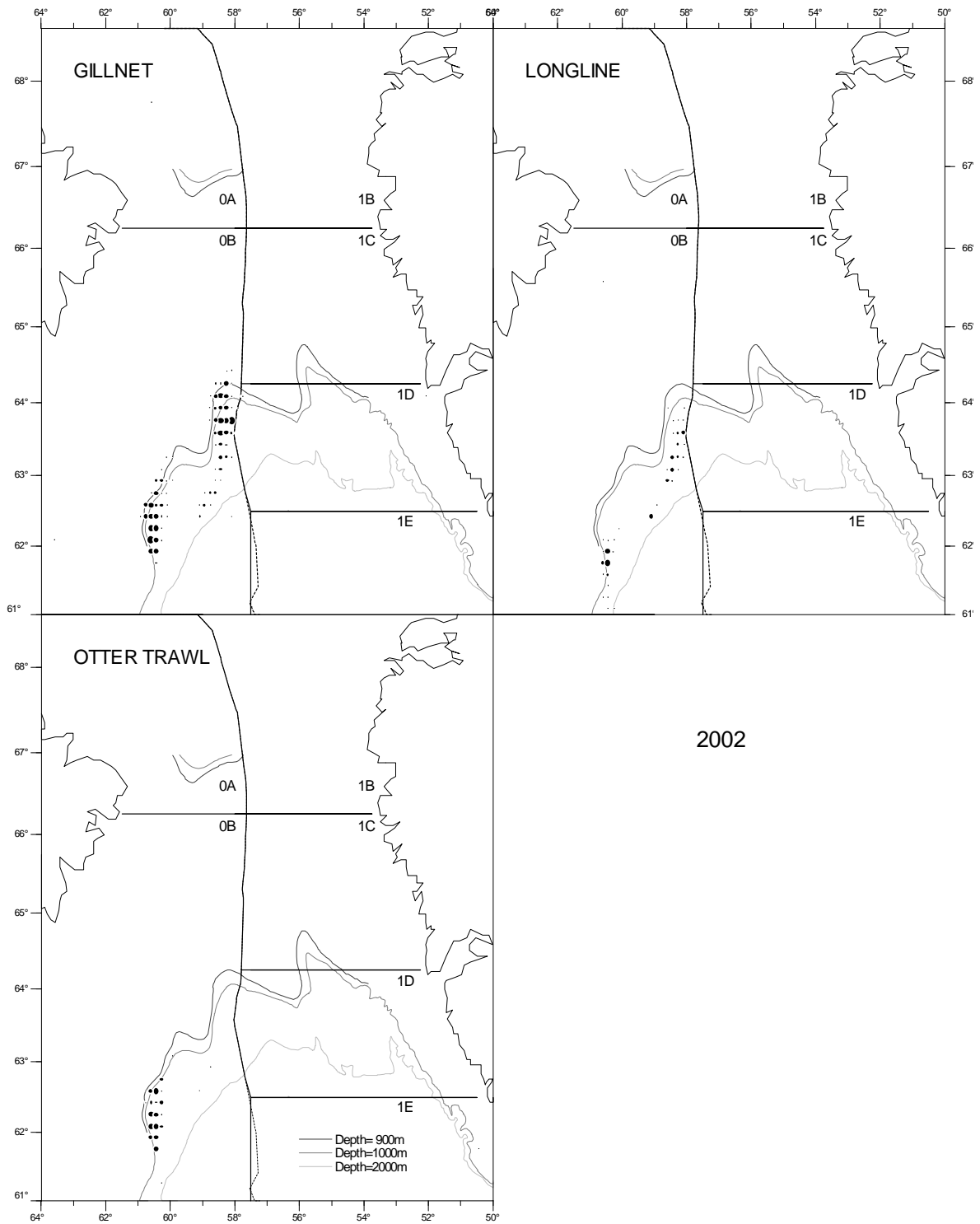


Fig. 5. Greenland halibut length frequency for the Div. 0A fishery, 1996-2002. Data from the sampled catch. Both trawl and longline gear was used in 2002.

