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The Canadian Fishery for Greenland Halibut in Subarea 2 + Divisions 3KLMNO, with Emphasis on 2003

by

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Abstract

The Canadian catch of Greenland halibut in 2003 in NAFO Subarea 2 and Divisions 3KLMNO was reported to be almost 7 000 tons, up about 10% from 2002. There was an increase in otter trawl catches, primarily in Div. 2H, to the highest level since 1985. There were reduced catches in the gillnet sector, mainly in Div. 3L. As in 2000-2002, much of the catch in 2003 came from Div. 3K, and over 80% of the catch was taken in June to August. The catch at age in 2003 was dominated by the 1996 year-class, which accounted for 43% of the catch numbers and 33% of the catch weight in the Canadian fishery.

Review of the Canadian fishery prior to 2003

The Canadian fishery for Greenland halibut in Subareas 2 and 3 began in the early-1960s, using gillnets in the deepwater bays of eastern Newfoundland, particularly Trinity Bay. As catches declined here, the effort moved progressively northward in the other bays along the east and northeast coast of Newfoundland. In later years, vessels moved further offshore to the deep channels, such as the area in the central part of Div. 3K known as Funk Island Deep, and eventually to the continental slope. Canadian catches increased from fairly low levels in the early-1960s to almost 32 000 tons in 1980 then declined steadily to between 2900 and 6 300 tons in each year from 1993-99 (Table 1). This declining trend was mainly a result of low catch rates and reduced effort, as fishers pursued other species such as snow crab which were more profitable. However, in 2000, the Canadian catch in NAFO Subarea 2 and Div. 3KLMNO increased to about 10 600 tons, more than two and a half times the catches in 1998 and 1999. Reasons for this increased catch and effort include a switch of some effort by fishers in Div. 3KL from snow crab to Greenland halibut due to declining quotas for crab in certain areas, combined with improved catch rates for Greenland halibut in most of the traditional fishing areas (Brodie and Power, 2000). However, catches declined by more than 2 000 tons from 2000 to 2001, and then declined by a similar amount to about 6 300 tons in 2002. This is the same level observed in 1996-97.

Canadian catches have been taken mainly by gillnet (Table 1), and most of these gillnet catches are from Div. 3K. This fishery has been conducted mainly by small vessels (<20 m) fishing in the deepwater channels near the Newfoundland and Labrador coast as well as in the deepwater bays, using an average mesh size of 150 mm. However, Canadian gillnet catches taken during recent years also include those from a substantial fishery along the deep edge of the continental slope. In an attempt to reduce the catch of young Greenland halibut in this deepwater fishery, gillnet mesh size for Greenland halibut in the Canadian zone in depths >731 m (400 fm) is regulated to be no less than 190 mm. Gillnet catches during the 1990s ranged from 2 400 to 6 700 tons, averaging about 4 200 tons. Catches in 2000 from this sector then increased to 9 300 tons, similar to the levels seen in the late-1980s. Gillnet catches declined to 6 400 tons in 2001, and further to 3 900 tons in 2002, with the latter value being similar

to the levels in 1998 and 1999. Since early-2002, an area in the Funk Island Deep region of Div. 3K (see Fig. 4) was closed to gillnetting in order to reduce by-catch of snow crab, and was partly responsible for some of the decline in gillnet catch.

Canadian otter trawl catches peaked at about 8 000 tons in 1982, but from 1993 to 1999, catches by this fleet were less than 1050 tons annually. Otter trawl catches increased sharply from less than 100 tons in 1998 and 1999, to almost 1 300 tons in 2000, then increased again in 2001-02 to around 1800 tons, which is the highest level since 1992 (Table 1). Much of the otter trawl catch in the recent period occurred in the slope area around the boundary between Div. 3K and 3L. This fishery is conducted mainly by large vessels (>30 m in length), and minimum codend mesh size has been regulated to be 145 mm for several years.

Catches from Subarea 2 were very low prior to the mid-1970s, then increased to a peak around 9 000 tons in 1982 (Table 2). Since 1991, catches from Subarea 2 have been in the range of 1 000 to 2 500 tons per year, and were stable around 1300 tons during 1999-2001. The catch in this area increased to almost 1800 tons in 2002, due to a higher catches in Div. 2GH. Most of the catch from Subarea 2 has come from Div. 2J, although catches in 1993-96 were higher in Div. 2GH combined compared to Div. 2J. The catch in Div. 2GH declined from values around 1400 tons in 1994-95 to less than 325 tons per year from 1999 to 2001, before increasing to about 730 tons in 2002. In most years, Div. 3K has produced the largest Canadian catches, peaking around 18 000 tons in 1979-80. Peak catches of around 13 000 tons in Div. 3L occurred in 1966-67 and 1980. Catches in Div. 3M and 3N have been negligible, and catches in Div. 3O increased from similar low levels to a few hundred tons per year from 1993-2001, peaking at 567 tons in 2000.

The Canadian fishery in 2003

There were some differences in the spatial and temporal patterns in the Canadian fishery for Greenland halibut in 2003 compared to those observed in 2000-02. The total reported catch was just under 7 000 tons, an increase of about 10% from 2002. This followed declines of approximately 2 000 tons in each of 2001 and 2002. There was a large increase in otter trawl catch, almost all of which occurred in Div. 2H. Catches in all fixed gear sectors declined in 2003, with the largest drop occurring in the deepwater gillnet fisheries (Tables 3a and 3b).

Breakdowns of the catch by gear, Division, depth range and month are shown in Tables 3 and 4. Otter trawl was the dominant gear in 2003, unlike previous years when the dominant gear, often by far, was gillnet. In 2002 the gillnet catches in the shallow and deep zones were almost equal, contrasting to 2001 and 2003 when catches in the shallow zone were substantially higher than those in the deeper zone. These gillnet catches are referred to in Tables 3 and 4 as GN<400 and GN>400. Longline catches, which had not exceeded 130 tons per year since the early-1970s, increased to 650 tons in 2002, mostly in Div. 2GH, and dropped by 10% in 2003. The increased catch by otter trawl catch in 2003, to the highest level since 1985, was caused by a new fishery by large vessels using single and double trawls in Div. 2H. As a result, catches in Subarea 2 in 2003 increased to almost 2900 tons, which is more than double the 1300 ton level of 1999-2001. Catches in Div. 3K remained around 2900 tons in 2003, with 3L catches decreasing by about 500 tons to just under 1 000 tons. The decrease in Div. 3L resulted from a lack of gillnet effort, due in part to restrictions on crab by-catch.

Figures 1-3 show the location of most of the Canadian catch of Greenland halibut in 2001-2003. These data were aggregated by 10-minute squares, from logbook records, and in 2003, account for almost 92% of the total Canadian catch. The spatial distributions of the 2002 and 2003 fisheries were quite similar (Fig. 2 and 3), with the major difference being the increased catch in Div. 2H in 2003. A major difference from 2002 onward was the reduction in catch from the central Div. 3K (Funk Island Deep) area, due to the area closed to gillnetting (as noted in previous sections, and shown in Fig. 4). Figure 4 also shows the location of the 2003 catch by the 4 major gear types (2 gillnet categories, otter trawl, and longline). Most of the otter trawl fishery in 2003 was located in 2 relatively small areas: one around the slope edge at the border between Div. 3K and 3L, similar to the fishery in 2000 and 2001, and the second ion the slope edge in the central part of Div. 2H. The spatial distribution of the deepwater gillnet fishery in 2003 was similar to 2001 and 2002, although the shallow water gillnet catches were more concentrated towards the slope area in 3K in 2002-03 compared to 2001 (Brodie and Power, 2002, 2003).

In 2003, about 80% of the catch occurred in the summer, June to August, similar to 2002 (75%) and other recent years. Much of the catch increase in 2003 compared to 2002 came from the otter trawl catches in Div. 2GH in August and September. Temporal patterns for the gillnet and longline fisheries in 2003 were similar to those seen in 2001 and 2002. June was the peak month for catches from the otter trawl fishery in Div. 3KL (Table 4), although the 2003 fishery in this area took more catch in the summer and less before June compared to 2002. Fig. 5-7 show the temporal and spatial patterns for both gillnet fisheries as well as otter trawl.

As in previous years, by-catches in the gillnet fishery include cod and snow crab, particularly in the GN<400 sector, while American plaice and witch flounder were important by-catches in the otter trawl fishery. By-catches of Greenland halibut in the Canadian shrimp fishery have been described in separate papers (eg. Orr et al. 2002).

Catch at age

Details on the catch at age for previous years can be found in Bowering and Brodie (2000), and Brodie and Power (2001, 2002, 2003). Ages 6-8 dominated the Canadian catch in most years, both in the otter trawl and shallow water gillnet fisheries. The deep water gillnet fishery was comprised mainly of larger, older individuals.

Sampling data collected in 2003 by observers at sea and by port samplers, were available from Div. 2GHJ3KLO. The following table shows the number of length measurements by Division and gear type, and the number of otoliths (in italics). The otolith samples from the fixed gear sectors have been combined. The high number of measurements from the otter trawl catch in is due to the requirement for these large vessels to have 100% observer coverage. As in past years, the exact catch location of some port samples from the fishery operating on the boundary of Div. 3K and 3L was not known, and these samples have been assigned as Div. 3K. There were no samples collected from the longline catches in Div. 2GH (413 tons), and a relatively small number of measurements from the deepwater gillnet fishery in Div. 3K.

	2GHJ		**3K**		**3L**		**3O**	
Gill net < 400	256		962		360			
Gill net > 400	2302	*270*	386	*376*	-	-	363	*268*
Longline	-						3876	
Otter trawl	12003	*957*	4411	*928*	5656	*722*		
Totals	14561	*1227*	5759	*1304*	6016	*722*	4239	*268*

Age compositions are presented for both gillnet components (GN<400 and GN>400) as well as for longline (Div. 3O only) and otter trawl (Table 5). The longline catches from Div. 2GH were assigned the same age composition as the total combined fixed-gear catch at age. The predominant age in the otter trawl, in all areas, and GN <400 sectors was 7 (1996 year-class), while age 10 (1993 year-class) was most abundant in the catches of deepwater gillnets. These dominant ages are identical to dominant ages (not year-classes) in 2002, and similar to those seen in the 2000 and 2001 fisheries. Overall, the catch at age in 2003 was dominated by the 1996 year-class, which accounted for 43% of the catch numbers and 33% of the catch weight. In 2002, the same age (7) accounted for 42% of the catch in numbers and 29% of the catch in weight. As was the case in 2000-2002, age 8 was second highest in the catch numbers, followed by age 6. Almost equal numbers of ages 6 and 8 were caught by otter trawlers in 2003, and there was no major differences in the age compositions of this gear in all areas (Table 5). The largest fish (>100 cm, Table 5) found in the Canadian fishery in 2003 were taken by longlines in Div. 3O. Mean weights at age were calculated using the same length-weight relationship used for Greenland halibut catch at age in 1998-2002, which was the Divisions-combined, year = 1997 (from Gundersen and Brodie, 1999). Weights at age in 2003 were very similar to those from 2002 (Brodie and Power, 2003), and the sum of products was 5.7% lower than the catch weight.

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Table 1. Canadian catch of G.halibut, by gear, from 1960-2003.