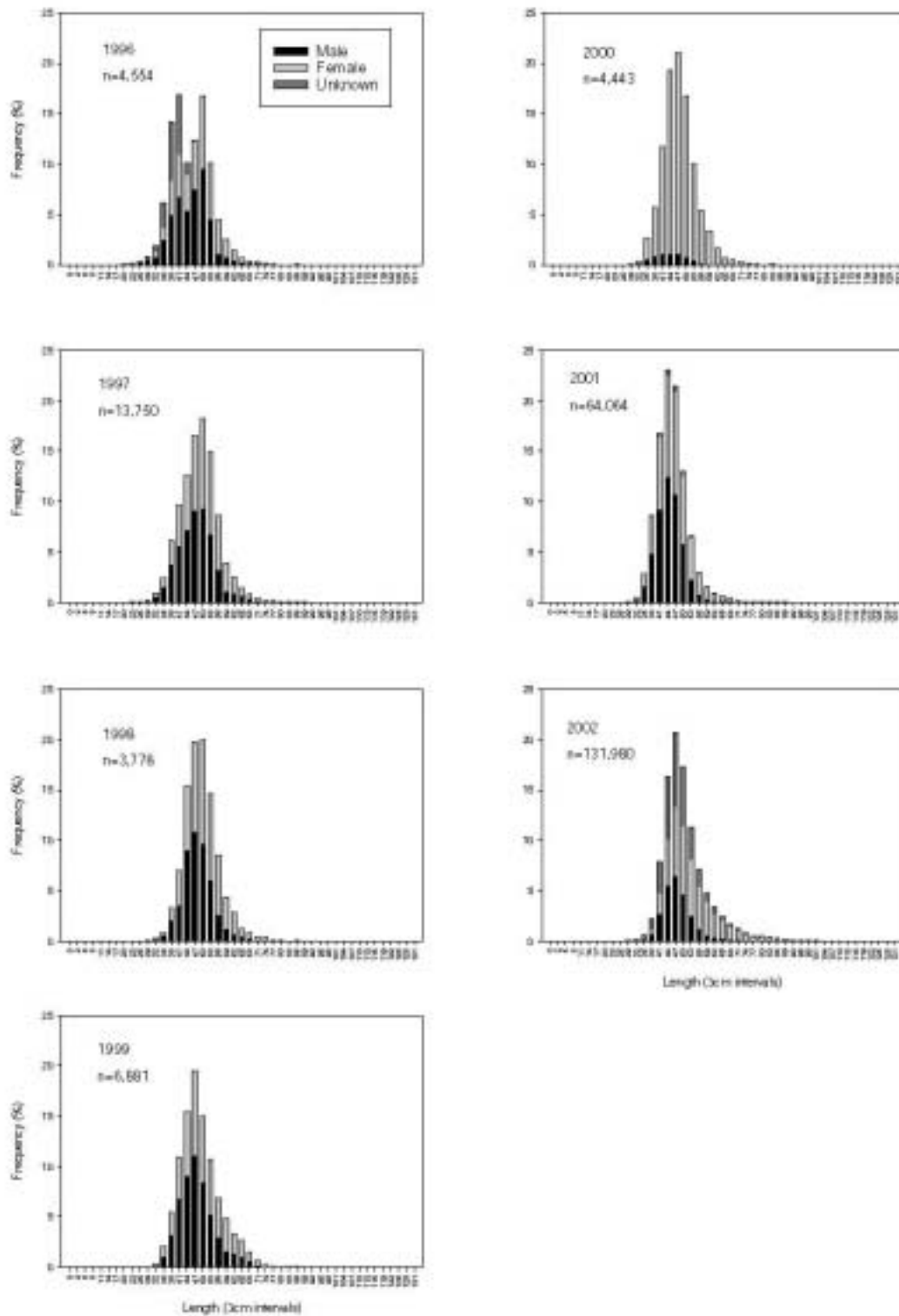


Fig. 6. Greenland halibut length frequency for the Div. 0A fishery, 1996-2002. Data from the sampled catch. Both trawl and longline gear was used in 2002.