	GEAR					
YEAR	GN	LL	MISC	UNSP	OT	**TOTAL**
1960				660		660
1961				741		741
1962				586		586
1963		5		771		776
1964				1757		1757
1965				8082		8082
1966	257	194	15	15640	120	16226
1967	93	144	95	15478	798	16608
1968		94		12766	493	13353
1969	9980	850	69	412	245	11556
1970	9818	371	119	318	85	10711
1971	8947	153	55	180	75	9410
1972	8775	34	22	50	71	8952
1973	6546	35	70	102	95	6848
1974	5500	49	16	8	184	5757
1975	7510	3	53	1	247	7814
1976	8500	6	41		767	9314
1977	15038	33	36		2866	17973
1978	20622	46	83		3951	24702
1979	24550	116	116		5183	29965
1980	27703	128	57		3946	31834
1981	17927	55	43		6155	24180
1982	11038	69	59		8143	19309
1983	9911	58	73		7085	17127
1984	11100	27	100		6070	17297
1985	7422	2	42		4847	12313
1986	6293	7	20		1896	8216
1987	10849	22	115		2465	13451
1988	7715	70	53		629	8467
1989	10956	16	35		988	11995
1990	6732	18	15		2402	9167
1991	3440	36	9		3254	6739
1992	4470	30	1		2502	7003
1993	3863	4	5		1034	4906
1994	2378				575	2953
1995	2602	1			632	3235
1996	5134	1		1	1043	6179
1997	5202	61			1017	6280
1998	3963	108	4		46	4121
1999	3870	65			81	4016
2000	9271	18	5	14	1285	10593
2001	6395	123	14		1833	8365
2002	3854	652			1784	6290
2003	2668	596			3710	6974

Table 2. Canadian catch of G.halibut, by Div, from 1960-2003.

	DIVISION								
2G	2H	2J	3K	3L	3M	3N	3O	**TOTAL**
			610	50				660
			613	128				741
			479	107				586
			592	184				776
			870	887				1757
			2129	5953				8082
			3691	12518		17		16226
		7	2892	13705		1	3	16608
		53	3672	9597		31		13353
			7140	4413		1	2	11556
			5937	4769		5		10711
			4160	5248		2		9410
			4736	4216				8952
		5	3602	3233		1	7	6848
		19	2817	2909		9	3	5757
		22	3245	4540		7		7814
62	168	153	4779	4144	1	7		9314
	72	419	10751	6725	1	2	3	17973
	14	1255	15875	7548	1	5	4	24702
	34	3163	18165	8578	2	17	6	29965
	217	1157	17658	12742	14	43	3	31834
10	41	862	14379	8833		49	6	24180
15	5155	3942	6031	4105		55	6	19309
	2578	2238	7679	4618		12	2	17127
	1913	2796	7496	5078		12	2	17297
	1758	3101	4395	3023		35	1	12313
	82	2476	2886	2769		2	1	8216
	6	4143	4740	4561		1		13451
45	27	1867	4591	1921	2	12	2	8467
	190	2635	6342	2809	6	10	3	11995
57	171	2798	4075	2020	38	4	4	9167
	50	3008	2215	1291	157	11	7	6739
428	230	476	3882	1951	4	10	22	7003
557	403	214	2398	880		19	435	4906
1045	210	203	1032	258		1	204	2953
1006	453	709	754	197			116	3235
688	639	1058	2567	888			339	6179
370	619	1513	2659	935			184	6280
358	418	1234	1374	633		1	103	4121
65	103	1094	1940	683			131	4016
45	81	1152	5845	2901	1	1	567	10593
63	251	1030	3999	2666		9	347	8365
374	360	1030	2933	1466	15		112	6290
258	1897	730	2873	964			252	6974

Table 3a. Summary of Canadian catches of G.halibut in 2002 by area and gear.

	GN <400	GN >400	Longline	Otter trawl	Can (N)
2GH	154	7	573		734
2J	389	597	9	35	1030
3K	1304	830	28	771	2933
3L	56	424	8	978	1466
3MO	93		34		127
Total	1996	1858	652	1784	**6290**

Table 3b. Summary of Canadian catches of G.halibut in 2003 by area and gear.

	GN <400	GN >400	Longline	Otter trawl	Total Can
2G			253	5	258
2H		52	160	1685	1897
2J	263	271		196	730
3K	1462	539	2	870	2873
3L	5		5	954	964
3O		76	176		252
Total	1730	938	596	3710	**6974**

Table 4. Breakdown of Canadian catches of G.halibut in SA 2 + Div 3KLMNO in 2003 by area, gear, and month.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	GN<400 fm							21	21	10				52
2GH	Otter trawl						351	293	713	213	104	16		1690
	Longline							145	115	109	20	24		413
	Total						351	459	849	332	124	40		2155
	GN<400 fm						98	110	39	16				263
2J	GN>400 fm						196	64	11					271
	Otter Trawl				27		54	1		95	19			196
	Total				27		348	175	50	111	19			730
	GN<400 fm						441	590	349	54	28			1462
3K	GN>400 fm						168	224	147					539
	Otter Trawl			3	41	145	312	149	172	48				870
	Longline							2						2
	Total			3	41	145	921	965	668	102	28			2873
	GN<400 fm							4	1					5
3L	Otter Trawl				16	147	397	341	36		17			954
	Longline										5			5
	Total				16	147	397	345	37		22			964
	Gillnet				26		18	21	11					76
3O	Longline			1	38	43	22	16	22	16	4	14		176
	Total			1	64	43	40	37	33	16	4	14		252
	TOTAL			4	148	335	2057	1981	1637	561	197	54		**6974**

Table 5. Catch at age for the Canadian catch of G.halibut in SA 2 + Div. 3KLMNO in 2003.

Catch at age in thousands of fish. See text for definition of GN gear types.

						Gear				Mean		
Age	OT 2GH	OT 2J	OT 3K	OT 3L	**Total Ot trawl**	**GN<400**	**GN>400**	**Long line**	**Total**	**Len (cm)**	**Wgt (kg)**	**S.O.P(t)**
3			1	*	1				**1**	29.0	0.190	0.2
4	4	2	10	1	17				**17**	32.5	0.272	4.6
5	44	11	55	18	128	1			**130**	37.0	0.411	53.4
6	267	48	210	222	747	35	1	*	**788**	41.4	0.584	460.2
7	705	105	367	502	1679	617	23	3	**2417**	47.2	0.891	2153.5
8	307	35	196	204	741	563	59	4	**1459**	52.5	1.237	1804.8
9	109	7	48	39	203	111	67	5	**413**	58.0	1.692	698.8
10	52	6	11	5	74	19	72	3	**182**	63.3	2.231	406.0
11	23	2	2	3	30	16	61	7	**126**	68.0	2.791	351.7
12	9		*	1	11	14	27	7	**66**	72.7	3.460	228.4
13	2	*	1		3	9	18	3	**37**	78.8	4.448	164.6
14			*		*	8	12	3	**26**	83.3	5.296	137.7
15	1	1			1	4	4	2	**13**	86.2	5.913	76.9
16						3	1	1	**5**	89.9	6.737	33.7
17								*	**0.009**	100.5	9.566	0.09
18								*	**0.003**	106.5	11.462	0.03
19								*	**0.008**	100.5	9.544	0.08
20								*	**0.002**	114.5	14.408	0.03
21								*	**0.005**	109.3	12.564	0.06
22								*	**0.002**	110.5	12.878	0.03
23												
24								*	**0.002**	118.5	16.058	0.03
									5680			6575
												Catch=6974

* indicates catch of less than 500 fish

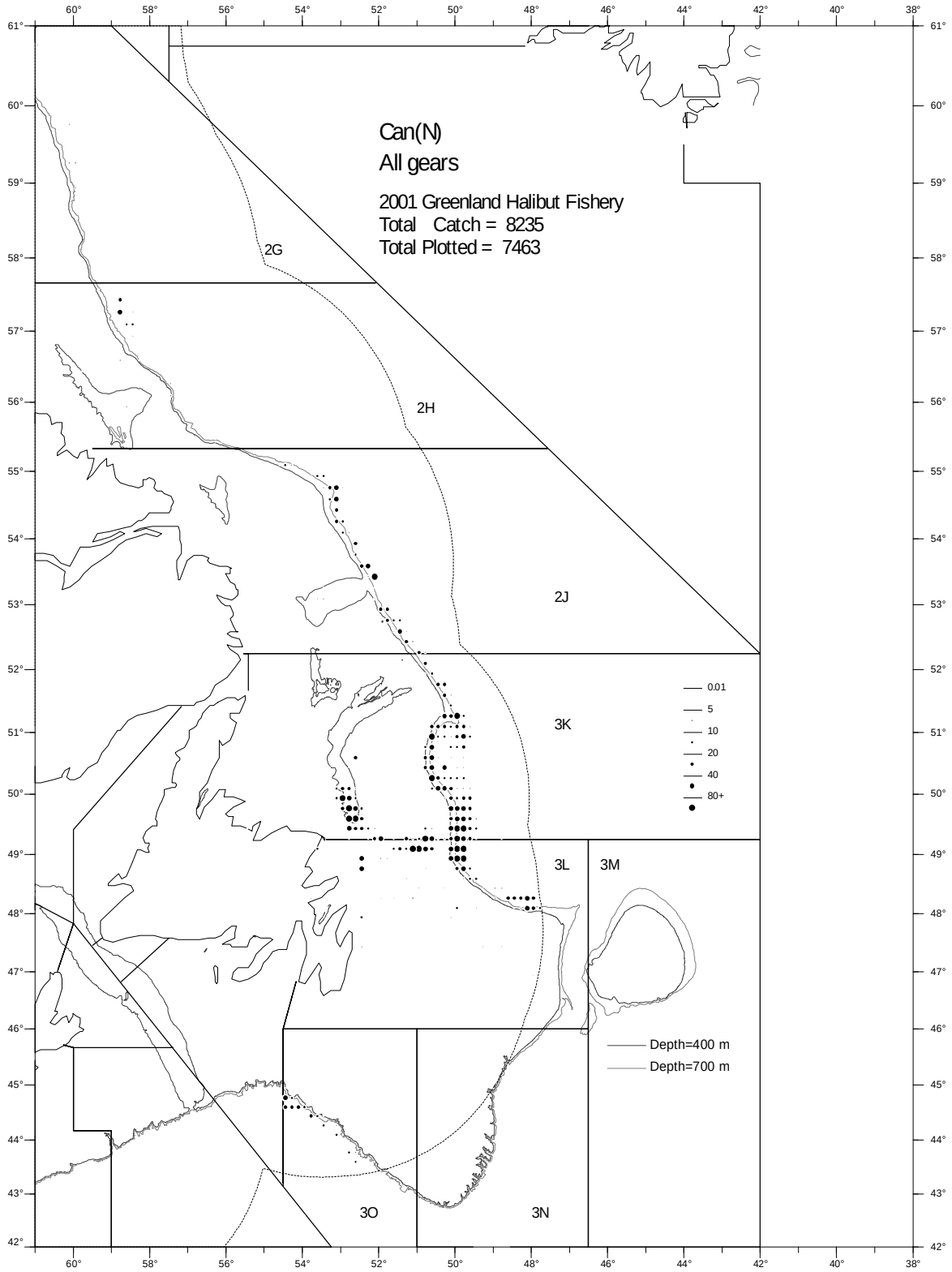

Fig. 1. Distribution of Can(N) Greenland halibut catch (tons) from the 2001 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook