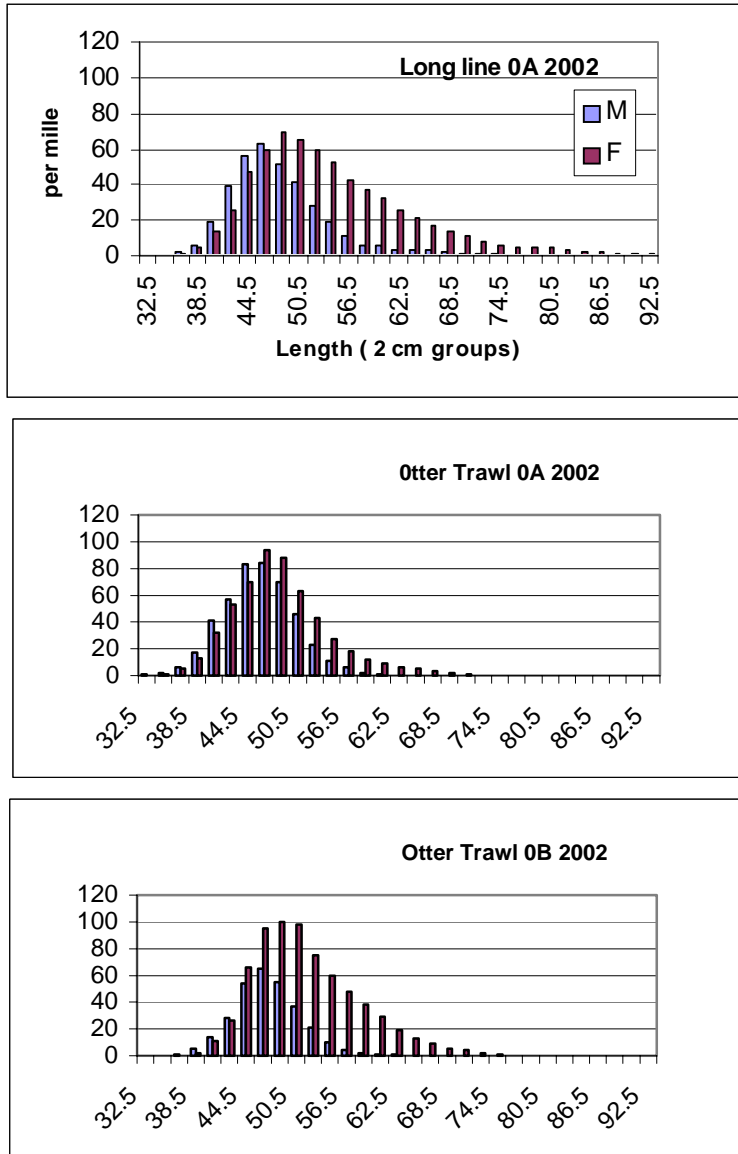


Fig. 7. Length frequency for the Subarea 0, 2002 fishery by area, gear type, and sex. Length frequency sample data raised to the total catch expressed as per mille. There were longline and gillnet fleets fishing in Div. 0B however, the observers did not collect length samples in 2002.

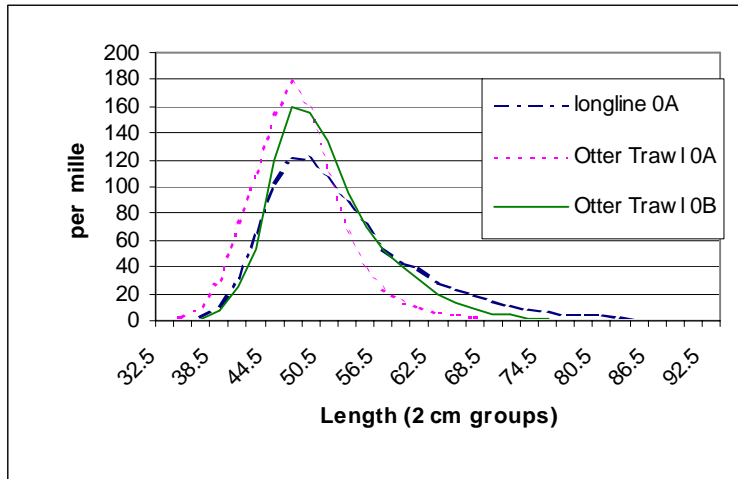


Fig. 8. Total length frequency, both sexes combined by gear and division for the Subarea 0 fishery in 2002. Observer samples raised to the overall catch and expressed as per mille.

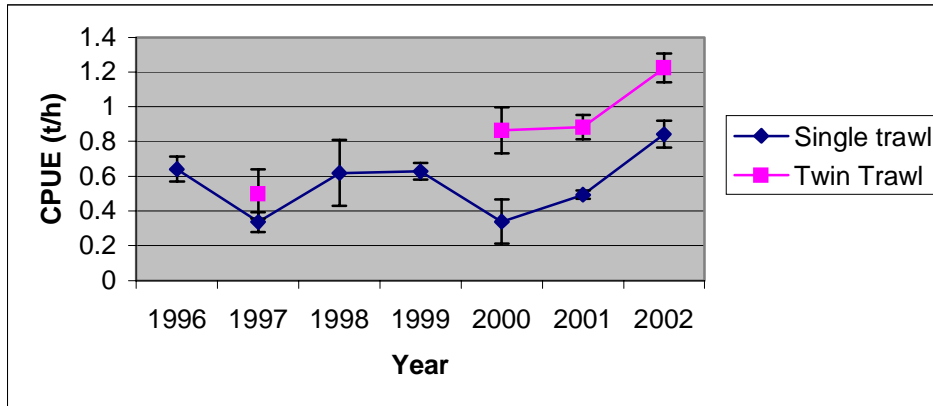


Fig. 9. Unstandardized mean catch per unit effort (CPUE) with 95% confidence limits for Div. 0A, 1996-2002.