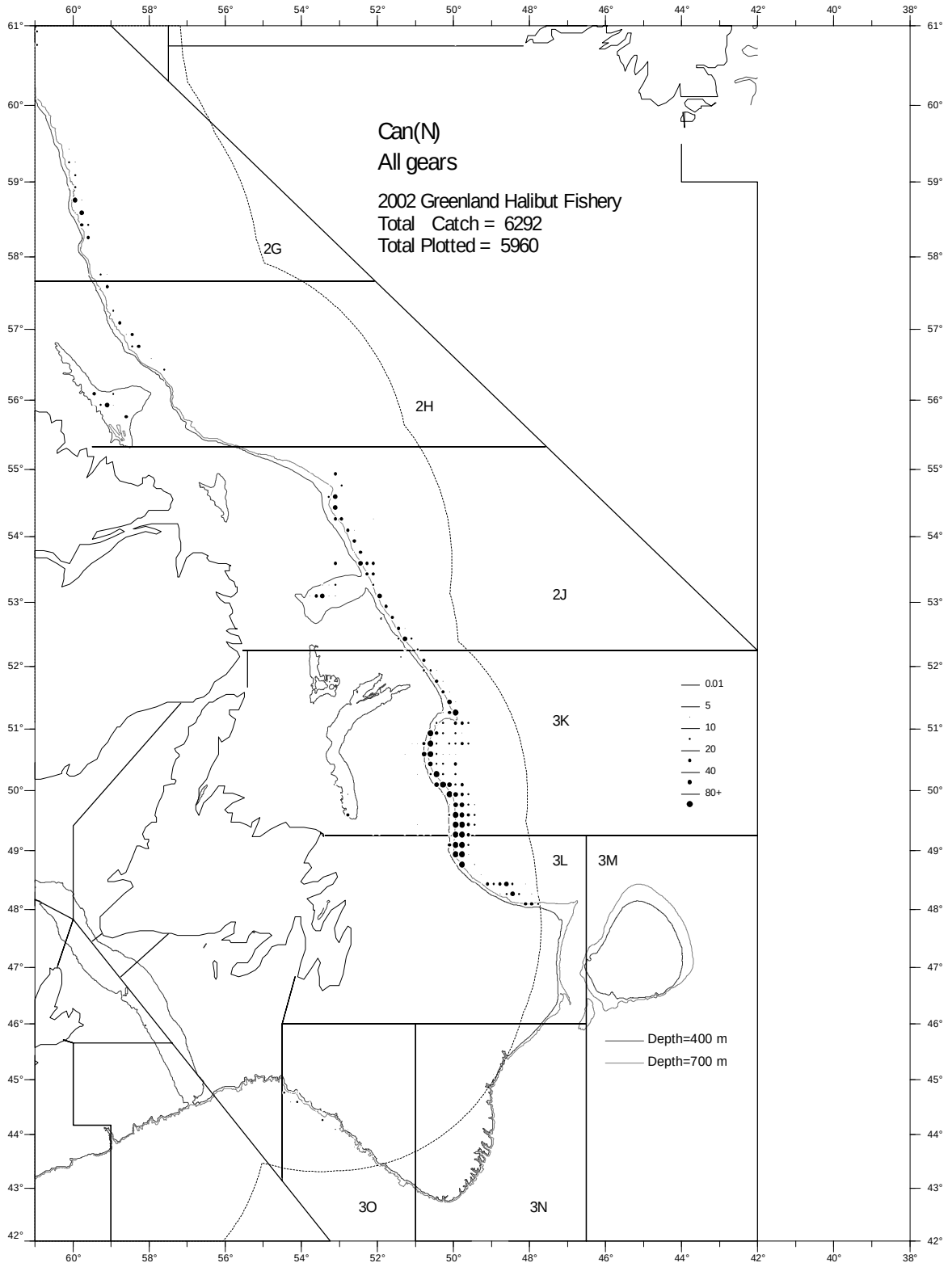

Fig. 2. Distribution of Can(N) Greenland halibut catch (tons) from the 2002 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook

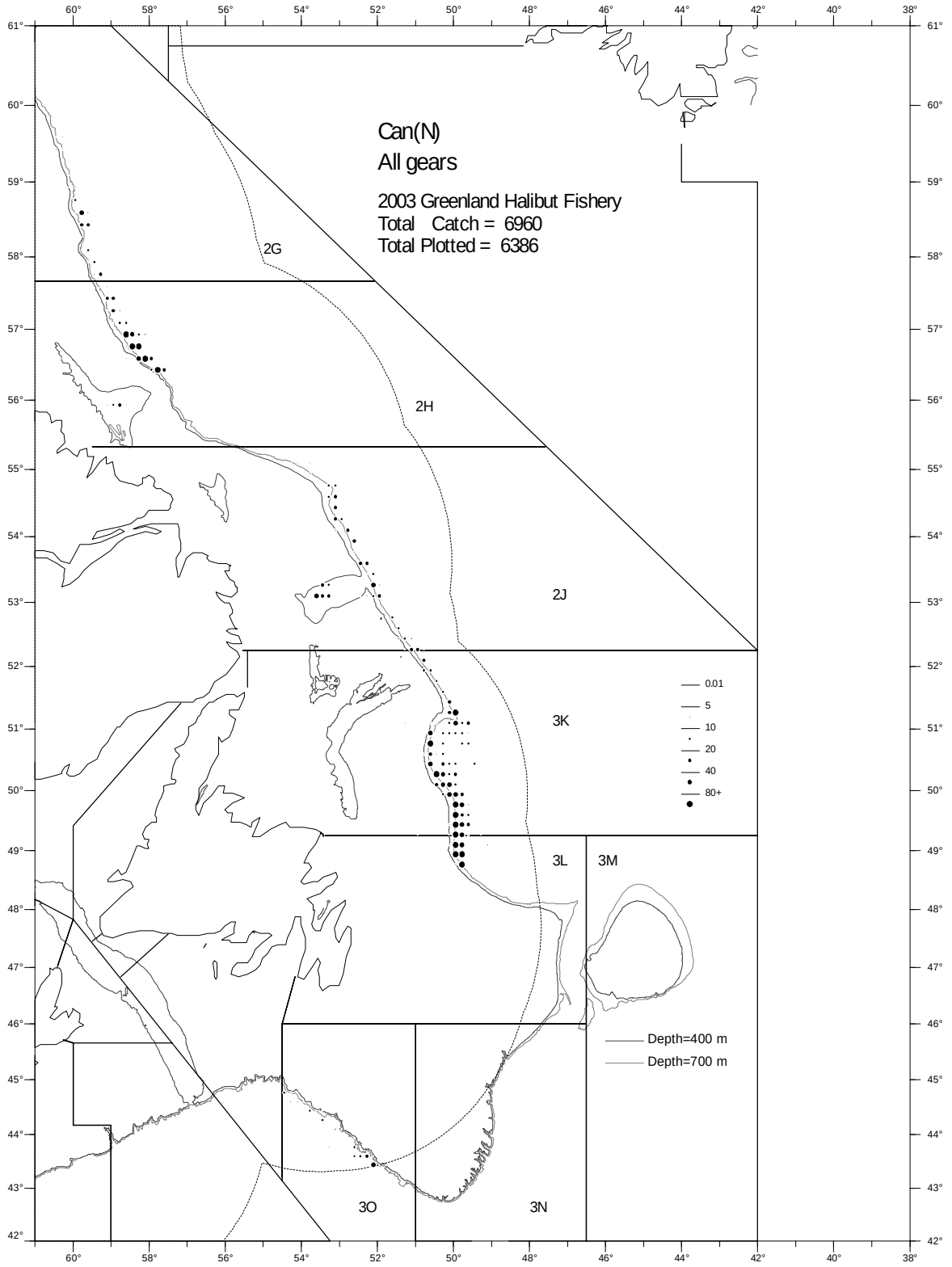

Fig. 3. Distribution of Can(N) Greenland halibut catch (tons) from the 2003 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook

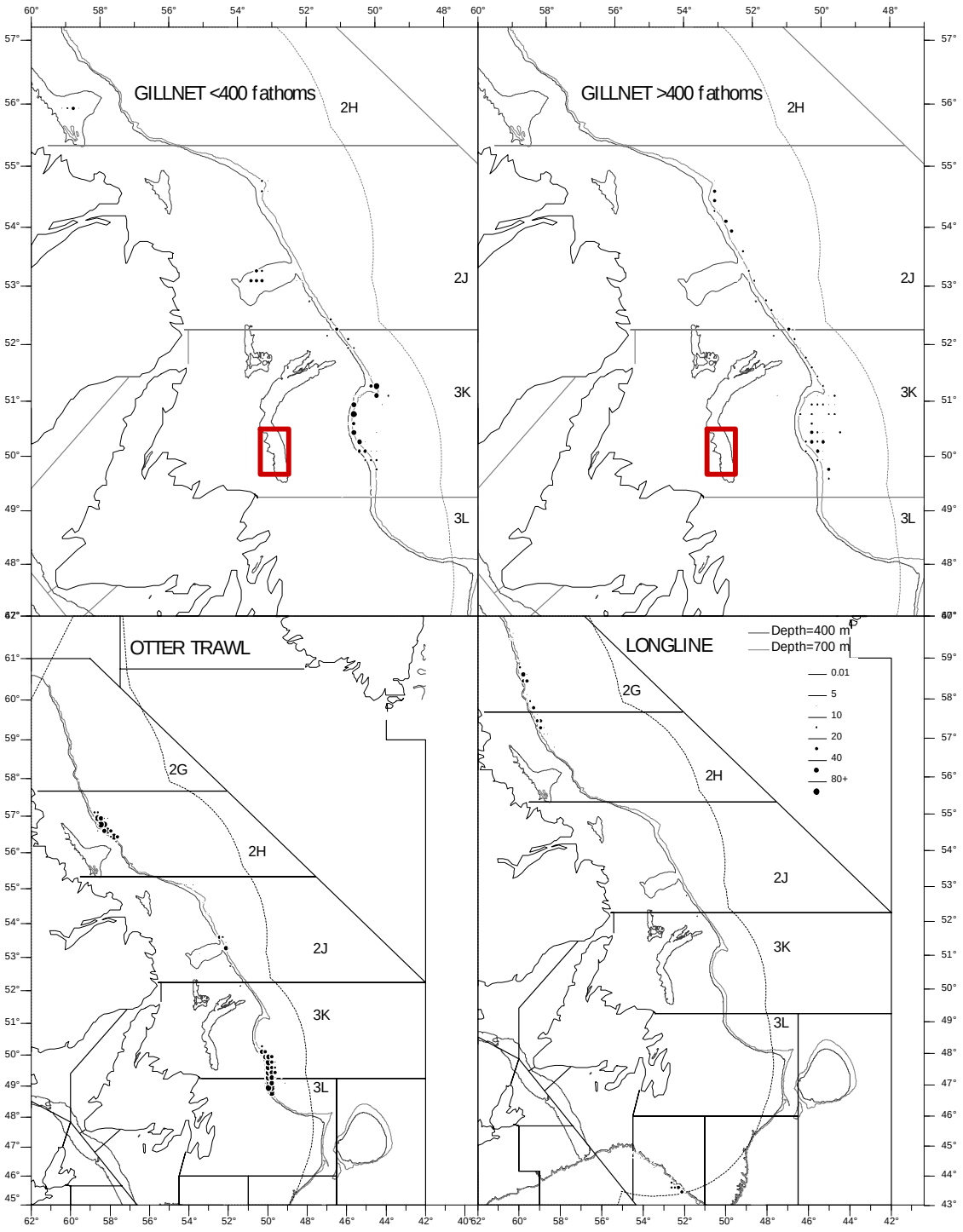

Fig. 4. Distribution of Can(N) Greenland halibut catch (tons) from the 2003 commercial fishery. Represented is LONGLINE, GILLNET (<400 fathoms and >400 fathoms) and OTTER TRAWL from both directed and by-catch fisheries. Data are aggregated by 10-minute square where position information exists. Note the closed area for GILLNETs in Div. 3K due to crab bycatch.

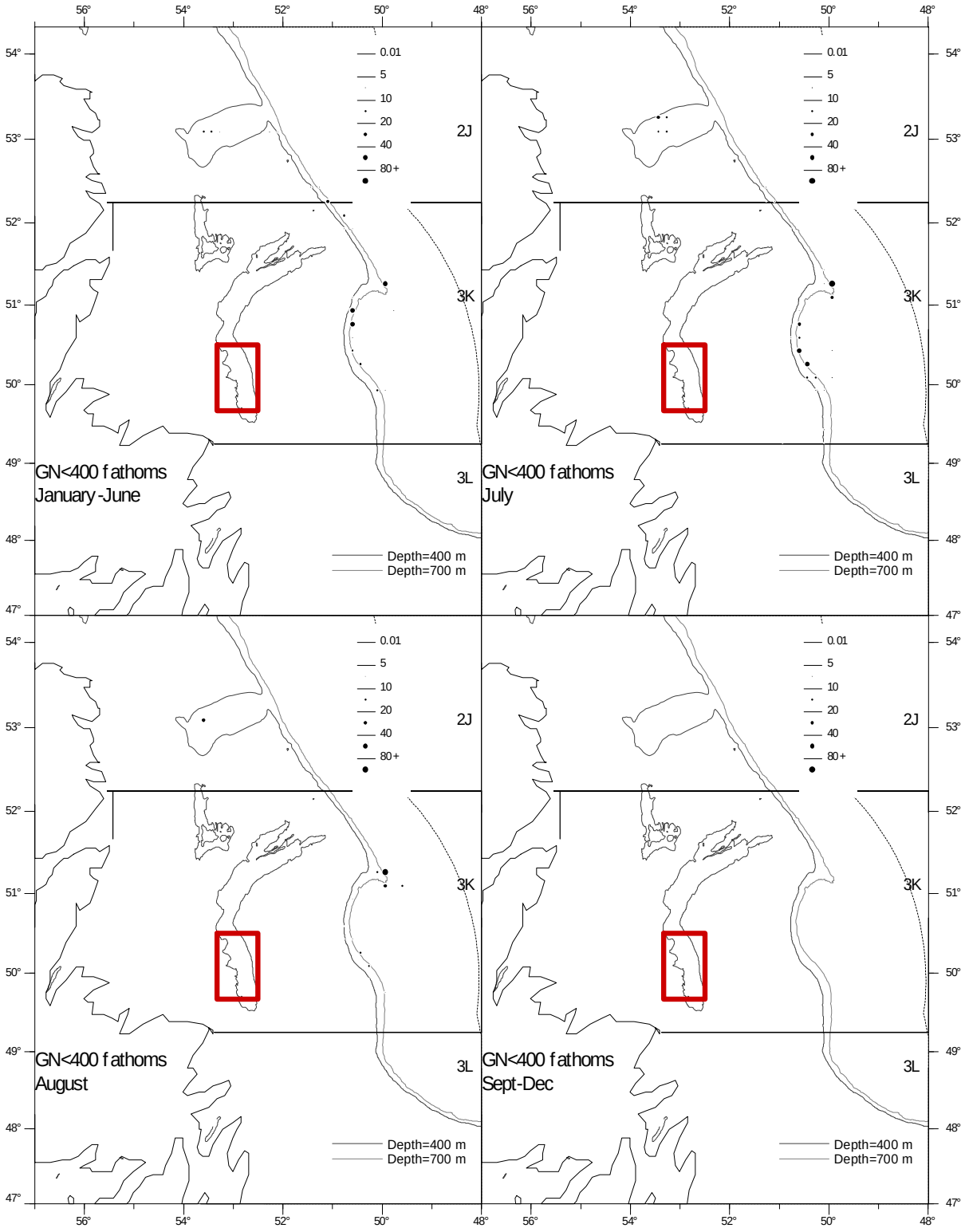

Fig. 5. Distribution of Can(N) Greenland halibut catch (tons) from the 2003 commercial fishery. Represented is GILLNET (<400 fathoms) for various months from both directed fisheries and by-catch fisheries. Data are aggregated by 10-minute square where position information exists. Note the closed area for GILLNETs in Div. 3K due to crab bycatch.

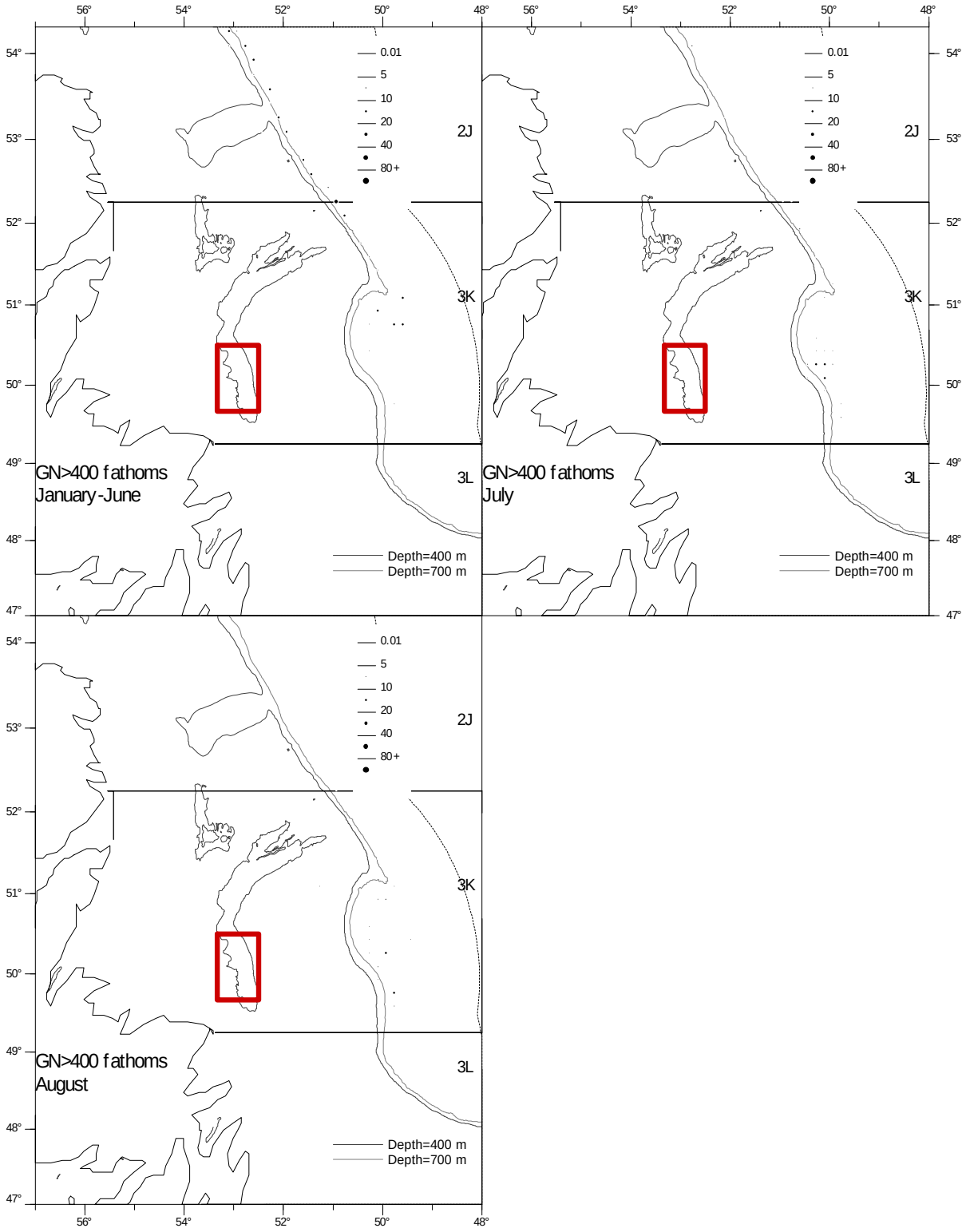

Fig. 6. Distribution of Can(N) Greenland halibut catch (tons) from the 2003 commercial fishery. Represented is GILLNET (>400 fathoms) for various months from both directed fisheries and by-catch fisheries. Data are aggregated by 10-minute square where position information exists. Note the closed area for GILLNETs in Div. 3K due to crab bycatch.

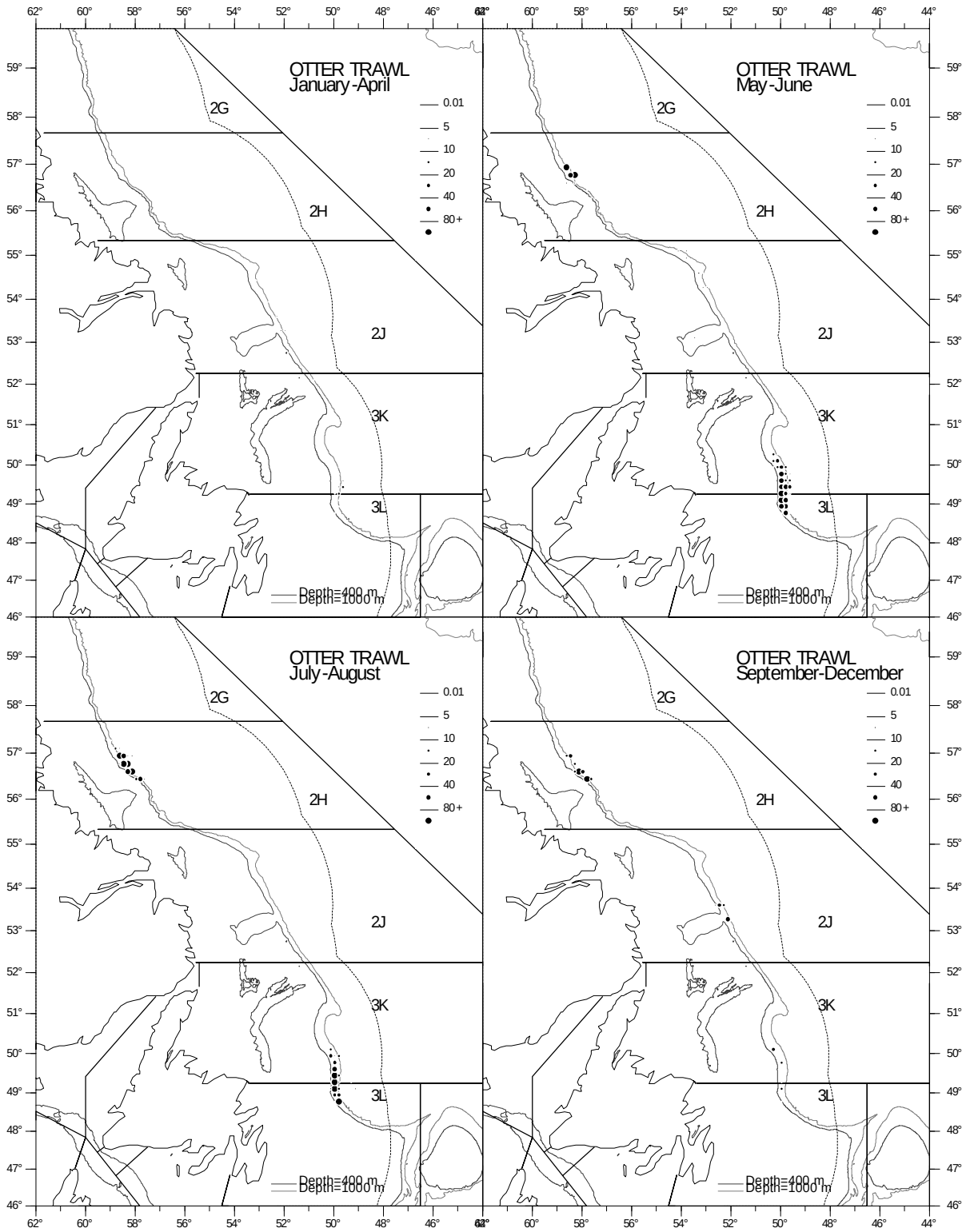

Fig. 7. Distribution of Can(N) Greenland halibut catch (tons) from the 2003 commercial fishery. Represented is OTTER TRAWL catch for various months from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square for Div. 2J3KL where position was recorded on the logbook.